Horn clauses and strict NPIs under negated matrix clauses

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Abstract

The present paper makes four main contributions: First, it argues for a surface-scope oriented approach to phenomena that have been considered strong arguments against surface scope of negation: the licensing of embedded strict Negative Polarity Items (NPIs) and embedded Negative Inversion (i.e. Horn clauses). Second, this surface-scope analysis is expressed within existing HPSG analyses of NPI licensing and Negative Inversion. Third, the strict/non-strict distinction of NPIs is reduced to universal vs. existential quantification over the licensing requirement within a semantic representation. Fourth, Negative Inversion is analyzed as a constructional NPI. The existence of constructional NPIs should not be surprising, but no such example has been previously discussed in HPSG to my knowledge.

1 Introduction

The paper investigates under which conditions strict Negative Polarity Items (such as *lift a finger*) and subject-auxiliary inversion can be licensed in an embedded clause through a negated matrix predicate. The most commonly known context for such non-local licensing is *Negation Raising* (Neg Raising), i.e., cases in which a negation that appears in the matrix clause is apparently interpreted in the embedded clause, as indicated in (1).

(1) I don't think [Chris won]. ⇒ I think [Chris didn't win].

This apparent low interpretation has been observed to correlate with the possible occurrence of strict Negative Polarity Items as in (2a), and of embedded "Negative" Inversion, so-called *Horn clauses*, see (2b).

(2) a. I *(don't) think [Chris will lift a finger].
     b. I *(don't) think [that ever before has Chris been in Olomouc].

However, Horn (2014) and Hoeksema (2017) show that neither of these two phenomena is restricted to Neg Raising. I will take their empirical observations as the basis to develop a more fine-grained characterization and analysis of Negative Polarity Item licensing in general, and in HPSG in particular.

Before going into the more detailed discussion, I need to introduce some terminology. I distinguish three licensing aspects for Negative Polarity Items (NPIs): Strength, at-issueness, and locality. Each of these aspects has been used in the literature before, however, their independence is usually not discussed. I will introduce a typographic marking for each dimensions at first mention.

Strength: strong vs. weak NPIs (van der Wouden 1997)   Strong NPIs require a verbal negation or a negative indefinite as licenser, but are not licensed by a "weak" licenser like *not every* or *few*, see (3).

(3)   a.   Strong NPI: No one/*Not everyone lifted a finger to help Alex.

　　 b.   Weak NPI: No one/Not everyone has ever helped Alex.

At-issueness: ⌐regular⌐ vs. ⌊lexical⌋ NPIs (Sedivy 1990)   Lexical NPIs can be licensed pragmatically, as in (4a) to reject the claim that Cynthia never lifts a finger. Regular NPIs require an overt (i.e. at-issue) licenser: ⌊at all⌋ is not licensed in (4b) even in a context where it is claimed that Bert doesn't care about the homeless.

(4)   a.   Cynthia DOES ⌊lift a finger⌋ when there is work to be done.

　　 b.   * Bert DOES care about the homeless ⌐at all⌐.   (Sedivy 1990: 98)

Locality: strict vs. non-strict NPIs (Hoeksema 2017)   Non-strict NPIs can occur embedded under negated factive predicates, but strict NPIs cannot, (5).[1]

(5)   a.   he didn't know [that the building had ever been used as a dry
　　　　　cleaner . . .]   (English Trends)

　　 b.   * he didn't know [that the building was **all that** old].

From here on, I will typographically indicate all three NPI-licensing aspects. For example, ⌐*ever*⌐ is a weak, ⌐regular⌐, non-strict NPI. In its NPI-use, ⌐*need*⌐ is weak, ⌐regular⌐, and strict. The NPI ⌊*lift a finger*⌋ is strong, ⌊lexical⌋, and strict. Furthermore, I will put overt licensers in **bold face**.

I will argue for the relevance of distinguishing these licensing aspects in Section 2. I do not claim, however, that they constitutes an exhaustive classification of NPIs. For example, van der Wouden (1997) shows that there are more subcategories with respect to strength than just two. Also, I do not consider the NPI licensing in questions, which represent yet another aspect. Section 3 presents a theory of NPI licensing based on the generalizations from Section 2. Section 4 provides an HPSG encoding, and Section 5 is a short conclusion.

2   Generalizations about NPI types

In this section I will propose the following three generalizations that seem to be not always prominent in the literature.

G-1 Licenser strength and locality requirement are independent of one another

G-2 Embedded licensing of strict NPIs does not require Neg-Raising

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[1]The corpus *English Trends* is available via `www.sketchengine.eu` (Kilgarriff et al. 2014).

G-3 Horn clauses behave exactly like strict NPIs

I will discuss data from the literature that support these generalizations.

2.1 Ad G-1: Independence of strength and locality

In many papers on NPI licensing in embedded clauses, all examples of strict NPIs are also strong NPIs. Usually, we find ⌞*lift a finger*⌟ and ⌜*until*⌝. But modal auxiliary ⌜*need*⌝ is a strict NPI as well, though it is weak, as it is licensed by *few*, (6a). However, as a strict NPI, it is not licensed by negated factive *know*, (6b).

(6)   a.   Of course, **not every** criticism ⌜**need**⌝ be taken at face value

       b.   Boris Johnson does **not** think/*know that rules ⌜**need**⌝ apply to him (grammatical versions from English Trends)

I list the classifications of some NPIs in Table 1. This table shows that there are weak strict NPIs. However, the table only shows five out of eight possible combinations of the three licensing aspect. The missing combinations are: strong non-strict lexical; weak non-strict regular, and strong strict lexical. Or, expressed differently: All strong NPIs and all lexical NPIs I looked at are strict. It is an empirical question if these non-listed combinations exist.[2] NPIs such as ⌜*need*⌝ and ⌞*all that*⌟ are weak but strict, showing that not all strict NPIs are strong. Strict NPIs can be strong or weak, and lexical or regular. However, all non-strict NPIs might be weak.

	strength	at-issueness	locality	
ever, any	weak	⌜regular⌝	non-strict	(Sedivy 1990)
NPI *need, at all*	weak	⌜regular⌝	**strict**	
all that Adj.	weak	⌞lexical⌟	**strict**	(Horn 2014)
until, either	strong	⌜regular⌝	**strict**	
lift a finger	strong	⌞lexical⌟	**strict**	(Sedivy 1990)

Table 1: NPIs, classified by strength, at-issueness, and locality

2.2 Ad G-2: Strict NPIs under negated matrix predicates

The contrast in (5) has led to the simplified assumption that Neg Raising is the only constellation in which strict NPIs can be licensed by a negation in the matrix clause. Horn (2014) lists instances of Horn clauses and strict NPIs under negated non-Neg-Raising predicates, such as non-factive uses of *know* in (7).

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[2] A comprehensive list of English NPIs with licensing contexts, comparable to Hoeksema (2024) for Dutch, is a research desideratum. A good collection of English NPIs is provided in von Bergen & von Bergen (1993), but they do not discuss licensing profiles in detail.

(7) Strict NPI: I do**n't** know [that this is ⌊**all that**⌋ complicated].

≠ I know that it is **not** ⌊**all that**⌋ complicated.

Note that in (7), the negation is not interpreted in the embedded clause, i.e., there is no *Neg-Raising inference*. Instead the version with matrix negation expresses a lower degree of certitude than the one with negation in the embedded clause. This can be seen over and over in occurrences of strict NPIs under negated non-factive matrix predicates, as in (8)–(10).

(8) I do**n't** know [that it ⌜**need**⌝ create any serious difficulties].

≠ I know [that it ⌜**need**⌝ **not** create any serious difficulties].

(9) But that does**n't** mean [that she ⌜**need**⌝ correspond to contemporary notions of what a feminist should be]   (English Trends)

≠ that means [that she ⌜**need**⌝ **not** correspond . . .]

(10) I'm **not** sure [he's done ⌊**a damn thing**⌋ to correct it] (Hoeksema 2017)

≠ I'm sure [he has**n't** done ⌊**a damn thing**⌋ to correct it] . . .

Hoeksema (2017) explores the properties of negated matrix predicates that allow for embedded strict NPIs further. He observes that strict NPIs are blocked with factive predicates and, more generally, whenever the truth of the embedded clause can be inferred. This excludes strict NPIs under negated factive *know*, but also under matix expressions such as *I wouldn't have thought*, both of which imply the truth of their complement clause.

While Horn (2014) and Hoeksema (2017) show that Neg Raising is not a necessary condition for long-distance licensing of strict NPIs, the availability of a Neg-Raising inference is not a sufficient condition either. Zeijlstra (2017) argues that *be of the opinion* has a Neg-Raising inference, see (11). We find non-strict NPIs in the embedded clause, as in (12a), but no strict NPIs, see (12b).

(11) I am **not** of the opinion [that you are right].

= I am of the opinion [that you are **not** right].   (Zeijlstra 2017)

(12) I am **not** of the opinion . . .
   a.   Non-strict: [that it would ⌜ever⌝ be used . . .]   (English Trends)
   b.   Strict: *[that Carolyn will ⌊**breathe a word**⌋ about it.]

(Zeijlstra 2017)

Other predicates of this type are *it is not the case that* and *it is not true that*, which were already mentioned in Horn (1978) as involving a Neg-Raising inference but as not licensing strict NPIs, see (13).

(13)   * It is **not** true/the case [that he'll get there ⌜**until**⌝ Sunday].

(Horn 1978: 207)

So far, we saw that negated matrix predicates allow for strict NPIs unless they are veridical or of the *be of the opinion/be true* type. In either case, non-strict NPIs may occur. Hoeksema (2017) mentions a class of matrix predicates which preclude both strict and non-strict NPIs: speech report predicates.

In his corpus research, Hoeksema (2017) only finds data of NPIs under verbs of saying when these are used in a non-speech report way, as in (14).

(14)   a. Strict: I would**n't** say that it was ⌜**at all**⌝ likely.

       b. Non-strict: I'm **no**t saying [there is ⌜anything⌝ the matter with him]

                                         (Hoeksema 2017)

But Hoeksema (2017) did not find NPIs in speech report uses as in (15)

(15)   *I'm **no**t reporting/ *Alex did**n't** say …

                       [that there is ⌜anything⌝ the matter with him].

We can conclude that there is no correlation between the availability of a Neg-Raising inference and the occurrence of stict NPIs: we find strict NPIs with non-Neg-Raising predicates that are non-veridicial, but not with predicates with Neg-Raising inference such as *be of the opinion that* and *be the case that*.

2.3   Ad G-3: The NPI status of Negative Inversion and Horn clauses

Negative Inversion (NI) occurs primarily with a negative fronted constituent, but also with *only* and other known licensers of NPIs (Büring 2004), see (16b), including weak licensers such as *not every*, (16c).

(16)   a. NI: **Not a single** word did he utter unnecessarily.   (English Trends)
           Weak NPI: **not a single** bullet ⌜**need**⌝ be fired   (English Trends)

       b. NI: **Only** two of them did he find useful.   (Büring 2004)
           Weak NPI: **Only** one application form ⌜**need**⌝ be filled out. (www)[3]

       c. NI: **Not every** time did they hit a winning note,   (English Trends)
           Weak NPI: **Not every** lionfish ⌜**need**⌝ be removed.   (www)[4]

It is difficult to assess NI with respect to the at-issueness of licensing, as the contexts used in Sedivy (1990), such as stressed auxiliary in (4), cannot be applied to NI. For simplicity, I assume that NI requires an at-issue licenser.

When there is a matrix negation, NI is classified as a Horn clause (HC). Hoeksema (2017) and Horn (2014) show that strict NPIs and HCs can occur not just in Neg-Raising constellations but also with other non-veridical matrix predicates, as with non-fractive *know* in (17b). However, neither strict NPIs nor Horn clauses occur with factive predicates and speech reports, see (17c). Horn clauses are also excluded under *be of the opinion*, (17d). Thus, NI and HC together (NI-HC hereafter) behave like a weak, strict, possibly regular NPI.

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[3] `https://tinyurl.com/only-need`, accessed 1.9.2024
[4] `https://tinyurl.com/not-every-need`, accessed 1.9.2024

(17)   a.   I do**n't** think [that ever before have the media played such a major role in a kidnapping.]. (Horn 2014)

       b.   I do**n't** know [that ever before had all three boys slept simultaneously]. (Horn 2014)

       c. * I did**n't** realize/report [that ever before had all three boys slept simultaneously].

       d. * I am **not** of the opinion [that ever before have the media played such a major role in a kidnapping].

Nonetheless, there is an obvious difference between NI-HC and (ordinary) weak strict NPIs: We don't find NI when the NPI-licenser follows the inverted auxiliary, which is the prime licensing context for strict NPIs:

(18)   a.   NI-HC: *After a party could I **not**/**never** sleep.
            vs. **Never** could I sleep after a party.

       b.   Strict NPI: I do**n't**/**never** ⌞**give a damn**⌟ about sleep after a party.

I characterize the NPI-hood of NI-HC with the constraint in (19):

(19)   The NI-HC/NPI Constraint:
      The scope of the fronted constituent in NI-HC is a strict weak NPI.

      In other words: Whatever is in the scope of the fronted constituent must be (at the same time) licensed like a weak strict regular NPI.

It has been observed in the literature that the fronted constituent in NI must have wide scope within its clause. For example, a fronted negative constituent cannot express constituent negation, but marks the entire clause as negated. This does not mean that the negation must have widest scope, as modals can take scope over it (Francis 2017), see (20). The correct generalization seems to be that the fronted constituent takes scope over other quantifiers in the clause, and over the main lexical verb, but does not necessarily take widest scope.

(20)   [Context: *You are teaching a class. The university is concerned that too many students have been failing in recent years, so they tell all instructors to limit the number of Fs they give out.*]
      To (very) few students must you give an F. (**MUST-deontic** > **FEW**)
                                    (Francis 2017: 216)

This captures the data: **First**, if the fronted constituent is an NPI licenser itself, the NI-HC/NPI-Constraint holds trivially, as the fronted constituent is constructionally required to take scope over (major part) of the rest of the clause. **Second**, we exclude an NPI within the fronted constituent in unembedded "negative" inversion – whether or not the clause contains a negation, see (21): Since the fronted constituent in NI takes (relatively) wide scope, a fronted NPI cannot be in the scope of a licenser later in the clause.

(21) *Ever have I (not) been to Olomouc before.

Third, HCs may only have elements in the fronted position that do not intervene with the licensing. This excludes a universal quantifier or a positive polarity item, see (22).

(22) I don't think that [in a single year]/*[every year]/*[in some years] has Alex finished a paper.

Fourth, definites are excluded in the fronted position in HCs, (23). This is surprising as definites do not block NPI licensing, contrary to universals, (24).

(23) I don't think that *[this year] has Alex finished a paper.

(24) Alex did **not** give the/*every apple to ⌜any⌝ of the kids.

The ungrammaticality of fronted definites in HCs follows from the requirement that the fronted constituent must take scope over the rest of the clause. Definites are not scopal in the relevant sense – which is why they usually do not count as interveners in NPI licensing in the first place.

The NI-HC/NPI-Constraint captures the distribution of ⌜**NI-HC**⌝. Classifying it as a strict NPI accounts for its occurrence under negated matrix predicates.

3 Semantic analysis

With the refined empirical observations on the three licensing aspects of NPIs, I can now turn to the semantic analysis. I will mainly rely on previous work for the analysis of strength and at-issueness, in particular Sailer (2021, 2022). The main contribution of this paper lies in the account of locality.

3.1 Strength

Zwarts (1981, 1986) provides a basic characterization of licenser strength based on semantic entailment properties. His categories are derived from de Morgan's laws ($\neg(\phi \wedge \psi) \equiv \neg\phi \vee \neg\psi$, and $\neg(\phi \vee \psi) \equiv \neg\phi \wedge \neg\psi$). Zwart's categories have been shown to be empirically useful for classifying NPIs (van der Wouden 1997), and have been further extended, for example in Giannakidou (1998). Sailer & Richter (2002) propose a representational reformulation of Zwart's categories, given in Table 2. They decompose downward-entailing expressions into combinations of a negation and another operator.

I express the weak/strong distinction as follows: Strong NPIs must be in the scope of negation with possibly additional intermediate existential quantifiers. Weak NPIs must be in the scope of negation, but there can be other intermediate quantifiers. This captures the contrast in (3): The strong NPI ⌞*lift a finger*⌟ is licensed by *no one* (decomposed into $\neg\exists x(\ldots\mathbf{NPI}\ldots)$), but not by *not everyone* (i.e. $\neg\forall x(\ldots\mathbf{NPI}\ldots)$). The weak NPI ⌜*ever*⌝ is fine in both licensing environments.
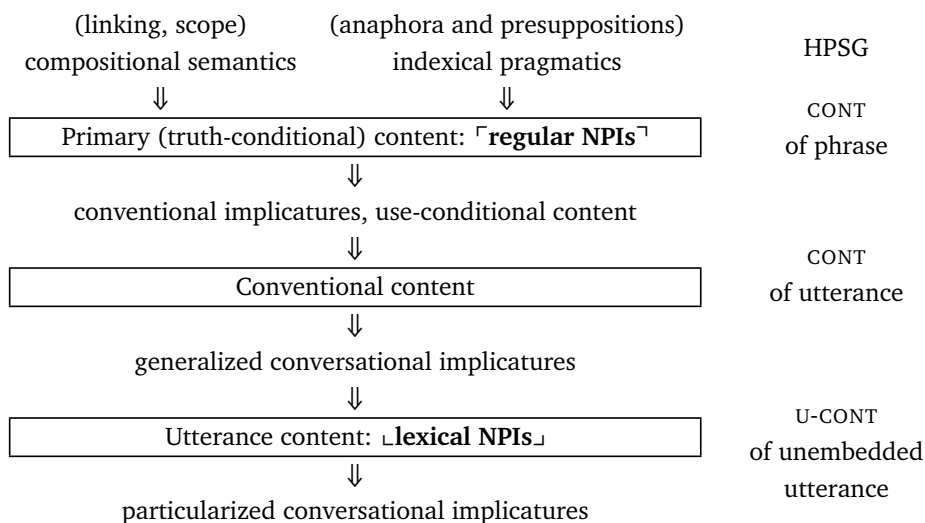
strength	example	entailment	representation
super-strong	*not*	antimorphic	$\neg(\ldots \textbf{NPI} \ldots)$
strong	*nobody*	anti-additive	$\neg\exists x(\ldots \textbf{NPI} \ldots)$
weak	*few*	downward entailing	$\neg\textbf{Many}x(\ldots \textbf{NPI} \ldots)$

Table 2: Representational encoding of entailment categories

3.2 At-issueness

The at-issueness aspect of NPI licensing requires an inclusion of various types of pragmatic inferences. Sailer (2021) presents an HPSG-compatible model of the semantics-pragmatics interface, which is heavily based on Levinson (2000), but includes Conventional Implicatures. In Figure 1, I repeat his model, indicating where regular and lexical NPIs are licensed. On the right side I also mention where the different types of semantic representation occur inside the HPSG encoding that I will use in Section 4.

In this model, there is a *primary truth-conditional content* that comprises ordinary, combinatorial semantics, including linking, scope and anaphora resolution, and accommodation of presuppositions. The *conventional content*, then, includes conventional implicatures and other use-conditional content (Potts 2007a). As proposed in Levinson (2000), the *utterance content* is arrived at by further enrichment through generalized conversational implicatures (including scalar implicatures). Particularized conversational implicatures à la Grice (1975) are not considered part of the linguistic representation in this model.

Sailer (2021, 2022) uses this model to capture the distributions of what I refer to as regular and lexical NPIs in the present paper. He proposes that a stressed auxiliary as in (4) contributes a use-conditional semantics of rejecting a salient proposition. This salient proposition may contain a negation. Regular NPIs such as ⌜*ever*⌝ need to be licensed within the primary content, i.e., they require an overt licenser. Lexical NPIs such as ⌞*lift a finger*⌟ are fine if licensed in the utterance content. Consequently, they can be licensed by a negation that is only part of the use-conditionally enriched semantic representation. I sketch the relevant semantic representations in (25) to illustrate how this accounts for the contrast in (4).

(25)   a.   Regular NPI: *Bert DOES care about the homeless ⌜at all⌝.
                (reject: 'Bert does**n't** care about the homeless ⌜at all⌝.')
      b.   Lexical NPI: Cynthia DOES ⌞**lifted a finger**⌟ when …
            (reject: 'C. does**n't** ⌞**lift a finger**⌟ under any circumstances.')
      Primary content: $\ldots \textbf{NPI} \ldots$
      Utterance content: $\ldots \textbf{NPI} \ldots \wedge \textbf{reject}(\textbf{speaker}, \ldots \neg(\ldots \textbf{NPI} \ldots) \ldots)$

The part of the utterance content that is derived through enrichment (i.e., Conventional Implicatures, use-conditional meaning, or generalized conversa-

(linking, scope)	(anaphora and presuppositions)
compositional semantics	indexical pragmatics

$$\Downarrow \qquad \qquad \Downarrow$$

HPSG

Primary (truth-conditional) content: ⌜**regular NPIs**⌝

CONT
of phrase

$$\Downarrow$$

conventional implicatures, use-conditional content

$$\Downarrow$$

Conventional content

CONT
of utterance

$$\Downarrow$$

generalized conversational implicatures

$$\Downarrow$$

Utterance content: ⌞**lexical NPIs**⌟

U-CONT
of unembedded
utterance

$$\Downarrow$$

particularized conversational implicatures

Figure 1: Semantics-pragmatics interface and NPI licensing in HPSG

tional implicatures) is underlined. Neither NPI is licensed in the primary content of the relevant example, but in both cases, an occurrence of the NPI is in the scope of negation in the utterance content. The regular NPI in (25a) is not acceptable as it is unlicensed in the primary content. The utterance content is the relevant licensing domain for lexical NPIs, therefore (25b) is fine.

3.3 Locality

We can now turn to the strict/non-strict distinction. As noted above, in the relevant examples of embedded NPI licensing beyond Neg Raising, the negation is interpreted in the matrix clause, not in the embedded clause. This is also the case in (17b). Horn (2014) explains the occurrence of HCs in non-Neg-Raising contexts as follows: In examples like (17b), non-factive *know* has a relevant weaker alternative – for example *think* – that triggers a Neg-Raising inference. I.e., the example is fine because *I don't think that ever before . . . is.*

I will propose a simpler theory, in which strict NPIs and HCs are directly licensed by a matrix negation in the complement of a Neg-Raising or a non-veridical predicate. This is particularly plausible as, semantically, these contexts pattern with other licensing cases.

Universally quantified noun phrases block NPI licensing, even for non-strict NPIs like ⌜*any*⌝, as in (24) above. However, modal and opaque predicates do not block NPI licensing, even those that are considered universal quantifiers over a set of possible worlds $\mathscr{W}$. In (26), the strict NPI ⌞*lift a finger*⌟ is licensed by the negation even with a universal modal taking intermediate scope.

(26)　He won't have to ⌞**lift a finger**⌟ to win that primary.　(English Trends)
　　　$\neg \forall w \in \mathscr{W}(\dots \textbf{NPI} \dots)$

Just like modals, Neg-Raising predicates and other matrix predicates are typically analyzed as quantifiers over possible worlds. Consequently, it is to be expected that they do not constitute interveners for NPI licensing either.

We can apply this basic insight to Neg Raising *think* and non-factive *know*. We treat both predicates as universal quantifiers over the worlds compatible with what the subject believes or is certain about. As shown in (27), the strict NPI ⌜*all that*⌝ is in the scope of a negation with just the quantification over some relevant set of worlds taking scope between the negation and the NPI.

(27)   I don't think/know [that this is ⌜**all that**⌝ complicated].
       $\neg \forall w \in \mathscr{W}_{\textbf{speaker}}.(\dots \textbf{NPI} \dots))$

While this captures the matrix scope reading for non-Neg-Raising predicates, it also derives just a matrix-scope reading for Neg Raising. To get the low interpretation, we can apply strengthening or similar strategies, as suggested in semantic and pragmatic accounts of Neg Raising, such as Gajewski (2007) or Romoli (2013), to name just two. The same analytic strategy has been proposed in Zeijlstra (2017). In other words, the current proposal is fully compatible with semantic and pragmatic accounts of Neg Raising, but attributes the NPI licensing to an independent property that Neg-Raising predicates share with other matrix predicates. This analysis captures the licensing of all discussed NPI types under matrix negation. However, we now have shifted the analytic burden from why strict NPIs are licensed in Neg Raising to why they are not licensed under other types of matrix predicates.

Blocking case 1: Veridical inference blocks strict NPIs and HCs   If we allow a matrix negation to license embedded strict NPIs, we seem to have lost control over the restricted distribution of these NPIs. Strict NPIs and HCs are not licensed if the veridicality of the complement clause is inferred or assumed. Kastner (2015) suggests that the complement of factive predicates is a definite noun phrase (and behaves semantically as one). This looks promising at first, as NPIs are not licensed inside a definite noun phrase. However, the analogy breaks down because non-strict NPIs like ⌜*ever*⌝ are excluded from licensing inside a definite noun phrase, see (28a), but can occur in the complement of negated factive predicates, see (28b).

(28)   a.   They didn't write [a/*the book [that could ⌜*ever*⌝ be published]].
       b.   They didn't realize [that the book could ⌜*ever*⌝ be published].

Montero & Romero (2023) explore whether mood choice in the complement clause of negated matrix predicates in Spanish influences factivity. They derive veridical inferences as scalar implicatures triggered by exhaustification, following Romoli (2015): As a factive predicate, **know** has the scalar alternatives **know**(x, p) and p – with p being the weaker alternative. Under negation,

$\neg\mathbf{know}(x, p)$ is exhaustified to $\neg\mathbf{know}(x, p) \wedge p$, i.e., when negating a strong element on the scale, the weaker scalar alternative is still assumed to be true.

In the analysis of lexical NPIs in Section 3.2 we exploited non-at-issue inferences to license lexical NPIs. Homer (2008) has shown that non-at-issue semantics can also block NPI licensing.[5] If the factive/veridical inference is a scalar implicature, it will be part of the utterance content in the model in Figure 1. This gives us a natural way to express licensing constraints that are sensitive to the factivity/veridicality of the context. For strict NPIs we need to assume that pragmatic enrichment must not introduce a constellation that excludes the NPI – as would be the case for a strict NPI inside p in $\neg\mathbf{know}(x, p)$ after exhaustification to $\neg\mathbf{know}(x, p) \wedge p$.

Blocking case 2: *be true/be of the opinion* As discussed in Section 3.3, predicates like *be the case, be true, be of the opinion* do not allow for licensing of embedded strict NPIs – even though they may trigger a Neg-Raising inference.

Typical negated uses of *be of the opinion* are as in (29). Here, the question of whether everyone should be tested is presented as being of conversational interest, and the speaker expresses a negative opinion on it.

(29) In a recent conversation, she asked me, "Why isn't everyone just tested before they get pregnant?" Good question.
To be clear, I am not of the opinion that everyone should "just get tested."
(English Trends)

This suggests that the proposition expressed in the embedded clause is contextually given in some sense. I will tentatively assume that it is part of Portner's *common propositional space*, i.e. a member of the set of propositions that are of interest for the current conversation.[6]

This leads to the semantic representations in (30), where I use the constant **CPS** for the set of propositions in the common propositional space. The primary content contains a negation. The utterance content has two more elements: (i) a Neg Raising inference, and (ii) the background assumption that the proposition expressed in the embedded clause is in the common propositional space.

(30) Kim is not of the opinion ...
a. [that Alex will ⌜ever⌝ talk about it].

$$\neg\forall w. w \in \mathscr{W}_{\mathbf{alex}}.(\ldots \text{NPI} \ldots) \qquad \text{(primary content)}$$
$$\wedge \forall w. w \in \mathscr{W}_{\mathbf{alex}}.\neg(\ldots \text{NPI} \ldots) \qquad \text{(Neg-Raising inference)}$$
$$\wedge \lambda w.(\ldots \text{NPI} \ldots) \in \mathbf{CPS} \qquad \text{(CPS inference)}$$

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[5]Though Homer (2008) discusses blocking of regular NPIs through presuppositions, which the model in Figure 1 treats as part of the primary content.

[6]This is inspired by Montero et al. (2024): They argue that propositions in the common propositional space can block the licensing of strict NPIs in Spanish embedded indicative clauses.

b. *[that Alex will ⌞**breathe a word**⌟ about it].

$$\neg\forall w.w \in \mathscr{W}_{\textbf{alex}}.(\ldots\textbf{NPI}\ldots) \qquad \text{(primary content)}$$

$$\underline{\wedge\forall w.w \in \mathscr{W}_{\textbf{alex}}.\neg(\ldots\textbf{NPI}\ldots)} \qquad \text{(Neg-Raising inference)}$$

$$\wedge\lambda w.(\ldots\text{*}\textbf{NPI}\ldots) \in \textbf{CPS} \qquad \text{(CPS inference)}$$

The non-strict NPI in (30a) is licensed by the negation in the primary content. The utterance content does not play a role for it. The strict NPI in (30b) would be licensed in the primary content and the Neg Raising inference. However, it does not tolerate a non-licensed occurrence in the last conjunct, which is related to the common propositional space.

Blocking case 3: Speech reports block HCs and all NPIs   Neither HCs nor any other NPIs can occur in negated speech reports. Hoeksema (2017) argues that the reported utterance itself is not at issue, whereas an NPI must be part of the at-issue content in the constellation in which it is licensed. Montero & Romero (2023) treat speech report on a par with attitude predicates with the only difference being in the modal base (the *reported background* for verbs of saying, following Portner & Rubinstein 2020), but the content of the speech report is not an alternative. Thus, if we adopted Montero & Romero's analysis, we would be in the same situation as for non-factive non-speech-report predicates and wrongly predict NPI licensing and HCs inside speech reports.

Therefore, I will go in a different direction. I propose that the content of the reported speech is simply not in the scope of the matrix negation. I sketch the resulting semantic representation in (31), where I assume that the variable x is of the semantic type u (for "utterance", see Potts 2007b), and the predicate **Content** holds between an utterance x and a proposition p iff p is a propositional content entailed by x. This way, the semantic representation of the embedded clause, p, is not part of the scope of negation.

(31)   * Alex didn't say [that Kim had ⌞ever⌟ submited a paper].

$$\exists x_u : \textbf{Content}(x,(\ldots\textbf{NPI}\ldots)) \wedge \neg\textbf{report}(\textbf{alex},x)$$

Of course, negated reported speech rarely occurs in natural communication. Uses of negated speech report predicates such as those in (14) are far more common and behave with respect to NPI licensing just as other negated matrix predicates discussed in this subsection.

Intermediate summary   I have argued that in NI-HC, the fronted constituent has scope over a substantial part of the rest of the clause and that what is in its scope behaves like a strict weak NPI (the NI-HC/NPI-Constraint). In addition, I have amended the NPI licensing theory of Sailer (2021) by adding a licensing condition for strict NPIs: every occurrence of a strict NPI beyond the primary content must be licensed. I propose that since quantification over possible worlds

	utterance content	non-strict	strict
Neg Raising	$(\neg\forall w\phi)$	ok	ok
non-factive *know*	$(\neg\forall w\phi)$	ok	ok
factive *know*	$(\neg\forall w\phi)\wedge\underline{\phi}$	ok	*
be of the opinion	$(\neg\forall w\phi)\wedge\underline{\lambda w.\phi\in\mathbf{CPS}}$	ok	*
speech report	$\exists y_u(\mathbf{Cont}(y,\phi)\wedge\neg\mathbf{say}(x,y)$	*	*

Table 3: Types of negated matrix predicates and licensing of an NPI inside ϕ

does not block NPI licensing, licensing from a matrix negation should be possible in general. However, the enrichment through a veridical inference or contextual giveness blocks the licensing of strict NPIs. For the semantics of speech reports I tentatively suggested that the content of the reported utterance is not in the scope of negation at all, which blocks all NPIs from being licensed through a matrix negation. The types of matrix predicates discussed in this paper and the relevant semantic representations are summarized in Table 3. In the following, I extend existing HPSG analyses to formalize this approach.

4 HPSG analysis of NPI licensing

4.1 Previous approaches

Neg Raising   Sailer (2006) analyzes Neg Raising as an instance of scope ambiguity, i.e., the negation from the matrix clause can either take scope over the matrix predicate or be in its scope, see (32).

(32)   I don't think [that Alex won].
Surface scope: $\neg\forall w(w\in\mathscr{W}_{\mathbf{speaker}}:\mathbf{win}_w(\mathbf{alex}))$
Neg-Raising: $\forall w(w\in\mathscr{W}_{\mathbf{speaker}}:\neg\mathbf{win}_w(\mathbf{alex}))$

This analysis was based on the assumption that Neg Raising is the only possibility for non-local licensing of strict NPIs. We saw, however, that with **G-2**, this analysis is no longer tenable. Instead, a simpler analysis turned out to be more adequate in which only the surface scope representation is needed but the universal quantification over possible world does not block NPI licensing.

NPI licensing   Richter & Soehn (2006) propose a collocational treatment of NPIs. They argue that an NPI must be licensed within the semantic representation of a particular syntactic domain containing it. Both, the kind of licenser and the size of the domain can vary. Richter & Soehn use a list-valued feature CONTEXT-OF-LEXICAL-LICENSING (COLL) to express distributional idiosyncrasies of lexical items. The elements on the COLL list specify the syntactic domain

$$
\begin{bmatrix}
\text{PHON} & \left\langle \ulcorner \underline{ever} \urcorner \right\rangle \\
\text{CONT} & \alpha \\
\text{COLL} & \left\langle \begin{bmatrix} utterance \\ \text{LF-LIC} \;\; \beta \end{bmatrix} \right\rangle
\end{bmatrix}
\quad
\begin{bmatrix}
\text{PHON} & \left\langle \llcorner \textbf{\textit{budge (an inch)}} \lrcorner \right\rangle \\
\text{CONT} & \alpha \\
\text{COLL} & \left\langle \begin{bmatrix} complete\text{-}clause \\ \text{LF-LIC} \;\; \beta \end{bmatrix} \right\rangle
\end{bmatrix}
$$
$$\text{\& de-str-op}(\alpha, \beta) \qquad\qquad \text{\& aa-str-op}(\alpha, \beta)$$

Figure 2: Licensing requirements adapted from Richter & Soehn (2006)

of the licensing by their type – for example *utterance* for licensing within the complete utterance. In addition, there are features for whether this is a semantic, syntactic, or phonological licensing condition. NPIs require semantic licensing, which is expressed by a feature LF-LIC.[7] The LF-LIC value is identical with the CONTENT value of the licensing syntactic object. The concrete licensing strength is encoded as relational constraints. For example, if α is the relevant part of the semantic representation that needs to be licensed by a strong (anti-additive) licenser within the CONTENT of the licensing domain, β, we add a constraint aa-str-op(α, β).[8]

I sketch the lexical entries of the NPIs $\ulcorner$*ever*$\urcorner$ and $\llcorner$**_budge (an inch)_**$\lrcorner$ according to Richter & Soehn (2006) in Figure 2. As a non-strict weak NPI, $\ulcorner$*ever*$\urcorner$ requires a licenser within the CONTENT of the overall utterance that is at least downward entailling. The strict strong NPI $\llcorner$**_budge (an inch)_**$\lrcorner$ asks for an anti-additive licenser within the CONTENT value of the smallest clause containing it. Note that the syntactic restriction to a clause-mate licensing for strict NPIs indicates that Richter & Soehn (2006) don't assume **G-2**, i.e., they assume that strict NPIs can only be licensed by a morpho-syntactically higher negation if that negation is interpreted within the clause that contains the NPI.

4.2 Revised analysis of NPI licensing

The aim of the present paper is to modify Richter & Soehn's collocational NPI-licensing theory so that it can express the licensing theory of Section 3. Since this theory relies heavily on pragmatic notions, the notion of an *utterance* is important. I will adopt the architecture of Höhle (2019: 583), who discusses phonological processes at the level of embedded an unembedded signs. Höhle assumes that unembedded signs are of type *unembedded-phrase*. Unembedded signs have both, a traditional PHON feature, and a feature UTTERANCE-PHON. The value of the latter is the result of applying post-lexical phonological processes to the utterance's PHON value.

---

[7]I use lower-case Greek letters instead of boxed integers as tags for semantic representations.

[8]This is a free adaptation of Richter & Soehn (2006): First, Richter & Soehn assume the semantic combinatorics of *Lexical Resource Semantics* (Richter & Sailer 2004). I am using a more traditional semantic architecture in this paper for better accessibility, though an LRS encoding would be straightforward. Second, they formulate functional rather than relational constraints.

I model the semantics-pragmatics interface from Figure 1 in analogy to Höhle's treatment of phonology: The *primary content* of a sign is its CONTENT value. The *conventional content* is the CONTENT value of an unembedded sign.[9] I introduce a new feature, UTTERANCE-CONTENT (U-CONT) on unembedded signs, whose value is the sign's *utterance content*. The U-CONT is the result of applying semantic/pragmatic enrichment (such as generalized conversational implicatures) to the utterance's CONTENT value. In other words, I assume that generalized conversational implicatures are to meaning what post-lexical phonological processes are to phonology.

I argued in Section 3 that NPI licensing can be checked at the primary content (for non-strict regular NPIs) and at the utterance content (for strict and lexical NPIs) – since the latter are sensitive to conventional and generalized conversational implicatures. Contrary to Richter & Soehn (2006), I do not distinguish between licensing at the clausal level and licensing at the utterance level because at least the NPI types discussed here can all be licensed non-locally. Consequently, I will assume that all NPI-related elements on the COLL list are of type *utterance*. Such *utterance* objects have an additional feature ULF-LIC, whose value is identical with the U-CONT value of the utterance containing the NPI.

I can now provide the HPSG encoding of my NPI-licensing theory. My specification of a weak strict regular NPI such as ⌜*ever*⌝ is just as Richter & Soehn's in Figure 2: The NPI asks for a downward-entailing licenser in the CONTENT value of the utterance containing them.

A lexical NPI need not be licensed in the primary content, but can be licensed anywhere within the enriched semantic representation, i.e., within the U-CONT value of the utterance. The difference between a regular and a lexical NPI is, therefore, just that the lexical NPI looks for its licenser in the U-CONT value.

In order to include the strict/non-strict aspect of NPI licensing, I unpack the notation in Richter & Soehn (2006). Richter & Soehn require an occurrence of the NPI's semantics in the scope of an appropriate licenser, i.e., there is an *existential quantification* over the occurrences of the NPI semantics. This suffices to capture non-strict NPIs. For **strict** NPIs, however, we need a *universal quantification* over the occurrences of the NPI semantics: every occurrence of the NPI semantics in the utterance content (beyond the primary content) must be in the scope of an appropriate licenser. This is implemented in Figure 3. A weak regular strict NPI like ⌜***need***⌝ requires a downward entailing licenser in the primary content (β), by virtue of being a weak regular NPI (the first condition next to the AVM). By virtue of being a strict NPI, any additional occurrence in the utterance content (γ) must also be licensed (the second condition).[10]

---

[9]The conventional content is the result of enriching the primary content with Conventional Implicatures. While Potts (2005) assumes that this only happens at the utterance level, Bach (1999) shows that many of these inferences can be integrated at embedded signs, as long as these have some kind of speech act operator. I will ignore this complication, but see Asadpour et al. (2022) for the relevance of this distinction also for conventionalized social meaning inferences.

[10]For the time being, I simply postulate that the universal non-at-issue licensing underlies the
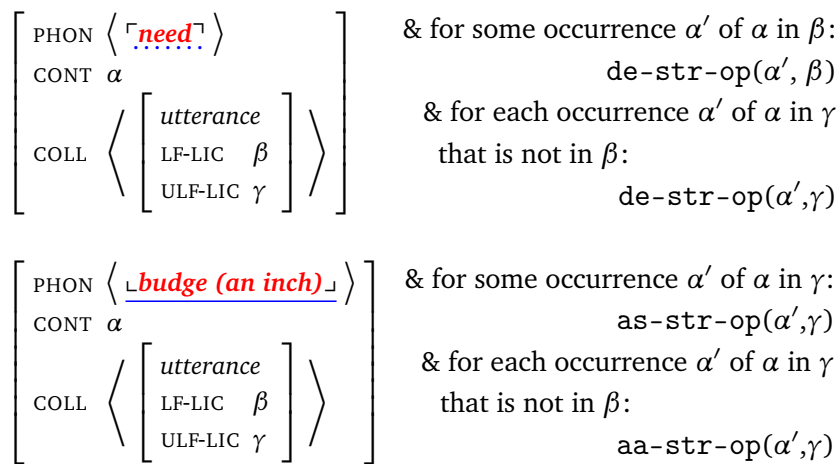
$$\begin{bmatrix} \text{PHON} & \langle\; \ulcorner\textit{need}\urcorner\; \rangle \\ \text{CONT} & \alpha \\ \text{COLL} & \left\langle \begin{bmatrix} \textit{utterance} \\ \text{LF-LIC} & \beta \\ \text{ULF-LIC} & \gamma \end{bmatrix} \right\rangle \end{bmatrix}$$
& for some occurrence α' of α in β:
$$\texttt{de-str-op}(\alpha', \beta)$$
& for each occurrence α' of α in γ
that is not in β:
$$\texttt{de-str-op}(\alpha', \gamma)$$

$$\begin{bmatrix} \text{PHON} & \langle\; \llcorner\textit{budge (an inch)}\lrcorner\; \rangle \\ \text{CONT} & \alpha \\ \text{COLL} & \left\langle \begin{bmatrix} \textit{utterance} \\ \text{LF-LIC} & \beta \\ \text{ULF-LIC} & \gamma \end{bmatrix} \right\rangle \end{bmatrix}$$
& for some occurrence α' of α in γ:
$$\texttt{as-str-op}(\alpha', \gamma)$$
& for each occurrence α' of α in γ
that is not in β:
$$\texttt{aa-str-op}(\alpha', \gamma)$$

Figure 3: Sketches of lexical entries of example NPIs with locality

I provide the revised lexical entry of ⌞***budge (an inch)***⌟ – a strong lexical strict NPI – below that of ⌜***need***⌝. This NPI asks for an anti-additive licenser in the utterance content γ, instead of the primary content. In addition, since it is a strict NPIs, all occurrences outside the primary content must be licensed.

4.3 HPSG analyses of Negative Inversion/Horn Clauses

My final task is to show how ⌜**NI-HC**⌝ can be modelled. I will start from the syntactic analysis of NI in Maekawa (2012) and add to it NPI-licensing conditions analogous to those of ⌜***need***⌝.

Maekawa (2012) adopts the classical analysis of NI from Emonds (1970) as a flat structure in which a clause-initial constituent is followed by an inverted auxiliary, its subject, and a VP. The fronted constituent is related to the VP by an unbounded dependency.

Maekawa (2012) restricts the fronted constituent to be marked as negative, which means that it must contain some element that is able to express clausal negation, such as *never*, or *not a single person*. Since we also find inversion with other NPI licensers, see (16), negative inversion cannot be related to morpho-syntactic negativity of the fronted constituent but rather to some semantic properties. In HC, the fronted element is never an inherently negative expression.

To remedy this limitation of Maekawa's analysis, it is sufficient to treat NI and HC as instances of the same construction and to assume that the scope of the fronted constituent is a weak regular strict NPI. Consequently, in NI, the fronted constituent must be a (weak) NPI licenser and, for HCs, the fronted constituent must not block the licensing from the matrix clause. The resulting analysis is summarized in Figure 4, using an oversimplified feature geometry, just to sketch the essence of the analysis.

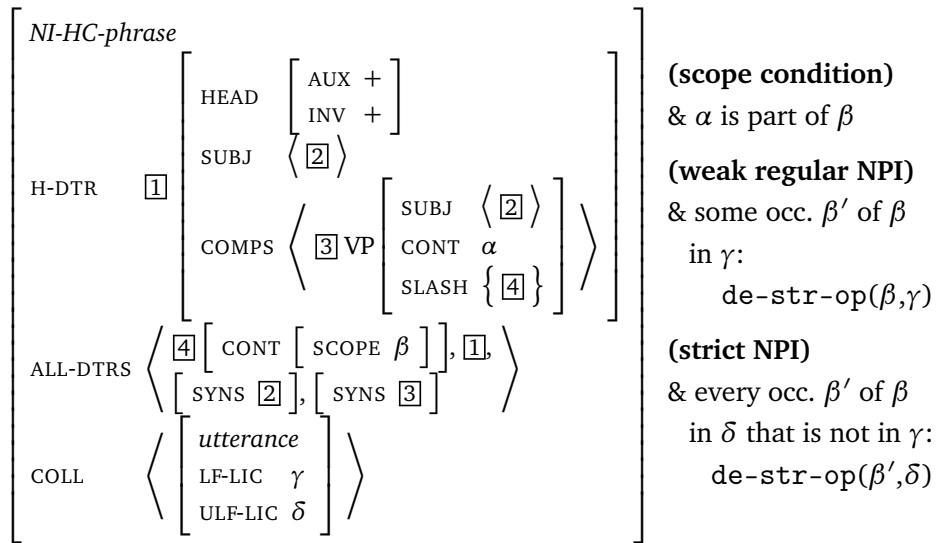
same strength requirements as the existential licensing.

$$
\begin{bmatrix}
\textit{NI-HC-phrase} \\[2pt]
\text{H-DTR} \quad \boxed{1}
\begin{bmatrix}
\text{HEAD} \begin{bmatrix} \text{AUX } + \\ \text{INV } + \end{bmatrix} \\
\text{SUBJ} \quad \langle \boxed{2} \rangle \\
\text{COMPS} \left\langle \boxed{3}\,\text{VP} \begin{bmatrix} \text{SUBJ} \langle \boxed{2} \rangle \\ \text{CONT} \; \alpha \\ \text{SLASH} \{ \boxed{4} \} \end{bmatrix} \right\rangle
\end{bmatrix} \\[10pt]
\text{ALL-DTRS} \left\langle \boxed{4}\,[\text{CONT}\,[\text{SCOPE}\,\beta]], \boxed{1}, [\text{SYNS}\,\boxed{2}], [\text{SYNS}\,\boxed{3}] \right\rangle \\[6pt]
\text{COLL} \left\langle \begin{bmatrix} \textit{utterance} \\ \text{LF-LIC} \; \gamma \\ \text{ULF-LIC} \; \delta \end{bmatrix} \right\rangle
\end{bmatrix}
$$

(scope condition)
& α is part of β

(weak regular NPI)
& some occ. β' of β
   in γ:
      $\texttt{de-str-op}(\beta,\gamma)$

(strict NPI)
& every occ. β' of β
   in δ that is not in γ:
      $\texttt{de-str-op}(\beta',\delta)$

Figure 4: Negative Inversion/Horn Clauses as weak regular strict NPI

I adopt Maekawa's flat syntactic structure. It is a headed phrase, headed by an inverted auxiliary, $\boxed{1}$. The head daughter selects for a subject, $\boxed{2}$ and a VP complement, $\boxed{3}$. The VP has an element, $\boxed{4}$, in its SLASH value. This extracted element is realized as the first daughter in the structure (see the ALL-DTRS value), followed by the head daughter, the subject, and the complement VP.

I add the special semantic properties of NI-HC to this basic syntactic structure. First, the fronted element is semantically scopal, indicated by the feature SCOPE. The first condition next to the AVM specifies that the CONTENT value of the head daughter (α) must be in the scope of the fronted constituent (β). According to the NI-HC/NPI-Constraint the scope of the fronted constituent behaves like a weak regular strict NPI. Consequently, the NPI-licensing constraints are stated for β. First, as a regular NPI, β must have a licensed occurrence within the primary content of the utterance containing the *NI-HC-phrase*. Second, being a weak NPI, the licenser need only be downward-entailing. These two licensing aspects are expressed in the second constraint next to the AVM. Third, since β is a strict NPI, any occurrence of it within the utterance content (δ) must be licensed as well. Consequently, the constraint on the sort *NI-HC-phrase* in Figure 4 illustrates nicely how NPI-licensing requirements can be added to individual constructions in a straightforward way.

5 Conclusion

The present paper made four main contributions: First, it argued for a surface-scope oriented approach to phenomena that have been considered strong evidence against surface scope of negation: the licensing of embedded strict NPIs

and Horn clauses. Second, this surface-scope analysis was expressed within existing HPSG analyses of NPI licensing and Negative Inversion. Third, the strict/non-strict distinction of NPIs is interpreted as universal vs. existential quantification over the licensing requirement within an enriched semantic representation. Fourth, Negative Inversion/Horn clauses are analyzed as a constructional NPI. The existence of constructional NPIs should not be surprising, but no such example has been previously discussed in HPSG to my knowledge.

The proposed theory of NPI licensing is a synthesis and further elaboration of previous representational (HPSG) accounts. I used three empirical aspects of NPI-licensing to develop this theory systematically: Strength distinctions are expressed through different licenser requirements in terms of relational constraints (Richter & Soehn 2006). At-issueness follows from whether an NPI needs to be licensed in the primary content or the utterance content of the utterance containing it, i.e., in the utterance's CONT or U-CONT value respectively (Sailer 2021). Finally, locality is a matter of quantification: A non-strict NPI needs just a single, licensed occurrence, a strict NPI requires that all its occurrences (outside the primary content) be licensed.

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