

On Reading-Dependent Licensing of Strong Negative Polarity Items

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Abstract

I address two sets of data in which the acceptability of strong negative polarity items (*lift a finger, so much as*) is reading dependent: (i) Strong NPIs may occur in sentences with a law-like interpretation but not in sentences with an episodic interpretation. (ii) They improve in the restrictor of a proportional determiner even if ungrammatical in the restrictor of a corresponding cardinal determiner. These data are problematic for entailment-based and pragmatic approaches to NPI licensing. I propose an account based on *Discourse Representation Theory* (DRT). The differences are captured using DRT's representation of proportional determiners as duplex conditions and by the explicit integration of presuppositions into semantic representations.

1 Introduction

Negative Polarity Items (NPI) are expressions that cannot occur in affirmative, declarative sentences, but typically occur in negated sentences or in the complement clause to a matrix sentence of the form *I don't think*. This is illustrated in (1-a)/(2-a) and (1-b)/(2-b). NPIs are not a homogeneous class. As shown in (1-c) and (2-c), only some NPIs can be used in the scope of *not every N*. I use this as a diagnostic environment in the present paper to distinguish between *weak NPIs*, which can occur in the scope of *not every N*, (see (1-c)) and *strong NPIs*, as in (2-c), which have a more restricted occurrence pattern. This distinction was drawn for example in (Zwarts, 1997).

- (1) Occurrence pattern of weak NPIs:
- a. *Pat has ever heard of Hegel.
 - b. I **don't think** that Pat has ever heard of Hegel.
 - c. **Not every German** has ever heard of Hegel.

- (2) Occurrence pattern of strong NPIs:
- a. *Pat lifted a finger to help me.
 - b. I **don't think** that Pat lifts a finger to help me.
 - c. ***Not every students** lifts a finger to help his neighbor.

In the present paper I will consider another type of environments, the restrictor of a universal quantifier and the antecedent of a conditional. According to the classification of NPI-licensing contexts in (Zwarts, 1997), both strong and weak NPIs should be possible in the restrictor of *every*. Similarly, both types of NPIs have been observed in the antecedent of conditionals. This is illustrated with the data in (3) and (4).

- (3) Weak NPIs:
- a. [**Every** restaurant that is ever mentioned in the Cosmopolitan] should be shut down.
 - b. [**If** I a restaurant was ever mentioned in the Cosmopolitan], it should be shut down.
- (4) Strong NPIs:
- a. [**Every** restaurant that charges so much as a dime for iceberg lettuce] should be shut down.
 - b. [**If** a restaurant charges so much as a dime for iceberg lettuce], it should be shut down.

I will argue that strong NPIs are only possible in these contexts under a particular reading. I will, then, extend the observations made for *every* to the restrictor of other quantifiers. The data are presented in Section 2. This is followed by a brief discussion of previous approaches in Section 3. Section 4 contains the basis of my representational account of NPI licensing. In Sections 5 and 6 this approach is generalized to account for the data of Section 2.

2 Data

2.1 Strong NPIs in Law-like Sentences

The status of NPIs in the contexts in (3) and (4) had been under discussion since Heim (1984). Addressing the data in (4), Heim suggests that a strong NPI is possible in the restrictor of *every* only in cases where there is an inherent connection between the restrictor and the scope of the quantifier — or the antecedent and the consequent in a conditional. I will call this type of sentences *law-like*.

The acceptable sentences in (4) are in contrast with the unacceptable occurrences of strong NPIs in (5). In (5) the relation between the two parts of the sentence is accidental, i.e. it is an observed co-occurrence of the events of the two parts of the sentence which is not based on an inherent link between the two. I will refer to this type of sentences as *episodic*.

- (5) Strong NPIs in ‘episodic’ statements:
- a. *?[**Every** restaurant that charges so much as a dime for iceberg lettuce] happens to have four stars in the handbook.
 - b. *?[**If** a restaurant charges so much as a dime for iceberg lettuce], it has four stars in the handbook.

Israel (1995) argues in detail that the difference between law-like and episodic statements has no parallel with weak NPIs. The data in (3) showed that weak NPIs are felicitous in law-like statements. The examples in (6) illustrate that they are equally fine in episodic statements.

- (6) Weak NPIs in ‘episodic’ statements:
- a. [**Every** restaurant that was ever mentioned in the Cosmopolitan] happens to have four stars in the handbook.
 - b. [**If** a restaurant was ever mentioned in the Cosmopolitan], it happens to have four stars in the handbook.

This brief review of Heim’s and Israel’s observations shows that even though the restrictor of universals and the antecedent of a conditional may host both weak and strong NPIs, strong NPIs are only possible in one reading. This can be captured in the following empirical generalization.

- (7) Empirical generalization 1: Strong NPIs can occur in ‘law-like’ statements with *every* and *if*-clauses, but not in episodic statements.

2.2 NPIs in the Restrictor

In Section 2.1 we looked at the occurrence of strong NPIs in the restrictor of *every*. While the literature on NPIs concentrates on NPIs in the scope of various quantifiers, the restrictor has not received that much attention. The examples in (8) illustrate the occurrence pattern of NPIs in the restrictor of quantifiers as discussed for example in Zwarts (1997). There it is observed that the restrictor of *no*, *every*, and *few* allows for NPIs, whereas NPIs are excluded in the restrictor of *some*, *many*, and *most*.

- (8) a. Determiners that allow for NPIs in their restrictor:
- (i) *no/ every*: [**No/ every** student who has ever studied syntax] will forget this example.
 - (ii) *few*: [**Few** students who have ever studied syntax] will forget this example.
- b. Determiners that don’t allow for NPIs in their restrictor:
some/ many/ most: * [Some/ Many/ Most students who have ever studied syntax] analyzed this sentence correctly.

It was shown in Israel (1995) and Israel (2004) that the licensing pattern in (8) does not reflect the full picture. Israel observes a contrast between the NPI licensing in the restrictor of unstressed and stressed *some* and *many*, for which he writes *sm/mny* and *sóme/mány* respectively. While NPIs are excluded in the restrictor of the unstressed

versions, even strong NPIs considerably improve if the stressed version is used instead. This is shown with Israel's examples in (9).

- (9) a. *[Sm/ mny of the guests who ate so much as a bite of trout] got sick.
 b. ?[Sóme/ Mány of the guests who ate so much as a bite of trout] got sick.

This contrast can be related to observations from Partee (1988) where unstressed *sm* and *many* are classified as *weak determiners*, whereas stressed *sóme* and *mány* are considered *strong determiners*. The weak-strong distinction of determiners goes back to Milsark (1977). The existential *there* construction can be used as a diagnostics whether a determiner is weak or strong: Only weak determiners are allowed in this construction. This is illustrated in (10).

- (10) Diagnostic environment: Existential *there*-sentences
- a. Weak determiners:
 There is a solution to this problem.
 There are sm/ mny/ several/ a few books on this topic.
 There are no ghosts/ few books on this topic.
- b. Strong determiners:
 * There is every book on this topic.
 * There are sóme/ mány/ most books on this topic.

The classes of determiners identified by distributional criteria such as existential *there* sentences pattern with the semantic distinction between *cardinal* and *proportional* determiners (Barwise and Cooper, 1981). A determiner *D* is cardinal iff the interpretation of $D(A)(B)$ depends only on the size of the set $A \cap B$. A determiner *D* is proportional iff the interpretation of $D(A)(B)$ depends on the size of the set *A* in addition. For illustration, consider the definitions for the cardinal determiner *several* and the proportional determiner *most* in (11).

- (11) a. for each sets *A, B*, **several**(*A*)(*B*) is true iff $|A \cap B| \geq 2$.
 b. for each sets *A, B*, **most**(*A*)(*B*) is true iff $|A \cap B| \geq 0.5|A|$.

It is an important observation of Israel that the cardinal/proportional distinction plays a role in NPI licensing. This can be shown with the data in (12), which repeats the contrast between *sm* and *sóme* in (9), but uses unambiguously cardinal and proportional determiners.

- (12) a. Cardinal determiners and NPI licensing:
 * [Several guests who ate so much as a bite of trout] got sick.
 b. Proportional determiners and NPI licensing:
 ? [Most (of the) guests who ate so much as a bite of trout] got sick.

The data from this subsection can be summarized in the empirical generalization in (13)

- (13) Empirical generalization 2: Strong NPIs are (marginally) acceptable in the restrictor of proportional quantifiers.

3 Previous Approaches

In this section I will briefly sketch that prominent approaches to NPI licensing cannot capture the empirical generalizations from (7) and (13).

3.1 Entailment-based Approaches

The entailment-based approach to NPI licensing is formulated for example in Ladusaw (1980) and refined in Zwarts (1997). The key idea is that the entailment behavior of the context determines whether an NPI is possible or not. NPIS must occur in the scope of a *downward-entailing* operator, strong NPIS are furthermore required to be in the scope of an *anti-additive* operator. The relevant inference patterns are defined in (14).

- (14) a. An operator O is *downward entailing* iff for each sets A and B ,
 $O(A \cup B)$ implies $O(A) \cap O(B)$.
 b. An operator O is *anti-additive* iff for each sets A and B ,
 $O(A \cup B)$ is equivalent to $O(A) \cap O(B)$.

Applying these definitions to our examples, it can be shown that the restrictor of *every* is anti-additive.

- (15) Every student who studies English or French knows Latin.
 \leftrightarrow Every student who studies English knows Latin and every student who studies French knows Latin.

The entailment-based approach also correctly predicts the licensing pattern in (8) as the determiners in (8-a) are all downward entailing in their restrictor, whereas those in (8-b) are not.

While the core data of NPI licensing are covered in this approach, the reading-dependent effects cannot be captured. The reason for this is that the entailment behavior does not seem to change according to the reading. For example, the entailment pattern in (15) is true independently of whether the sentences are interpreted in a law-like fashion or as an episodic observation about the current students. Similarly, the restrictor of *some* and *many* is not downward entailing, independent of whether they are used as a weak or strong determiner. The same is true for *most*, which is not downward-entailing in its restrictor either. This shows that the entailment-based approach cannot handle the observed reading-dependency of NPI licensing.¹

¹In a variant of the entailment-based approach, Giannakidou (1998) assumes that NPIS must be in the scope of a *nonveridical* operator. She defines nonveridicality for a determiner in such a way that $D(A)(B)$ is nonveridical in the restrictor iff the set A is not presupposed. Since strong determiners usually trigger an existential presupposition on their restrictor set (Geurts, 2007), it would be expected that NPIS are even worse in the restrictor of proportional determiners than they are in the restrictor of cardinals. In Section 6 I will assume that the existential presupposition of proportional determiners is suspended in law-like statements. Under this assumption, the restrictor of proportional determiners is a nonveridical context and, consequently, NPIS should be expected there. While this approach may account for the occurrence of NPIS in the restrictor of proportional determiners in law-like statements, there remains a problem. Since nonveridicality is the weakest occurrence condition for NPIS, this account would be forced to allow strong NPIS in nonveridical contexts in general, which may lead to a serious overgeneration.

3.2 Pragmatic Approaches

My main source of data in Section 2 were the publications by Michael Israel. Israel pursues a pragmatic account of NPI licensing, based on scalar implicatures, where the relevant scales may be provided by the context. According to Israel (2004) an NPI is possible in the restrictor of *most* just in case there is a contextually supported inference from sets to subsets, i.e. a pragmatic inference that behaves like downward entailment. Israel illustrates this with a scenario, in which everyone who can solve the hard puzzles can also solve the easy puzzles.

- (16) Scenario: for each x : x solves hard puzzles \rightarrow x solves easy puzzles
- a. inference from set to subset (similar to downward entailment):
[Most students who could solve the easy puzzles] got a prize.
 \rightarrow [Most students who could solve the hard puzzles] got a prize.
 - b. inference from set to superset (similar to upward entailment):
[Most students who could solve the hard puzzles] had trouble on the exam.
 \rightarrow [Most students who could solve the easy puzzles] had trouble on the exam.

Using this scenario, Israel (2004) shows that the NPI *even* is only compatible with a context in which an inference from sets to subsets is intended, i.e. an inference as in (16-a).

- (17) NPI-licensing pattern from Israel (2004):
- a. Most students who could solve even a single puzzle got a prize.
 - b. *Most students who could solve even a single puzzle had trouble on the exam.

While Israel's observation is extremely interesting, the data in (17) seem to be due to the special scalar behavior of *even* rather than common to NPIs in general. The examples in (18) show that the NPI *ever* is equally fine in both contexts from (17).

- (18) NPI-licensing pattern:
- a. Most students who could ever solve a single puzzle got a prize.
 - b. Most students who could ever solve a single puzzle had trouble on the exam.

However, if we change the proportional determiner *most* into a cardinal determiner as in (19-a), an NPI may not occur in the sentence. Note that the sentence is such that in the given scenario, the contextual inference from sets to subsets is possible, as indicated in (19-b).

- (19) a. *[Several students who could ever solve the easy puzzle] got a price.
b. [Several students who could solve the easy p.] got a price.
 \rightarrow [Several students who could solve the hard p.] got a price.

These examples illustrate that it is the cardinal-proportional distinction that is important for the NPI licensing in the restrictor of a determiner, not the direction of pragmatically available inferences.

4 A DRT-based Account of NPI Licensing

In this section I will present the basics of a DRT-based account of NPI licensing. The version of the account presented here is a minor simplification of the theory sketched in Sailer (2007a) and Sailer (2007b). Each sentence has a semantic representation that is a *Discourse Representation Structure* (DRS) as defined in Kamp and Reyle (1993). For NPIS I assume the general occurrence constraint in (20).

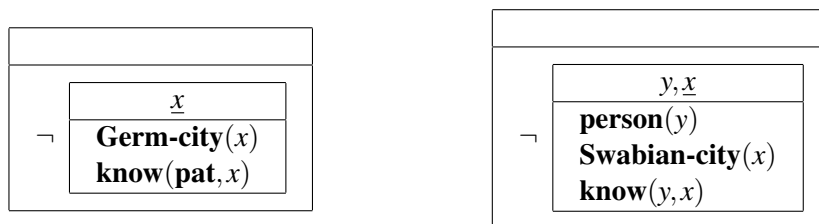
- (20) In the semantic representation of a sentence, the contribution of every NPI must be part of an NPI-licensing DRS.

The constraint in (20) uses the notion of an *NPI-licensing DRS*, which needs to be defined. In the course of this and the next section, I will widen the definition of an NPI-licensing DRS step by step. In a first attempt, in (21), the scope of a negated DRS condition is an NPI-licensing DRS.

- (21) NPI-Licensing DRS (first version): A DRS K is an *NPI-licensing DRS* iff K occurs in a DRS-condition of the form $\neg K$

This definition covers the occurrence of NPIS in sentences with a negated auxiliary and in the scope of negative indefinites such as *no one*. This is shown in the two examples in (22). The contribution of the NPI is underlined. In both cases it is the introduction of a discourse referent, written as \underline{x} . The contribution of the NPI occurs in the universe of the DRS that follows the negation symbol. Since this is a NPI-licensing DRS, the constraint in (20) is satisfied.

- (22) Pat **doesn't** know any German city. **No one** knows any Swabian city.

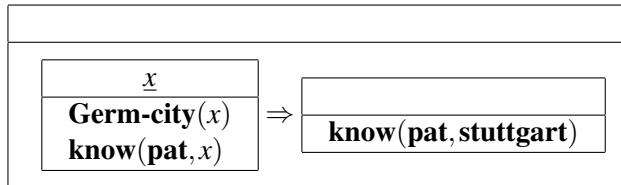


In DRT, a condition of the form $\neg K$ is equivalent to an implicational condition of the form $K \Rightarrow \mathbf{false}$, where **false** is any inconsistent DRS. To account for the occurrence of NPIS in the restrictor of a universal quantifier and in the antecedent of a conditional, it is sufficient to generalize the definition of an NPI-licensing DRS to the first DRS in an implicational condition. This leads to (23).

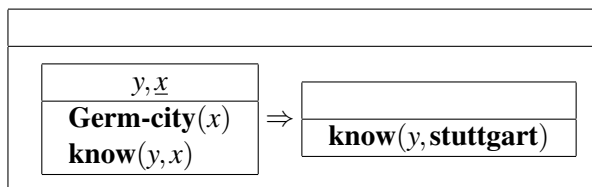
- (23) NPI-Licensing DRS (second version): A DRS K is an *NPI-licensing DRS* iff K is the first DRS in a DRS-condition of the form $K \Rightarrow K'$.

The NPI licensing in *if*-clauses and in the restrictor of *every* follows immediately from (23). This is illustrated in (24) and (25). In both cases, the contribution of the NPI (x) occurs in the first DRS of the duplex condition.

- (24) [**If** Pat knows any German city], Pat knows Stuttgart.



- (25) [**Everyone** who knows any German city], knows Stuttgart.



The representational theory of NPI licensing can be refined to account for the contrast between strong and weak NPIs. I assume that strong NPIs must be immediately contained in their licensing DRS, whereas weak NPIs allow for at most one intervening DRS. An intervening DRS is understood as a DRS that is contained in the same licensing DRS as the NPI and accessible from the NPI. These special constraints on strong and weak NPIs are stated in (26).

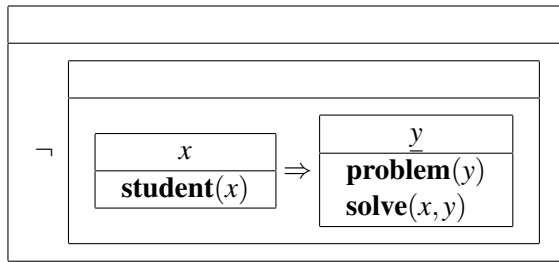
- (26) a. A *strong NPI* must be an immediate part of an NPI-licensing DRS.
 b. For a *weak NPI*, there may be at most one accessible DRS between the NPI and the NPI-licensing DRS.²

In all examples that we considered so far, the NPI was an immediate part of the licensing DRS. Consequently, both weak and strong NPIs are predicted to occur in these contexts.

The constraints in (26) can be illustrated with NPIs in the scope of *not every*, which I used as an empirical diagnostics in (1) and (2). In (27) a weak NPI, *any* with the semantic contribution y , occurs in the scope of *not every*. The NPI-licensing DRS is the DRS immediately following the negation sign. Within this DRS, the restrictor of *every* is accessible from the DRS that contains the NPI. This shows that the constraint on weak NPIs in (26-b) is still met.

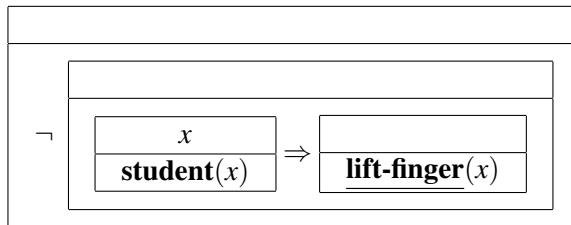
²In Sailer (2007a) I provide a more detailed characterization of the kinds of DRSs that may “intervene” between an NPI and its licensing DRS. For the present paper, the characterization in (26-b) is sufficient. Note also that the formulation “at most one . . .” in (26-b) accounts for intervention effects, i.e. there may not be an additional quantifier occurring between the licensing DRS and the NPI. See Sailer (2007a,b) for details.

(27) **Not** every student solved any problem.



In the corresponding example with a strong NPI in (28) the NPI is not licensed. Since *lift a finger* is a strong NPI, its contribution, **lift-finger**, is required to be immediately contained in the NPI-licensing DRS, which is not the case.

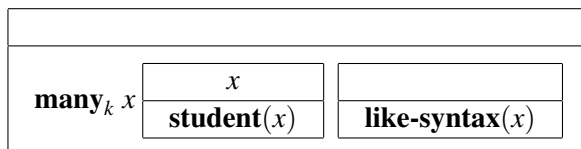
(28) ***Not** every student lifted a finger.



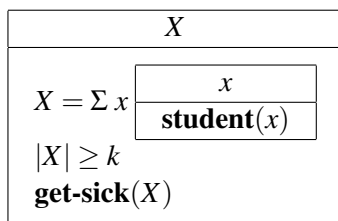
5 Generalization to Proportional Determiners

After these preliminaries, I will turn to the data from Section 2.2. Partee (1988) argues that DRT is ideally equipped to account for the difference between weak and strong determiners. She proposes that strong, i.e. proportional, determiners should be treated in terms of duplex conditions, which is parallel to the treatment of *every*. In contrast to this, weak, i.e. cardinal, determiners are to be analyzed parallel to indefinites. This is illustrated for the two readings of *many* in (29) and (30), where *k* is a contextually specified parameter for what should count as many.

(29) Many/ Mány students like syntax. (proportional reading)



(30) Many/ Mny students like syntax. (cardinal reading)

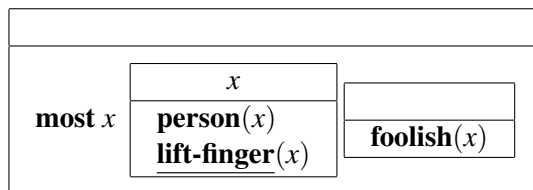


If we adopt Partee's suggestion of a representational difference between cardinal and proportional determiners, this can be exploited directly to generalize the definition of an NPI-licensing DRS even further.

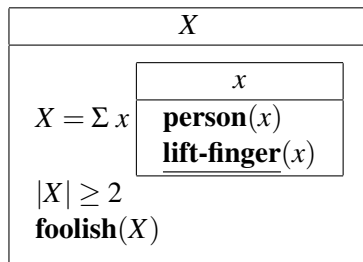
- (31) NPI-licensing DRS (final version): A DRS K is an *NPI-licensing DRS* iff K is the first DRS in a duplex condition.

With the definition in (31) we immediately derive the prediction that NPIs, both weak and strong, should be possible in the restrictor of proportional determiners but not in that of cardinal determiners. Only in the first case are they included in an NPI-licensing DRS. This is illustrated for proportional *most* in (32) and for cardinal *several* in (33)

- (32) ?[**Most** people who lift a finger to help Bill] are foolish.



- (33) * [Several people who lift a finger to help Bill] are foolish.



The proposed widening of what counts as an NPI-licensing DRS immediately captures the contrast between cardinal and proportional determiners. The generalization in (13), follows naturally with standard assumptions on DRSs.

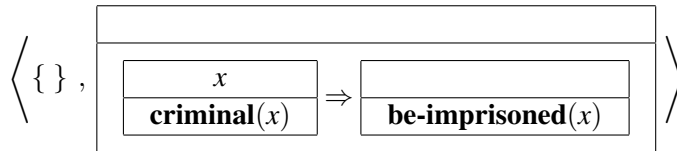
6 Presuppositions

In the preceding section, I only focused on the cardinal/proportional distinction and ignored the law-like/episodic contrast from Section 2.1. As a consequence, my account would allow for NPIs in both law-like and episodic statements. In the present section, I will use DRT's integrated treatment of presupposition to prevent this overgeneration. Kamp (2001) presents an architecture of DRT that includes presuppositions. He assumes that a sentence has a *preliminary representation* and a *resolved representation*. The preliminary representation is a pair whose first element is a set of presupposed DRSs and whose second element is the DRS representing the asserted content of the sentence. In a resolved representation, the presuppositions are integrated into the asserted content.

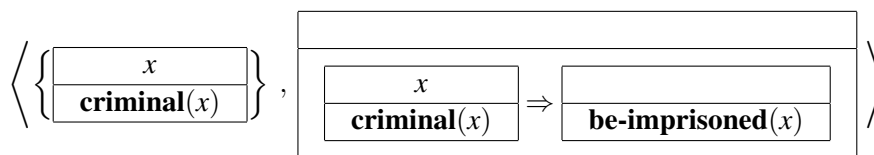
Horn (1997) argues that the difference between episodic (his *empirical*) and law-like statements can be related to a difference in presupposition. According to Horn, the

restrictor set is presupposed in an episodic universal statement. Such a presupposition is absent from a law-like statement. Adopting this plausible assumption, we arrive at distinct preliminary representations for law-like and episodic universal statements. In the law-like statement in (34) the set of presuppositions is empty. In the corresponding episodic statement in (35) it contains the restrictor DRS.

(34) Law-like statement: Every criminal will be imprisoned.



(35) Episodic statement: Every criminal was imprisoned.



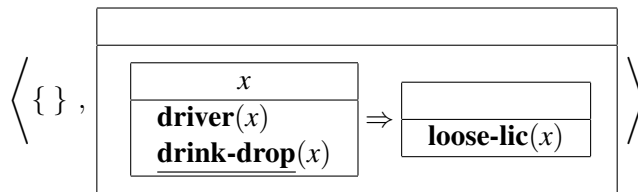
Given that there are distinct representations for law-like and episodic statements, it is possible to fine-tune the representational theory of NPI licensing accordingly. In the following, I assume that NPI licensing is checked at the level of the preliminary representation.

The inclusion of presupposition into the preliminary DRSs of a sentence has as its consequence that some parts of the contributed semantic material may occur more than once in the representation. In (35) the DRS that represents the restrictor of *every* occurs twice: Once in the asserted content, once in the set of presupposed DRSs. So far, my theory of NPI licensing does not specify whether both of these occurrences need to be licensed. I propose to distinguish two kinds of NPIS, which I will call *presupposition-sensitive NPIS* and *presupposition-neutral NPIS*. The relevant constraints on these types are given in (36).

- (36) a. Every occurrence of a *presupposition-sensitive NPI* in the preliminary representation must be licensed.
- b. Every occurrence of a *presupposition-neutral NPI* in the asserted part of the preliminary representation must be licensed.

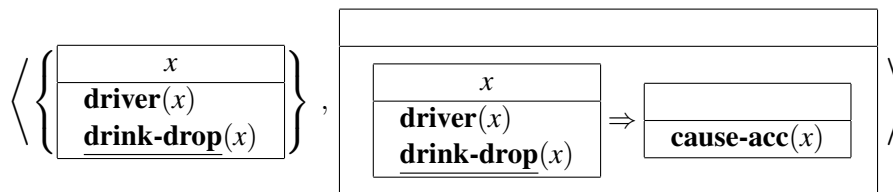
The data in Section 2.1 suggests that in English, weak NPIS are typically presupposition-neutral, whereas the listed strong NPIS are presupposition-sensitive. With this assumption, the ban of strong NPIS from episodic universal statements and conditionals can be captured. Consider first the grammatical, law-like statement in (37) and its DRS. Being a law-like statement, the restrictor of the universal is not presupposed. Therefore, there is only one occurrence of the strong NPI, **drink-drop**, in the DRS. This occurrence is in the first box of a duplex condition. Consequently, it is immediately contained in an NPI-licensing DRS, and the constraints in (26-a) and (36-a) are satisfied.

- (37) [Every driver who drinks a drop] should loose his license.



The DRS of the corresponding episodic statement is given in (38). As far as the asserted content is concerned, the structure is as in (37) above. However, since the statement is episodic, the restrictor of the universal is included in the set of presupposed DRSs. As a consequence, the semantic contribution of the NPI occurs among the presuppositions as well. Since the NPI is presupposition sensitive, its occurrence in the presupposition set needs to be licensed. But in this set, the DRS that contains the NPI is not an NPI-licensing DRS. From this, it follows that the occurrence of the NPI violates (36-a) and, therefore, is not felicitous.

- (38) *[Every driver who drank a drop last night] caused an accident.



Combining the insights from this and the previous section, we can see why the use of strong NPIs in the restrictor of proportional determiners is usually degraded. The existential impact of the restrictor set tends to be strong for proportional determiners. Only in limited occasions is it possible to arrive at a law-like, i.e. non-presuppositional, reading with a determiner such as *most*. This is exactly confirmed by the observations in Israel (1995) that the law-like/episodic dichotomy is not only relevant for NPIs in the restrictor of universals but extends to proportional determiners in general. I quote Israel's data that illustrate this contrast in (39).

- (39) [Most students who've read the least bit of poetry], ...
 a. will be familiar with Steven's "The Emperor of Ice Cream".
 b. ?*seem to wear hats.

The present theory accounts for this contrast in the same way it accounted for the difference between (37) and (38). In both version of the sentence in (39) the strong and presupposition-sensitive NPI *the least bit* is licensed in the asserted part of the DRS. In the episodic reading in (39-b), however, the NPI fails to be licensed in the presupposed part.

As pointed out to me by Regine Eckardt (p.c.) the present proposal also correctly predicts that strong NPIs are usually excluded in the restrictor of *none of the N*, even though they are freely possible in the restrictor of *no N*. This is shown in (40). The important difference is that *none of the N* is presuppositional.

- (40) a. *None of the [students who've read the least bit of poetry] seems to wear a hat.
 b. No one [who was paying the least bit of attention] forgot this poem.

7 Conclusion

The paper is based on often-neglected data on the occurrence of strong NPIs in the restrictor of proportional determiners and in the antecedent of conditionals. I showed that an account of the facts is possible that uses standard DRT structures for the sentences. I made use of two important properties of DRT: First, proportional and cardinal determiners can be represented in structurally distinct ways. Second, with the integration of presuppositions into the DRS of a sentence, DRT provides just enough pragmatics inside the semantic representations to capture the contrast between law-like and episodic statements.

I classified NPIs in two dimensions: First, in (26), according to the allowed distance between the NPI and its licensing DRS, and second, in (36), with respect to their sensitivity to presuppositions. I consider it an open question whether these dimensions should be unified. The data in Giannakidou (2006) suggest that the two dimensions may, indeed, vary independently of each other. Her characterization of the distribution of certain Greek NPIs suggests that they may be licensed in weak licensing contexts such as in the scope of *few*, but that they show presupposition-sensitivity. Since Giannakidou's theory is cast in different terms, it is not clear whether the behaviour of Greek NPIs can be captured in the way I just sketched. More detailed and cross-linguistic data needs to be taken into account to settle this question.

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