

Spurious NPI licensing is covert licensing

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1 Introduction

- NEGATIVE POLARITY ITEMS (NPIs) are expressions subject to specific licensing conditions, e.g. *any, ever, at all, in weeks*.
- It has been generally argued that the licensing environment of NPIs includes Downward Entailing (DE) contexts (e.g. Fauconnier 1975; Ladusaw 1979). A feature of DE contexts is that they support set-to-subset inferences, as shown below for negation (1) and the restrictor of a universal quantifier (2):

(1) Negation

- I don't like vegetables. \models I don't like carrots.
- I like vegetables. $\not\models$ I like carrots.

(2) Universal quantification

- Every student with an idea should speak up. \models Thuy should speak up
- Some student with an idea should speak up. $\not\models$ Thuy should speak up

- It thus follows that an NPI like *at all* can be licensed both under the scope of negation (3) and in the restrictor of a universal quantifier (4):

(3) Negation

- I didn't like the movie **at all**.
- *I liked the movie **at all**.

(4) Universal quantification

- Every student who tried solving the problem **at all** got some points.
- *Some student who tried solving the problem **at all** got some points.

- What the examples in (a) have in common—and that the examples in (b) crucially lack—is that they provide DE environments, which, in turn, are responsible for licensing the NPI *at all*.

- *Licensing conditions*

A standard way to implement this restriction on NPIs has been to assume that the licensing conditions are structural.

- A licenser must c-command an NPI in the syntax (Ladusaw 1979).
- Failure to satisfy this structural requirement leads to ungrammaticality.

- For example, in (5b), the negative quantified phrase *no topic* modifies the NP headed by *assignment*, such that it occupies a position from where it does not c-command the NPI *any*, hence the ungrammaticality of the sentence.

- No student of mine liked any of my homework assignments.
- *The student of mine liked **any** homework assignment on **no topic**.

⇒ *Clear prediction*

In the absence of a c-commanding licenser, a sentence with an NPI should be ungrammatical.

.....

- * *Spurious NPI licensing*

However, under certain circumstances, speakers appear to be subject to so-called SPURIOUS NPI LICENSING EFFECTS, whereby they perceive that NPIs without a c-commanding licenser are in fact licensed and grammatical.

- An example of spurious NPI licensing is given in (6), where (6b) patterns like (6a) instead of like (6c), even though there is no accessible licenser:

- (6) a. **GRAMMATICAL**
 No mountains that the Swedish hikers have climbed have **ever** been taller than 5000 feet.
- b. **SPURIOUS**
 The mountains that **no** Swedish hikers have climbed have **ever** been taller than 5000 feet.
- c. **UNGRAMMATICAL**
 The mountains that the Swedish hikers have climbed have **ever** been taller than 5000 feet.

- These effects directly contradict the predictions of the traditional grammatical theory of NPI licensing.

• **Empirical robustness**

Moreover, the pattern in (6) has been widely attested under a variety of different experimental methodologies:

- Acceptability-judgment tasks (Drenhaus et al. 2005)
- Eye-tracking (Vasishth et al. 2008)
- Self-paced reading (Xiang et al. 2006)
- ERP (Xiang et al. 2009)

- The resulting state of affairs is unexpected: The robust empirical pattern is in conflict with the clear predictions of the theory of NPIs.

⇒ **Central questions**

1. What triggers the spurious licensing of NPIs?
2. What is the actual interpretation of these illusory sentences?

* **Main claims in this talk**

1. Spurious licensing is covert licensing by EXH, a covert exhaustivity operator with a similar syntax/semantics as *only*; EXH c-commands the NPI at LF.
2. Covertly licensed NPIs are fully licensed, but at the cost of a repair strategy that results in lower acceptability.

* **Empirical contribution**

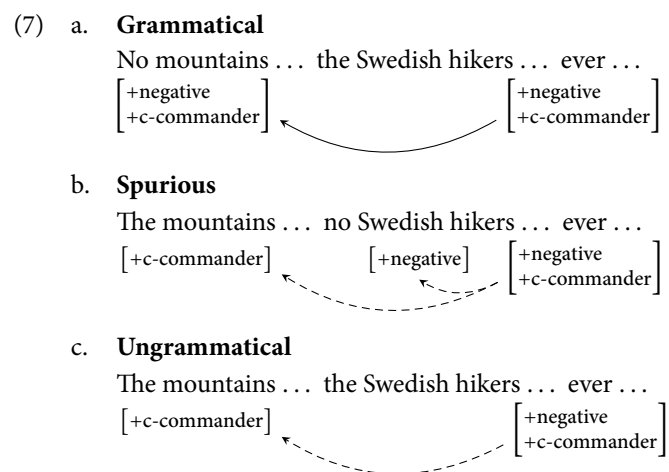
Spurious NPI licensing can occur in the outright absence of a licenser.

2 New perspective

2.1 Previous account: Similarity-based interference

- Vasishth et al. (2008) argue that spurious NPI licensing arises from similarity-based interference from a partial match during memory cue retrieval, working within the cue-based retrieval system known as ACT-R:
 - Upon encountering a dependency, the parser retrieves the matching “chunk” out of memory to satisfy the dependency.
 - Each chunk has a level of **ACTIVATION**, which **DECAYS** as a sentence is processed.
 - Chunks that are more active are easier to retrieve from memory than chunks that are less active.
 - Chunks contain feature matrices, which a dependency can partially match.

⇒ They propose that an NPI requires a [+negative] and [+c-commander] element as its licenser. Spurious NPI licensing results when the NPI partially matches the embedded [+negative] element:



⇒ **Problems**

- The similarity-based interference account is presented as relying on linearity alone, but it is forced to postulate a feature [+c-commander], whose nature is unclear.
- The analysis offered by the account boils down to the function determining decay, which does not have significant explanatory adequacy.

- Moreover, NPis seem more prone to illusions than other formally similar dependencies (e.g. reflexives) in similar contexts. Such between-construction differences are not necessarily expected in an account that attributes the effect to the memory architecture of the parser (Xiang et al. 2009).
- This processing model does not realize the right grammatical constraints that are widely believed to be involved in NPI licensing.

2.2 Proposal: Covert licensing

* *Proposal*

- Spurious NPI licensing involves genuine licensing.
- When a discourse requires a sentence to be parsed exhaustively, by means of an exhaustivity operator EXH, akin to *only*, a DE-environment is created despite there being no overt morphological reflexes of this environment.
- In such cases, the NPI may be licensed covertly by EXH, but this mechanism is a repair strategy, which results in lower acceptability.

• *Encouraging exhaustification*

Discourse pressures towards exhaustification may arise in a number of ways.

- We concentrate on situations involving SHORTFALL (used by Moxey (2006) to investigate complement-set reference): the expectation of what the reference set of a previously mentioned NP should be, particularly when there is a deficit between what is expected and what is fact.
- To illustrate, consider (8), where the first sentence creates an expectation to continue talking about all of the plants, an expectation that is not met in the second sentence.

(8) Whenever the summer is really dry, Susy expects all of her plants to die.
This year, a small number of the plants have died.

- Not parsing the second sentence exhaustively would incur a violation of the Maxim of Quantity, which is difficult to cancel, as illustrated by the oddness of the follow-up below:

(9) #... In fact, all of them have.

3 Experiment

- To test our hypothesis, we conducted a speeded-acceptability judgment task.

* *Design*

We manipulated two factors: (i) the presence of an NPI ([±EVER]) and (ii) the obligatoriness of exhaustive parsing via shortfall ([±EXH]).

- (10) a. [+EXH], [±EVER]
Whenever the summer is really dry, Susy expects **all** of her plants to die. However, a small number of the plants have {**ever** / ∅} died.
- b. [-EXH], [±EVER]
Whenever the summer is really rainy, Susy expects **none** of her plants to die. However, a small number of the plants have {**ever** / ∅} died.

• *Experimental task*

1. The participant read a context sentence that manipulated shortfall. They had as much time as they needed to read the sentence.
2. The participant was presented a target sentence with or without *ever* in a rapid word-by-word display.
3. The participant was asked to judge the target sentence as ‘Very natural’ or ‘Not so natural’.

• *Details*

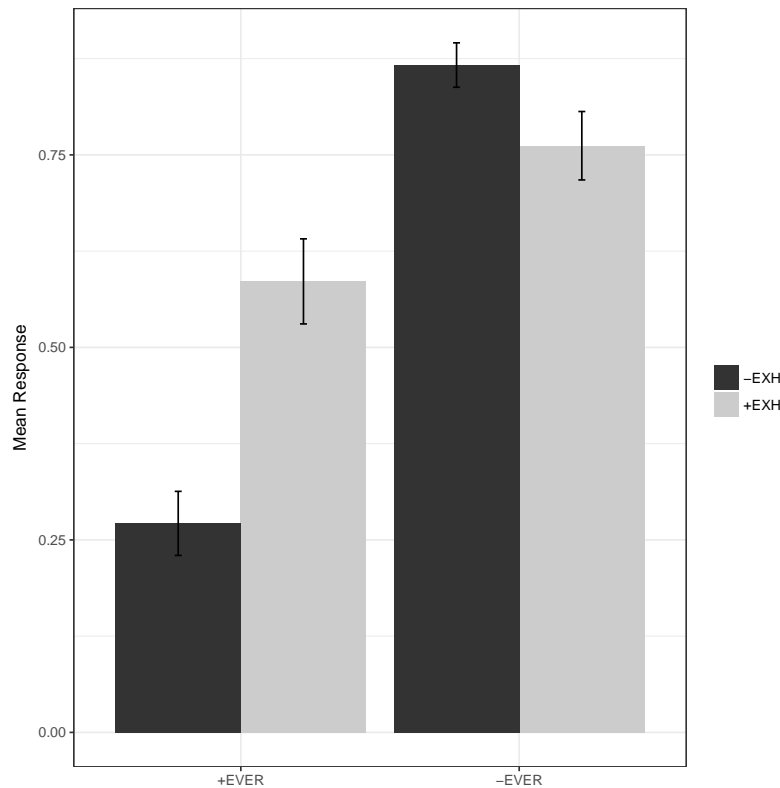
- 35 participants saw 24 items distributed across four lists in a Latin square design.
- The participants were recruited on Amazon Mechanical Turk.
- Each participant was paid \$1.

* *Results*

(11) **Proportion of ‘natural’ responses (and standard errors) by condition**

	[+EVER]	[-EVER]
[+EXH]	0.59 (0.06)	0.76 (0.04)
[-EXH]	0.27 (0.04)	0.87 (0.03)

(12) Proportion of ‘natural’ responses and standard errors by condition



• **Statistics**

- We analyzed the results using a logistic mixed effects model with [EXH] and [EVER] as fixed effects and full random effects structure for subjects and items.
- The proportion of ‘natural’ responses was lower in the [+EVER] condition ($z = -8.6, p < 0.05$), and there was no main effect of [EXH] ($z = 0.7, p = 0.5$).
- There was an interaction between the two factors ($z = 6.1, p < 0.05$).
- To investigate this interaction, we ran a second model that nested the factor [EXH] under the levels of [EVER] and retained the full random effects structure of the original model.
- This model revealed a crossover interaction: in [-EVER], the presence of shortfall ([+EXH]) degraded a sentence ($z = -3.1, p < 0.05$); in [+EVER], the presence of shortfall improved the sentence ($z = 5.2, p < 0.05$).

4 Discussion

4.1 Analysis

⇒ **Question**

The results show that NPIs can be licensed in the absence of DE-inducing environments. But how?

- Our explanation of (our cases of) spurious NPI licensing relies on two (sets of) assumptions, one semantic and one pragmatic.

4.1.1 Semantics

• **EXH and only**

- EXH and *only* are focus sensitive operators, with very similar syntactic and semantic properties, i.e. the difference is their (c)overtness.
 - They both can induce DE-environments, and so the two share the same NPI-licensing potential:¹
- (13) a. $[[\text{only}]]^w = \lambda C_{(st,t)}. \lambda p_{(st)} : p(w). \forall q \in \text{Alt}(p)[q(w) \rightarrow p \subseteq q]$
 b. $[[\text{EXH}]]^w = \lambda C_{(st,t)}. \lambda p_{(st)}. p(w) \wedge \forall q \in \text{Alt}(p)[q(w) \rightarrow p \subseteq q]$
- The syntactic distribution of EXH follows, roughly, that of *only*. Thus, it is freely insertible whenever *only* is.

- Klima (1964) first observed that *only* can also license NPIs like *ever*:

(14) **Only** young writers ever accept suggestions with **any** sincerity.

[Klima 1964:311]

- * Crucially, nothing stops the parser from freely inserting EXH in the follow-up sentence in shortfall cases:

(15) Whenever the summer is really dry, Susy expects all of the plants in her garden to die. However,...

- * a small number of the plants have **ever** died.
- only** a small number of the plants have **ever** died.
- EXH** a small number of the plants have **ever** died.

¹ See Chierchia (2006) and Fox (2007). These definitions ignore Innocent Exclusion.

- In sum, by providing the same semantics to *only* and EXH, we expect the same behavior with respect to NPI licensing.² In other words, if *only* can license an NPI, so can EXH.

4.1.2 Pragmatics

- Moreover, there are independent pragmatic pressures to parse the second sentence in shortfall cases with EXH.
- Assume that speakers are cooperative (Grice 1975), and focus on the following two Maxims (simplified):

(16) **MAXIM OF QUANTITY**
Make your contribution as informative as required.

(17) **MAXIM OF MANNER**
Be perspicuous; avoid obscurity of expression.

- Shortfall contexts require an exhaustive parse of the follow-up sentence for two pragmatic, albeit independent, reasons:

– *Reason #1*

Listeners expect their interlocutors to be cooperative, and cooperative speakers never use unlicensed NPIs; it is a conspicuous way of violating the Maxim of Manner.

– *Reason #2*

- * A nonexhaustive interpretation leads to an incoherent discourse move.
- * Shortfall cases are characterized by introducing a reference set (e.g. *all the plants*), followed by an immediate predication of a subset of that set (*a small number of the plants*).
- * Assuming that all pragmatic principles are in place—i.e. the speaker is following the Maxim of Quantity—a Scalar Implicature *must* be calculated (*a small number of the plants but not all of the plants*).

(18) Whenever the summer is really dry, Susy expects **all of the plants** in her garden to die. However, a small number of the plants [**but not all of them**] have died.

⇒ *The intuition*

Why mention *a small number of the plants VP* if it is the case that *all of the plants VP*? The oddness of a follow-up where the Scalar Implicature is negated indicates that an exhaustive parse is the only coherent discourse move:

(19) Whenever the summer is really dry, Susy expects **all of her plants** to die. This year, **a small number of the plants** have died. #In fact, **all of them** have.

4.1.3 Bringing semantics and pragmatics together

- Shortfall environments require exhaustification to preserve discourse coherence. All that listeners can do is parse the second sentence with a covert *only*, our EXH, and EXH licenses the NPI.
- Thus, inserting EXH in shortfall cases is a repair strategy that solves the two issues: it semantically licenses the NPI, and it preserves discourse coherence by abiding by the Maxim of Quantity.

4.2 Questions

⇒ *Explaining asymmetries in acceptability*

Spuriously licensed NPIs in shortfall cases are still not fully acceptable, and are rated lower than fully licensed NPIs with *only*. We suggest the following reasons for the lower acceptability:

- Spuriously licensed NPIs still violate the Maxim of Manner: licensing an NPI covertly is “more obscure” and not as “clear” as licensing it overtly.
- Spuriously licensing an NPI requires accessing a repair strategy (insertion of EXH) that in turn—in Shortfall cases—requires reasoning counterfactually about why the speaker chose to utter such a sentence; i.e. to calculate a Scalar Implicature. Otherwise, the result is an incoherent discourse.

- Thus, asymmetries in acceptability in the spurious cases reflect (i) differences in how easily listeners can access the repair, and (ii) how charitable they are with the violation of the Maxim of Manner.

⇒ *Unlicensed NPIs*

Given that a repair strategy exists for unlicensed NPIs, something must be said about why unlicensed NPIs ever exist. That is, assuming that when a listener encounters an unlicensed NPI, she reasons that it cannot be unlicensed and simply proceeds with the repair strategy wrongly predicts that there should never be unlicensed NPIs.

² For discussion, see Krifka (1995); Lahiri (1998); Wagner (2006); Chierchia (2013), a.o.

- According to our account, the availability of the repair strategy is contingent on two conditions:

(20) **Conditions for a repair strategy**

a. **Semantic requirement**

A suitable context that puts pressure towards an *obligatory* parse with EXH; otherwise, the discourse is incoherent.

b. **Pragmatic requirement**

The possibility of unambiguously identifying what the F-marked constituent of the sentence is; otherwise, the sentence is rendered uninterpretable.

- Consequently, we expect that the repair strategy will not be available when the above conditions are not met, predicting the ungrammaticality of run-of-the-mill ungrammatical cases.

(21) *Donald has ever read a book.

5 Extension

* **Predictions**

Our account predicts that, if EXH \leftrightarrow *only* with respect to NPI licensing, we should find that covert NPI licensing has a similar distribution as NPI licensing by *only*, modulo the repair conditions in (20). For instance, we expect that:

- EXH will not be able to license strong NPIs, because *only* cannot license them.

(22) ***Only** Mary came **in weeks**.

- Covert licensing may happen in other environments that require exhaustivity.
- Conversely, covert licensing may *not* happen in environments that do not admit exhaustivity.

- Yesterday, at the poster session, Ivan and Dillon (2018) provided preliminary support for the first case: lack of “spurious” strong NPI licensing in Romanian.

5.1 Follow-up experiment

- In a follow-up experiment, we are currently testing the latter two predictions.
- We use the same speeded-acceptability judgment task design to create a 2x2 experiment where we manipulate two factors: the presence of the NPI *ever* ([\pm EVER]) and the pressure towards exhaustivity ([\pm EXH]), for a total of four conditions.

* **Design**

We use short question–answer dialogs to manipulate the two [\pm EXH] conditions, by being explicit about how knowledgeable/ignorant the speaker providing the answer is:

(23) Do you know which of my relatives I’m allowed to invite to my graduation commencement?

a. [**+EXH**], [\pm EVER] knowledgeable speaker
Yes, I do, I work for the university. Your parents are {**ever** / \emptyset } allowed to attend the ceremony.

b. [**-EXH**], [\pm EVER] ignorant speaker
No, I don’t, I never went to college, but I think that your parents are {**ever** / \emptyset } allowed to attend the ceremony.

- The rationale is the same as in shortfall: an answer to a permission question by a speaker assumed to be knowledgeable is interpreted as exhaustive (our [**+EXH**] condition); otherwise, the discourse is not coherent. This is shown by the following contrast, with a follow-up negating the exhaustive implicature.

(24) a. Yes, I do, I work for the university. Your parents are allowed to attend the ceremony. #In fact your siblings are allowed too.

b. No, I don’t, I never went to college, but I think that your parents are allowed to attend the ceremony. In fact your siblings are allowed too.

* **Predictions**

If our hypothesis is on the right track, we expect:

(25) a. [**+EXH, +EVER**] > [**-EXH, +EVER**]
greater acceptability of covert licensing with knowledgeable speakers vs. ignorant speakers

b. [**+EXH, +EVER**] < [**+EXH, -EVER**]
lower acceptability with covert licensing vs. no licensing

5.2 More extensions

- In the future, we plan on extending our hypothesis to explaining spurious cases to two other environments:
 - *Nonmonotonic environments (Linebarger 1980)*
It has long been noted that NPIs can be licensed in non-DE environments:

(26) *Context*: there are 25 students in my class

 - a. #Exactly twenty students in my class have ever read a book.
 - b. Exactly two students in my class have ever read a book.
 - These cases are highly context dependent: the knowledge that there are 25 students is critical. Formally, these cases are very similar to shortfall cases: downsizing to 2 from 25 seems to trigger the exhaustivity inference that *only two* is the case, an inference that would render the otherwise-nonmonotonic *exactly two* into a DE environment (for discussion, see Crnič 2014).
 - “Classical” spurious NPI licensing (Drenhaus et al. 2005)
Shortfall cases are different from the classical spurious cases discussed in the processing literature. We are working on a unified explanation where the presence of a neg-word like *no* can provide the suitable focus structure required to interpret Ex_H (e.g. as opposed to sentential negation, which does not spuriously license NPIs).
- We also plan on providing a better understanding of the differences between *only* and Ex_H . As it has been noted, it seems that Ex_H alone is unable to license an NPI:

(27) a. Only $ALEX_F$ has ever read a book.
b. ?? Ex_H $ALEX_F$ has ever read a book.
- Note that the (b) example above only abides by one of the two conditions in (20) we claimed are required to covertly license an NPI.
- We suspect that enriching the context so as to create a greater pressure towards exhaustification in cases like (b) may increase its acceptability as well.

6 Conclusion

- *Empirical contribution*
We showed that, under certain conditions, no overt DE-inducing material is required to license an NPI.
- *Theoretical contributions*
We started off with two questions:
 - What triggers the spurious licensing of NPIs by non-c-commanding licensors?
 - What is the actual interpretation of these illusory sentences?
- *Answer to Question 1*: We suggested that spurious licensing is in fact covert licensing by Ex_H , a covert exhaustivity operator with similar syntax/semantics to *only*, which c-commands the NPI at LF.
- *Answer to Question 2*: We argued that covertly licensed NPIs are fully licensed, hence interpreted as usual. However, this comes at the cost of a repair strategy that results in lower acceptability.
- Generally, then, it is possible to attribute part of the “spurious” licensing effect to aspects of grammar and language use that are well studied. The hope is that they all are are such—and we are working at exploring that possibility.
- More broadly, our work joins others in trying to model grammatical illusions in terms of core grammatical mechanisms, rather than as ‘mere’ processing effects:
 - O’Connor (2015) on inversion/depth-charge sentences
 - O’Connor (2015) and Wellwood et al. (2018) on comparative illusions
 - Sloggett (2017) on reflexive illusions

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