

Negative Polarity

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Abstract

Negative Polarity Items (NPIs), for example the indefinites *any*, *kanenas* (in Greek), *quoi que ce soit* (in French), minimizers (e.g. *lift a finger*), the adverb *yet*, etc., have a limited distribution; they appear to stand in a licensing relationship to other expressions, e.g. negation, in the same sentence. This chapter offers an overview of some of the empirical challenges and theoretical issues raised by NPIs. It retraces a line of research (initiated by Klima (1964) and Ladusaw (1979, 1980b)) which started out as an investigation of the right ‘licensing condition(s)’ of NPIs: it sought to characterize licensing operators and used some semantic property (affectivity, downward-entailingness and variants thereof, or nonveridicality) to do so. It gradually shifted to exploring the very sources of polarity sensitivity: current theories no longer view NPIs as being in ‘need’ of licensing, and instead hold that their contribution to meaning leads to semantic or pragmatic deviance in certain environments, from which they are thus barred. We first present the so-called Fauconnier-Ladusaw approach to NPI licensing, and its licensing condition based on the notion of downward-entailingness. This condition proves to be both too strong and too weak, as argued by Linebarger (1980, 1987, 1991): it is too strong because NPIs can be licensed in the absence of a downward-entailing operator, and it is too weak, in view of intervention effects caused by certain scope-taking elements. We explore two ways of weakening the original condition: Giannakidou (1998, 1999, 2002, 2011 i.a.) proposes to replace downward-entailingness with another semantic property, nonveridicality; and von Stechow (1999) introduces Strawson downward-entailingness. The upshot of this discussion is that NPIs are not licensed by *operators*, but rather, they need to fit in certain *environments*. Finally, we show how the restrictions on the distribution of NPIs (specifically indefinites) can be explained by the interaction between certain features of the meaning of NPIs and semantic properties of their environment (Kadmon and Landman 1993, Lahiri 1998, Chierchia 2013).

Keywords: NPIs, polarity, licensing, indefinites, downward-entailingness, alternatives, intervention, presupposition, scalar implicature, nonveridicality.

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Introduction

The most striking and most notorious property common to all Negative Polarity Items (NPIs) is their *limited distribution*. For example, the NPI *any* is ungrammatical in sentence (1a) while it is grammatical in sentence (1b). I say ‘ungrammatical’, because a sentence like (1a) has a ring of ill-formedness, and doesn’t seem *prima facie* to be semantically deviant.

- (1) a. *Sally ate any breakfast yesterday.
- b. Sally didn’t eat any breakfast yesterday.

The distribution puzzle is better known as the *licensing problem*. Solving the licensing problem, i.e. understanding the conditions that make *any* grammatical in a given sentence, is and has always been the main task of theories of polarity. A complete theory of NPIs should not only contain a descriptive generalization that synthetically distinguishes grammatical cases from ungrammatical ones; it should also provide a complete solution to the licensing problem, i.e. derive polarity sensitivity, and hence the observed distribution, from some characteristic properties of NPIs.

Licensing can be viewed as the satisfaction of a certain ‘need’ of NPIs. This need is visibly satisfied in (1b). A reasonable hypothesis one can draw from the comparison of (1a) with (1b), is that this need is satisfied by sentential negation, which acts as the ‘licenser’ of the NPI. If we now consider (2b), we see that negation can only make *any*

acceptable if the two elements stand in a certain structural relationship, for example one could propose: the licenser has to c-command the NPI on the surface.

- (2) a. *Anyone saw Sally yesterday.
- b. *Anyone didn't see Sally yesterday.

We thus have two elements, *viz.* the NPI and its licenser, and a relation between them. We would like to understand each of the three pieces. We thus ask three interrelated questions (which together form the licensing problem):

1. (Ladusaw's (1996) licenser question) What characterizes a possible licenser? Is there just one licenser, say negation, or can many different things be licensers? If there are many, what do they have in common?

2. (Ladusaw's licensing relation question) What characterizes the relation? If it is indeed a structural relationship, what is it exactly, and does it hold on the surface, or at LF?

3. What characterizes the licensee? The third question is really the hardest, because it is ultimately a question about the source and nature (syntactic, semantic, pragmatic) of the licensing need. Why are there polarity items? And what exactly happens when they fail to be licensed? It is customary, as I do here, to mark sentences with an unlicensed NPIs as ungrammatical, but it should be emphasized that there is no consensus yet on the nature of the deviance.

Historically, the three questions have not received equal attention. Research originally concentrated on the first two, starting with Klima (1964); in this context, an important debate revolved around the claim that licensers share a semantic property (downward-entailingness), which was Ladusaw's (1980b) answer to the first question. The third question has gradually become prominent since the 1990's: some landmarks of this shift can be found in seminal work by Krifka (1990, 1992, 1995), Kadmon and Landman 1993, Lahiri (1998) a.o.

There are three sections in this chapter. In Section 1, Ladusaw's semantic theory of licensing based on the notion of downward-entailingness is presented and explained, as well as a contender, Linebarger's syntactic theory. Section 2 explores two problems and some answers to them: downward-entailingness is too weak and it is too strong. The section closes on a criticism of the very notion of licensing and claims that it is not an adequate characterization of polarity sensitivity: in other words, our Questions 1 and 2 are actually ill-posed, because NPIs do not need to stand in a licensing relation to some item, but rather require a licensing *environment*. Lastly, Section 3 addresses our third question: what explains polarity sensitivity?

1 From affectivity to downward-entailingness

1.1 Many licensers, many licensees

Using minimal pairs such as the following, Klima (1964) showed that the range of licensers goes well beyond negation. In this set, we find quantificational DPs and adverbs (I tentatively underline the licensers):

- (3) Quantificational DPs
- a. No student ate any breakfast yesterday.
 - a'. *Some student ate any breakfast yesterday.
 - b. Few students ate any breakfast yesterday.
 - b'. *Many students ate any breakfast yesterday.
 - c. At most three students ate any breakfast yesterday.
 - c'. *At least three students ate any breakfast yesterday.
- (4) Adverbs
- a. John never ate any breakfast.
 - a'. *John sometimes ate any breakfast.
 - b. John rarely ate any breakfast.
 - b'. *John often ate any breakfast.

Here is a non-exhaustive list of additional licensers:

- (5)
- a. John left home without eating any breakfast.
 - b. Only John ate any breakfast.
 - c. I doubt that John ate any breakfast.
 - d. John failed to eat any breakfast.
 - e. John is unlikely to eat any breakfast.
 - f. If John ate any breakfast, he won't be tired today.

Sometimes it is even difficult to pinpoint the licenser, for example in questions (direct or embedded) or in comparatives:

- (6)
- a. Did John eat any breakfast?
 - b. John is taller than any other employee.
 - c. John is too short to see anything.

In the set of licensers, we find phrasal elements: it is thus *a priori* unlikely (Ladusaw 1980a) that we could find anything like a lexical NPI feature, shared by the two terms of the relation (the NPI and its licenser).

There are complications at the other end of the relation as well. The diversity of NPIs is staggering. Quantificational elements like *any*¹ and *ever*; phasal adverbs (like

¹The quantificational force of the NPI *any* has been the object of some debate: it has sometimes been analyzed as a wide-scope universal quantifier (Quine 1960), but Fauconnier (1978) convincingly argued that it is a narrow-scope existential quantifier. For example, in a situation in which there are four men among the ten under discussion about whom the speaker has no uncertainty (because he knows Susan didn't marry them), (i) can be true:

yet, anymore), prepositions (punctual *until*), modal verbs (auxiliary *need*, epistemic *can*)..., and a huge class consisting of ‘minimizers’, i.e. idioms (Chapter 108 of this *Companion*) associated with the lowest degree on a scale (*a single, at all, one bit, in the least, lift a finger, sleep a wink...*):

- (7)
- a. Has Mary ever been to Pinsk?
 - b. I haven’t seen this movie yet.
 - c. John doesn’t talk to me anymore.
 - d. Nobody was at all interested in my talk.
 - e. She can’t leave until Tuesday.
 - f. My parents haven’t visited me in months.
 - g. You needn’t worry.
 - h. Susan can’t be the culprit.
 - i. Peter doesn’t give a damn about the political situation.
 - j. I wouldn’t dream of talking to her.

A cursory look at this very limited list once again suggests that being a lexical item or a constituent for that matter (witness the many idioms found among minimizers) is not necessary to enter the licensing relation.

Klima (1964) proposed a theory which set the stage for all subsequent research. It combined a semantic component and a syntactic one. Convinced that negation could not be the only NPI licenser, he argued that what unites the class of licensers is a certain semantic property called *affectivity* (for him it was actually a feature carried by the licensing expressions). And the relation that must hold between the licenser and the NPI is what we would probably call ‘c-command’ today (in his own terms, NPIs are only licensed if they occur ‘in construction with’ the licenser). The affective feature is an answer to our Question 1, while the c-command relation is an answer to our Question 2.

1.2 Downward-entailingness: Fauconnier-Ladusaw and Zwarts

Many researchers tried to cash out this notion of affectivity. Ladusaw (1980b, 1983), building upon work by Fauconnier (1975, 1978)² and Fodor (1979), proposed that the

- (i) I wonder if Susan married any of those ten men. [modified from Fauconnier 1978, ex. 34]

Regarding the Free Choice item *any*, that we see in (ii) (Chapter 4 of this *Companion*), some facts like modification by *almost* have been taken to show that it is a universal.

- (ii) I can eat (almost) anything.

But a current trend of research views NPI and Free choice *any* as one and the same thing, despite the apparent difference in force (Kadmon and Landman 1993, Chierchia 2006, 2013; for a non-unified approach, see Dayal 1998, 2004).

²Fauconnier discovered that superlative NPs seem to have universal quantification force and that ‘affective’ expressions, for example negation, have an implication reversing effect on them:

- (i)
- a. John can solve the hardest problem.
≈ John can solve every problem.
 - b. John can’t solve the hardest problem.
No ‘quantified’ reading.

unifying characteristic of licensers is that they denote functions which reverse the direction of entailment in their argument (answer to our Question 1). We can show this easily with negation:

- (8) a. John is a father.
 b. John is a man.
 (8a) entails (8b)
- (9) a. John isn't a father.
 b. John isn't a man.
 (9b) entails (9a)

Negation, like all other licensers, permits so-called downward inferences, i.e. inferences that are truth-preserving when going from sets to subsets (e.g. we can replace $\llbracket \text{man} \rrbracket$ with $\llbracket \text{father} \rrbracket$ *salva veritate* in (9b), given that $\llbracket \text{father} \rrbracket \subseteq \llbracket \text{man} \rrbracket$). Hence the notion of downward-entailingness (here I use von Stechow's (1999) definition), a logical monotonicity property:

- (10) **Downward-entailingness (DEness):** A function f is downward-entailing iff for all A, B in the domain of f such that $A \Rightarrow B$, $f(B) \Rightarrow f(A)$.

' \Rightarrow ' stands for cross-categorical entailment, which we need for functions which do not take propositional arguments (it is a generalization of entailment applying to all types that 'end in t '). \Rightarrow is defined recursively (first at the level of truth-values) in the following way:

- (11) a. For p, q of type t : $p \Rightarrow q$ iff $p = \text{False}$ or $q = \text{True}$;
 b. For f, g of type $\langle \sigma, \tau \rangle$: $f \Rightarrow g$ iff for all x of type σ : $f(x) \Rightarrow g(x)$.

(11a) captures entailment between sentences; (11b) captures entailment between function-denoting expressions whose type ends in t , for example *novel* and *book*, both of type $\langle e, t \rangle$ (we write: $\llbracket \text{novel} \rrbracket \Rightarrow \llbracket \text{book} \rrbracket$).

In Ladusaw's theory, the relation between the licenser and the licensee is one of scope (necessary condition):³

- (12) **Ladusaw's Licensing Condition:** An NPI is grammatical only if it is in the scope of a downward-entailing (DE) expression.

The relevant notion of scope, for current models of grammar, is c-command; this condition holds at LF, as shown for example by the acceptability of NPIs *embedded* in a

-
- (ii) a. John can't solve the simplest problem.
 \approx John can't solve any problem.
 b. John can solve the simplest problem.
 No 'quantified' reading.

He claimed that NPIs such as *any* can be analyzed on a par with 'quantificational superlatives' like *the simplest problem*: they denote the lower end of a scale provided that a scale reversal operator, e.g. negation, is present.

³The view that NPIs require being in the scope of a certain kind of expression characterizes the operator-based family of theories; in Section 2.5, I show how the shortcomings of this view have led to a reevaluation of the role of operators and to their replacement by licensing *environments*.

subject in English (the subject DP is not c-commanded by negation at surface structure):

- (13) A doctor who knew anything about acupuncture was not available.
[Linebarger 1980, ex. (21a), de Swart 1998, ex. (13c)]
≈ No doctor who knew anything about acupuncture was available.

However an NPI DP, i.e. an NPI whose determiner is an NPI, cannot reconstruct under negation in English (14):⁴

- (14) *Any doctor was not available.

An NPI embedded in a subject can only be licensed if the containing DP can reconstruct under negation, and reconstruction under negation is partly determined by properties of the verb (see Linebarger 1980, Uribe-Etxebarria 1994, 1996 and de Swart 1998):

- (15) a. *A doctor who knew anything about acupuncture did not agree with the diagnosis. [Linebarger 1980, ex. (22)]
b. A doctor did not agree with the diagnosis.
Cannot mean: $\neg\exists x[\text{doctor}'(x) \wedge \text{agree}'(x)]$

Compare with:

- (16) A doctor was not available. [cf. (13)]
Can mean: $\neg\exists x[\text{doctor}'(x) \wedge \text{available}'(x)]$

Certain facts indicate that surface c-command is sometimes relevant (on this issue, see also Mahajan 1990, which offers a crosslinguistic perspective):

- (17) *He read any of the stories to none of the children. [Ladusaw 1996, ex. 29]

The introduction of downward-entailingness was a major theoretical breakthrough. One of its remarkable results is a straightforward explanation to the otherwise mysterious licensing power of *every* illustrated in (18) (mysterious because *every* is not in any intuitive sense ‘negative’ or ‘affective’):

- (18) [Every [student who read any books on NPIs]] [passed].

The contrast between (18) and (19) also follows.

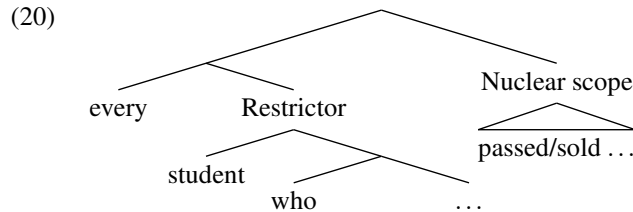
- (19) *[Every [student who took my class]] [sold any books on NPIs].

To see why NPIs are licensed in the restrictor of *every*, and not in its nuclear scope, we can run a simple downward inference test and verify that the function $\llbracket \text{every} \rrbracket$ is DE

⁴An NPI DP shows what one might want to call scope inertia (on this, see Kusumoto and Tancredi 2013 and Barker 2018): it doesn’t reconstruct, and it also doesn’t QR. (i) lacks a reading where *anything* has covertly raised past the embedded negation while still being in the scope of the DE operator *impossible*:

- (i) It’s impossible that John didn’t read anything. *IMPOS. >> ANY >> NEG
Cannot mean: It must be the case that John read everything.

(per (10)), while the function $\llbracket \text{[every [student who took my class]]} \rrbracket$ is not. A common way to say this is that *every* is DE in its restrictor, and non DE, in fact upward-entailing (UE), in its nuclear scope.



(21) $\llbracket \text{novel} \rrbracket \Rightarrow \llbracket \text{book} \rrbracket$

(22) a. Every student who read a **book** passed.
 b. Every student who read a **novel** passed.
 (22a) \Rightarrow (22b) (downward inference)

(23) a. Every student who took my class sold a **book**.
 b. Every student who took my class sold a **novel**.
 (23a) $\not\Rightarrow$ (23b)

Substitution of *book* with *novel* is only truth-preserving in (22). In keeping with (12), we can say that the licenser of *any* in (18) is *every* (note that the determiner c-commands material in its restrictor, not in its nuclear scope). *Every student who took my class*, which does not denote a DE function (per (23)), is not a licenser, hence the ungrammaticality of (19).

Things are different with *no*: NPIs are licensed both in its restrictor and in its nuclear scope:

(24) a. [No [student who read any books on NPIs]] [passed].
 Licensor in (24a): *no*
 b. [No [student who took my class]] [sold any books on NPIs].
 Licensor in (24b): *no student who took my class*

It is easy to check, using the above test, that the two functions $\llbracket \text{no} \rrbracket$ and $\llbracket \text{[no [student who took my class]]} \rrbracket$ are DE. The latter is a phrase: Ladusaw (1980a) underlines this point, as an objection against Klima's affective lexical feature.

Ladusaw views downward-entailingness as a compelling argument for the logicality of grammar: certain grammatical phenomena are conditioned by logical properties. But it should be noted that in his theory, licensing is not evaluated in syntactic representations such as Logical Form (although I used modern LF-style diagrams to illustrate downward-entailingness). Instead, polarity sensitivity is a constraint on the form of semantic representations of truth-conditional meaning; and the existence of NPIs shows, in his view, that such semantic objects (where scope relations are represented) are needed in grammar.⁵

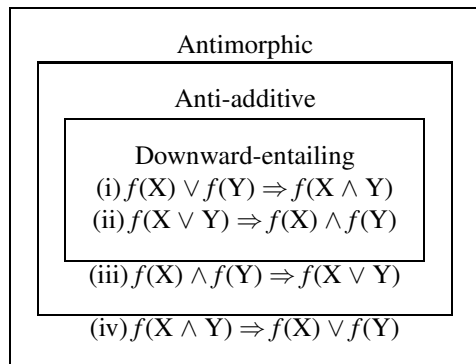
⁵The sensitivity of certain expressions to the implication reversing effect of affectives was not seen by Fauconnier as evidence in favor of semantic representations. He defended an essentially pragmatic view of NPI licensing as sensitivity to scalarity. For reasons of space, I cannot do justice here to the pragmatic line

However illuminating the introduction of DEness might have been, it failed to capture certain aspects of the distribution of NPIs. It is indeed not the case that all NPIs can be licensed by all licensers. While *any* can be licensed by all DE expressions, certain NPIs are more ‘picky’, i.e. the set of their licensers is a proper subset of the set of licensers of *any*. *Any* is said to be a weak NPI (and so is *ever*). And there exist stronger NPIs, whose distribution is more constrained, such as minimizers (*lift a finger, sleep a wink, give a rat’s ass, have the faintest idea, budge an inch, bat an eyelash...*) as well as ‘strict’ NPIs, whose distribution is the most constrained, i.e. *in years, punctual until, yet, half bad, all that*. While *any* and *ever* are licensed under *at most five NP* and in conditionals, strict NPIs, e.g. *in years*, are not:

- (25) a. At most five people saw anyone.
 b. If you see anything, the blindfold is not covering your eyes properly.
 c. No one saw anything.
 d. Paul didn’t see anything.
- (26) a. *At most five people have seen John in years.
 b. *If you have seen John in years, you know that he quit smoking.
 c. No one has seen John in years.
 d. Paul hasn’t seen John in years.

DEness is not always enough. But that doesn’t mean it should be jettisoned altogether. For DEness is a weak form of negativity: maybe stronger NPIs are sensitive to ‘more’ negative licensers. Intuitively, *at most five NP* is ‘less’ negative than *no NP* or *not*. Zwarts (1998) provides an algebraic account of these differences.

(27) **Negative Strength:**



The four entailment relations represented above are the result of breaking up the equivalences known as De Morgan’s Laws and replacing negation in them with *f*:

- (28) De Morgan’s Laws:
 a. $\neg(X \wedge Y) \Leftrightarrow \neg X \vee \neg Y$
 b. $\neg(X \vee Y) \Leftrightarrow \neg X \wedge \neg Y$

of research that originates in Fauconnier’s work, e.g. Israel 1996, 2011.

If a function f is DE, then it verifies at least the entailment relations (i) and (ii). To be anti-additive (AA), f must also verify (iii). Negation, which verifies all four, is antimorphic. The nesting in the diagram reflects an implicational hierarchy (all anti-additive functions are DE, but not *vice versa*). According to Zwarts, strict NPIs must be licensed by an expression denoting an anti-additive function:

- (29) **Anti-additivity:** A function f is anti-additive (AA) iff $(f(X) \wedge f(Y)) \iff f(X \vee Y)$. [Zwarts 1998]

Let's check that *no NP* denotes an AA function, while *at most five NP* doesn't, by way of a linguistic test:

- (30) a. No student smokes and no student drinks \iff No student smokes or drinks (AA)
 b. At most five students smoke and at most five students drink $\not\iff$ At most five students smoke or drink
 At most five students smoke or drink \implies At most five students smoke and at most five students drink (not AA)

Using Zwarts's insights, it is possible to remedy one of the apparent flaws of Ladusaw's view of licensing based on monotonicity: NPIs fall in different strength categories, whose number is limited. The basic licensing condition can be fine-tuned to accommodate the specific needs of each category. The gradience has been extensively described about Dutch (Zwarts 1981, van der Wouden 1997): weak NPIs (e.g. *kunnen uitstaan* 'can stand' (31)) require a DE licenser, stronger NPIs (the indefinite *oor maar iets* 'anything at all' (32)) require an anti-additive licenser, and there are also superstrong NPIs (*voor de poes*, literally 'for the cat' (33); Zwarts also cites *one bit* in English), which require an antimorphic licenser:⁶

- (31) *Weinig monniken kunnen vader abt uitstaan.*
 few monks can father abbot stand
 'Few monks can stand father abbot.' [van der Wouden 1997, ex. (136a)]
Weinig monniken denotes a merely DE function.
- (32) a. **Weinig kinderen hebben ook maar iets gezien.*
 few children have at all anything seen
 Intended: 'Few children have seen anything at all.'
Weinig kinderen denotes a merely DE function.
 b. *Geen van de kinderen heeft ook maar iets gezien.*
 none of the children has at all anything seen
 'None of the children has seen anything at all.'
 [Zwarts 1981, cited in van der Wouden 1997, ex. (75)]
Geen van de kinderen denotes an AA function.
- (33) a. *Die AIO is niet voor de poes.*
 that graduate student is not for the cat

⁶Some recent work suggests however that there might be more variation among NPIs than Zwarts's tripartition would lead us to expect: for example Hoeksema (2013) reports corpus data showing that *ever* is a lot more frequent than *any* in superlatives.

'That graduate student is not to be trifled with.'

Niet denotes an antimorphic function.

- b. *Die AIO is nooit voor de poes.
that graduate student is never for the cat
[van der Wouden 1997, ex. (173)]

Nooit denotes a merely AA function.

1.3 Linebarger's challenges to downward-entailingness

Thus modified by Zwarts, Ladusaw's theory still faces a number of empirical challenges. Because it is essentially governed by logical properties, the theory cannot easily countenance contextual effects or syntactic locality effects on licensing. And yet, Linebarger (1980, 1987, 1991) claims that both types of effects do obtain.

After does not denote a DE function, however (34) shows that it can license *any* and *at all*, if the sentence that contains it implicates some 'negative' statement (such as (34c)):

- (34) a. *John left after having read any book.
b. She persisted long after she had any hope at all of succeeding.
[Linebarger 1987, ex. (142a)]
c. She persisted (even) when she didn't have any hope of succeeding.

Conversely, the following pair suggests that *every*, which does denote a DE function, can only license the NPI *so much as* if the sentence expresses a law-like statement rather than some accidental generalization (things are different with *any* and *ever*, which are not 'even-NPIs', Heim 1984):

- (35) a. Every restaurant that charges so much as a dime for iceberg lettuce ought to be closed down.
b. ??Every restaurant that charges so much as a dime for iceberg lettuce actually has four stars in the handbook. [Linebarger 1980, p. 107]

On the syntactic front, while Ladusaw's theory predicts that licensing should be impervious to syntactic material between the NPI and its potential licensor, Linebarger documents cases where a third party — specifically a quantificational element — blocks licensing. (36) shows a case of 'intervention' because it lacks a reading where *every* takes intermediate scope between negation and *any*:

- (36) She didn't wear any earrings to every party. *NEG>>EVERY>>ANY

Linebarger's (1987) own account is essentially syntactic: against Ladusaw's DEness-based theory, she claims that there is only one licensor of NPIs, namely negation (our Question 1). Furthermore, as suggested by cases of intervention, the relation between the NPI and negation is one of 'immediate' syntactic proximity at LF (our Question 2), i.e. no scope-taking element may intervene. It bears saying that this 'Immediate Scope Constraint' is in fact too strong, as NPIs can be licensed by negation across other NPIs, bare plurals, non-numerical indefinites, attitude predicates, modal verbs (e.g. *have to*).

Polarity licensing is a two-tiered process for Linebarger (a trait already found in Baker’s (1970) theory). An NPI that fails to be in the immediate syntactic scope of negation can be licensed pragmatically, by a ‘negative implicatum’ (NI) (which can be any kind of inference). The LF of this negative implicatum must contain an instance of the same NPI that is directly licensed by negation. For example, *any* is licensed derivatively in (34b) because an inference is available, in whose linguistic form an instance of *any* is in the immediate scope of negation (34c). An obvious shortcoming of licensing by implicatum is, as Linebarger herself acknowledges, the problem of double negation: any sentence *p* entails *not not p*; and contraposition in conditionals incorrectly leads to predict that NPIs can be licensed in their consequent.

Notwithstanding the shortcomings of her theory, many of the facts described by Linebarger are genuine counterexamples to Ladusaw’s account.

2 How to weaken Ladusaw’s condition?

Although elegant, the Fauconnier-Ladusaw approach faces objections. We have seen that intervention effects were left unexplained by it, but could be made to follow from Linebarger’s syntactic theory. Among the problems raised by Linebarger were also cases that seem to show that DEness is not in fact necessary, that is, cases where an NPI is licensed, and yet, it is not in the scope of a DE expression (34b). Such cases are tackled by Giannakidou (§2.1) and von Stechow (§§2.2-2.4), who each propose a way of weakening Ladusaw’s semantic condition. In this section, I present these two proposals, and also show how intervention effects call for replacing licensing *operators* with licensing *environments* (§§2.5-2.6).

2.1 (Non)veridicality

Giannakidou (1998, 1999, 2002, 2011 i.a.) concurs with Linebarger: Ladusaw’s licensing condition (12) is too strong, as there are many cases, in English and crosslinguistically, of grammatical NPIs outside of the scope of DE expressions. She particularly highlights questions: NPIs (weak and strong) are licensed in polar questions (37), and also in some *wh*-questions (exhaustivity plays an important role here, according to Guerzoni and Sharvit (2007)), but it is difficult to appreciate entailment in any intuitive way.

(37) Did John eat anything for breakfast? [see also (6a) and (7a)]

(38) $\llbracket \text{French food} \rrbracket \Rightarrow \llbracket \text{food} \rrbracket$

- (39) a. Did John eat **food**?
 b. Did John eat **French food**?

It is indeed unclear how (39a) ‘leads to’ (39b). This is so despite the fact that a semantics for questions can be offered that guarantees that an NPI is in the scope of a DE operator, e.g. Higginbotham 1993, which posits a covert universal quantifier (for a recent proposal, see Nicolae 2015). The problem of non DE licensers is compounded in Modern Greek: the (unstressed) indefinite *kanenas* is licensed in certain positions

where *any* is not, such as the scope of disjunction and the scope of *perhaps* (two non DE operators):

- (40) a. I bike kanenas mesa i afisame to fos anameno.
 or entered.3SG anyone in or left.1PL the light lit
 ‘Either somebody broke into the house or we left the light on.’
 [Giannakidou 1998, ex. 54]
 b. *Either anybody broke into the house or we left the light on.
- (41) a. Isos na irthe kanenas.
 perhaps SUBJ came.3SG anybody
 ‘Perhaps somebody came.’ [Giannakidou 1998, ex. 58]
 b. *Perhaps anybody came.

Like Ladusaw’s account of licensing, Giannakidou’s is semantic: it seeks to identify the logical property that characterizes the class of licensers. As an alternative to DEness, the strictly weaker property of nonveridicality (Zwarts 1995) is put forth:

- (42) **Nonveridicality (first pass):** A propositional operator F is nonveridical *iff*, for any p , $F(p)$ doesn’t entail p . [Giannakidou 2002]

The *kanenas* type of NPIs requires being in the scope of an expression that denotes a nonveridical function. Nonveridical functions are a proper superset of DE functions. By the above definition, *perhaps* is a nonveridical operator: ‘perhaps p ’ doesn’t entail p . Giannakidou argues that the question operator is nonveridical as well: asking the question *Did Johnny come?* doesn’t convey the information that Johnny came; similarly, ‘ p or q ’ doesn’t entail either disjunct. To ensure that epistemic propositional attitude verbs, like *believe*, and *verba dicendi* like *say*, which are also nonveridical by the same definition, are not incorrectly predicted to license NPIs, Giannakidou adds a further restriction:

- (43) **Nonveridicality (revised):** A propositional operator F is nonveridical *iff*, for any p , $F(p)$ doesn’t entail that p is true in some individual’s model.

For example the belief model of an individual x in world w is x ’s belief state in w , in other words, it is the set of possible worlds in which everything x believes to be true in w holds. *John believes p* says that proposition p is true in each of the worlds that make up John’s belief state, which means it is true in his belief model (John’s belief model is relevant because he is the attitude holder): *believe* is thus not a nonveridical operator per (43), i.e. it is *veridical*.

For stronger NPIs, for example *tipota* ‘anything’ and English strict NPIs, which are licensed by negation but not by the nonveridical *few NP* and *at most five NP*, the right property is antiveridicality:

- (44) **Antiveridicality:** A propositional operator F is antiveridical *iff*, for any p , $F(p)$ entails $\neg p$ in some individual’s model.

Regarding *any*, which is in some sense intermediate between *kanenas*⁷ (it is not li-

⁷*Any* also differs from *kanenas* in that it can be licensed by *only* (*only John ate anything*) and emotive

censed by disjunction (40b) or *perhaps* (40b)) and strict NPIs, Giannakidou (1999:416) submits that it is subject to an *anti-licensing condition*, i.e. it must not be in the scope of a veridical operator. It is hard however to see how this condition applies: if a veridical operator in (40b) and (41b) is responsible for the unavailability of *any*, what ensures that no such anti-licenser is present in questions (37) or any other sentence where *any* is acceptable?

2.2 Strawson downward-entailingness

Unlike Giannakidou, von Stechow (1999) retains DEness as the predictor of NPI licensers. He sets himself the goal to ‘see how far one can push the Fauconnier-Ladusaw approach’, and proposes that non DE licensers are non DE due to presuppositions, whose effect on monotonicity can be neutralized.

Take for example the case of *only DP*. It is an NPI licenser (45):

(45) Only John read any book.

And yet, if we test for entailment, we see that set-to-subset inferences are not warranted in its scope:

- (46) $\llbracket \text{novel} \rrbracket \Rightarrow \llbracket \text{book} \rrbracket$
- a. Only John read a **book**.
 \rightsquigarrow John read a book.
 - b. Only John read a **novel**.
 \rightsquigarrow John read a novel.

We can easily imagine a context in which we know that John read a book but we are uncertain about the kind of book it was: it could be a scientific monograph, or a collection of poems. For this reason, the entailment is not warranted. If we adopt, as von Stechow does, Horn’s (1969) ‘asymmetric’ analysis, *only* presupposes its prejacent (which I underline):

- (47) Only John read a book.
- a. *Assertion*: No one distinct from John read a book. (‘negative’ component)
 - b. *Presupposition*: John read a book. (‘positive’ component)

Under this view,⁸ an *only*-sentence whose ‘positive’ component (the presupposition) is not satisfied is simply undefined. It is thus not the case that every situation which makes (46a) true also makes (46b) true. Consequently, the entailment fails: *only DP* triggers an inference that makes it non-monotonic, thus non DE (we would get the same effect if we assumed that the positive component is a ‘simple’ entailment, not a presupposition). Perhaps one could propose that the inference triggered by *only* doesn’t

factives (*I am surprised that John ate any breakfast*), which are non DE (see the discussion below, §2.2). In a way reminiscent of Linebarger’s licensing by implicature, Giannakidou (2006) argues that *any* is *rescued* here rather than *licensed*: what makes it acceptable is the presence of a nonveridical operator in the linguistic form of an inference of the host sentence, for example *no one who is not John ate breakfast*, the negative entailment of *only John ate breakfast*.

⁸It is not uncontroversial. For example, Horn (1979) analyzes it as a conventional implicature.

interfere with the calculation of DEness because it is not a presupposition (thus not a source of undefinedness) nor a ‘simple’ entailment (as in Atlas 1996, an example of a symmetric, or conjunctionalist, analysis of *only*). For example, one could argue that it is an implicature. Ladusaw (1979:160f.) proposes such a solution for the implicative verb *fail*, which licenses NPIs in its complement, although it doesn’t intuitively support downward inferences:

- (48) John failed to buy any shirt.
 (49) $\llbracket \text{red shirt} \rrbracket \Rightarrow \llbracket \text{shirt} \rrbracket$
 (50) a. John failed to buy a shirt.
 Assertion: John didn’t buy a **shirt**.
 Conventional implicature: John tried to (or was expected to) buy a shirt.
 b. $\Rightarrow^?$ John failed to buy a red shirt.
 Assertion: John didn’t buy a **red shirt**.
 Conventional implicature: John tried to (or was expected to) buy a red shirt.

Under this view then, if we consider the assertive component alone, (50a) entails (50b) although it is pragmatically odd to assert the conclusion. Such a move however seems to be barred in the case of adversative predicates, e.g. *surprised* and *sorry*, which license NPIs in their complement and yet are uncontroversially analyzed as being presupposition triggers:

- (51) a. Meredith is surprised that John has any complaints about the hotel.
 b. John is sorry that Bill said anything against Paul.
 (52) a. Meredith is surprised that John has complaints about the hotel.
 Presupposition: Meredith believes that John has complaints about the hotel.
 b. John is sorry that Bill said something against Paul.
 Presupposition: John believes that Bill said something against Paul.

If we apply our linguistic test, we find that entailment fails from (54a) to (54b):

- (53) $\llbracket \text{Honda} \rrbracket \Rightarrow \llbracket \text{car} \rrbracket$
 (54) a. John is sorry that Mary bought a **car**.
 Presupposition: John believes that Mary bought a car.
 b. John is sorry that Mary bought a **Honda**.
 Presupposition: John believes that Mary bought a Honda.

The entailment fails because not every context that makes (54a) defined and true makes (54b) defined (John can be sorry that Mary bought a car without believing it was a Honda). The kind of truth-preserving inference that we need in the assessment of NPIs, which von Stechow dubs ‘Strawson-entailment’, should be weaker than entailment:

- (55) Cross-categorical Strawson-entailment ($\overset{\text{Strawson}}{\Rightarrow}$)
 a. For p, q of type *t*: $p \overset{\text{Strawson}}{\Rightarrow} q$ iff $p = \text{False}$ or $q = \text{True}$;

- b. For f, g of type $\langle \sigma, \tau \rangle$: $f \xrightarrow{\text{Strawson}} g$ iff for all x of type σ such that $g(x)$ is defined: $f(x) \xrightarrow{\text{Strawson}} g(x)$.

It is easy to see that (54a) Strawson-entails (54b), i.e. (54a) entails (54b) under the assumption that the presuppositions of the two sentences are satisfied. Just as we did before, we can, *mutatis mutandis*, define a monotonicity property that a function must have in order to be an NPI licenser, Strawson downward-entailingness (SDEness):

- (56) **Strawson downward-entailingness:** A function f of type $\langle \sigma, \tau \rangle$ is Strawson downward-entailing (SDE) iff for all x, y of type σ such that $x \Rightarrow y$ and $f(x)$ is defined: $f(y) \Rightarrow f(x)$.

If a function is DE, then it is also SDE (the converse is not true). Ladusaw’s licensing condition is thus weakened by only requiring SDEness:

- (57) **Von Fintel’s (1999) Licensing Condition:** An NPI is only grammatical if it is in the scope of an α at LF such that $\llbracket \alpha \rrbracket$ is SDE.

This licensing condition rides on the generalization that presuppositions do not have a disruptive effect on NPIs (but see §2.6 below).

- (58) **Standard Generalization:** Presuppositions never disrupt the licensing of NPIs.

Von Fintel shows that, by combining his licensing condition with an appropriate semantics for adversative attitudes (which he provides),⁹ one can correctly predict the distribution of NPIs in their complement (and SDEness also allows him to capture the licensing of NPIs in antecedents of conditionals¹⁰ and superlatives).

2.3 The problem of strict NPIs

Von Fintel’s solution to the excessive strictness of the Fauconnier-Ladusaw licensing condition has proven useful in many other places, such as Herdan and Sharvit 2006 (on

⁹According to von Fintel, ‘sorry that p ’ is equivalent to ‘wish that not p ’. For *sorry* (and any other adversative predicate) to be an NPI licenser, it has to denote a monotonic function; and yet, it has long been observed that *wish*, whose meaning is, according to von Fintel, a core ingredient of the meaning of *sorry*, fails simple monotonicity tests (Asher 1987). Von Fintel offers a semantics for *wish* where monotonicity is guaranteed by certain definedness conditions, in other words, by presuppositions (such as the restriction of the domain of quantification to worlds compatible with the attitude holder’s beliefs, Heim 1992). Because when checking for the SDEness of a function, all its presuppositions are granted, the denotation of *sorry* comes out to be, not only a monotonic function, but also an SDE one.

¹⁰The failure of Strengthening the Antecedent illustrated below seems to call for a non-monotonic analysis of the antecedent of conditionals; yet von Fintel argues that examples such as (i) involve context shift, and that *if* is in fact SDE, and hence licenses NPIs in the antecedent of the conditional:

- (i) a. If kangaroos had no tails, they would topple over.
 b. $\not\Rightarrow$ If kangaroos had no tails but used crutches, they would topple over.

Before him, Heim (1984) advocated a weakening of the Fauconnier-Ladusaw condition whereby entailment should be checked, not with arbitrary antecedents, but with antecedents that only differ in the place of the NPI.

superlatives), Guerzoni and Sharvit 2007, Guerzoni and Sharvit 2013 (on questions). But it is not entirely without problems.

First of all, once Strawson-entailment enters the picture, we might want to extend its use to the licensing condition of strict NPIs, e.g. *in years*, *either* and *punctual until*. What we need then is Strawson anti-additivity, defined as follows:

- (59) **Strawson anti-additivity:** A function f of type $\langle \sigma, \tau \rangle$ is Strawson anti-additive (SAA) iff for all X, Y of type σ ($f(X) \wedge f(Y)$) and $f(X \vee Y)$ Strawson-entail each other.

The licensing condition would thus be:

- (60) **Strawson-based licensing condition of strict NPIs:** A strict NPI is only grammatical if it is in the scope of an α at LF such that $\llbracket \alpha \rrbracket$ is SAA.

It is easy to verify that, being a presupposition trigger, *only DP* is not AA (a context in which only John drinks or smokes is not necessarily a context which supports the presupposition of *Only John drinks and only John smokes*, namely that John drinks and smokes), but it is SAA:

- (61) Left to Right
 a. Only John drinks and only John smokes \Rightarrow Only John drinks or smokes
 b. Only John drinks and only John smokes $\stackrel{\text{Strawson}}{\Rightarrow}$ Only John drinks or smokes
- (62) Right to Left
 a. Only John drinks or smokes $\not\Rightarrow$ Only John drinks and only John smokes
 b. Only John drinks or smokes $\stackrel{\text{Strawson}}{\Rightarrow}$ Only John drinks and only John smokes

Similarly we could show that *sorry*, just as the other adversative factives, is SAA. Now, our Strawson-based licensing condition (60) turns out to be too weak. Strict NPIs are not available in the scope of *only* and adversative factives (Horn 1989, Atlas 1996, Nathan 1999, Rullmann 2003, Giannakidou 2006, Gajewski 2007, 2011 a.o.).

- (63) a. Only John saw anything.
 b. *Only John has exercised in years.
 c. *Only John left until the next day.
 d. *Only John has arrived yet. [Levinson 2008, ex. 358 p. 69]

We also observe that strict NPIs are not acceptable under adversative factives, e.g. *sorry*, *regret* and *be surprised*.¹¹

¹¹Showing that adversative factives do not license strict NPIs requires additional controls, because they seem to be sensitive to the nature of the clause they appear in: for example, *in years*, when in a tensed clause, fails to be licensed by a superordinate negation, unless the embedding predicate is a neg-raiser, e.g. *think* (Gajewski 2007; on neg-raising, see Chapter 41 of this *Companion*); this might be a locality constraint:

- (i) *Context:* John is so out of shape...
 a. *It is impossible that John has exercised in years.

- (64) a. *John is sorry to have left until the next day.
 b. *John regrets to have left until the next day.
 c. *John is surprised to have arrived until the next day.

Note that punctual *until* is perfect under *refuse*, which, unlike adversative predicates, is not a presupposition trigger:

- (65) John refuses to leave until the next day.

Von Fintel's original condition (57) is a necessary condition on the licensing of *weak* NPIs, so it is not falsified by these data. And yet, such facts are at odds with the spirit of the condition, because they indicate that grammar does not generally ignore presuppositions for the purpose of NPI licensing. A possible remedy would be to restrict the use of Strawson-entailment to the condition for weak NPIs, and require plain anti-additivity (rather than Strawson anti-additivity) for strict NPIs (but see Gajewski 2011 for a proposal to do away with anti-additivity in the licensing of NPIs).

2.4 Strawson upward-entailingness

Strawson-based licensing faces another challenge: von Fintel's condition for weak NPIs incorrectly predicts that the singular determiner *the*, a presupposition trigger, should be a licenser of weak NPIs as it denotes an SDE function (the same problem arises with the trigger *both*):

- (66) *Context*: There is exactly one student who read some books on NPIs.
 a. *The student who read any books on NPIs is selling them.
 b. The student who read books on NPIs is selling them.
 c. *Presupposition of (66b)*: There is exactly one student who read books on NPIs.¹²
- (67) a. $\llbracket \text{novel} \rrbracket \Rightarrow \llbracket \text{book} \rrbracket$
 b. The student who read a **book** is selling it.
Presupposition: There is exactly one student who read a book.
 c. The student who read a **novel** is selling it.
Presupposition: There is exactly one student who read a novel.
 d. (67b) $\not\Rightarrow$ (67c) (not DE)
 e. (67b) $\stackrel{\text{Strawson}}{\Rightarrow}$ (67c) (SDE)

Singular *the* triggers a uniqueness presupposition. As a result, the premise and the consequence in (67) are about the same individual, *viz.* the denotation of the subject

-
- b. It is impossible that John did any kind of exercise.

- (ii) I don't think that John has exercised in years.

The examples used in the literature involve tensed clauses:

- (iii) *I didn't go to Spain. I regret that I went to [Portugal]_F either. [Rullmann 2003, ex. 29]

Licensing appears to be easier in infinitives in general.

¹²For ungrammatical sentences, I provide a grammatical paraphrase and its presupposition.

DP: if we grant that they exist and are both unique, the student who read a book and the student who read a novel have to be the same individual. And whatever is said of one can also be said of the other, hence the entailment in both directions, i.e. from sets to subsets and from subsets to sets. Or, more accurately, we should say: Strawson-entailment in both directions. Alongside Strawson downward-entailingness, the notion of Strawson upward-entailingness is called for:

(68) **Strawson upward-entailingness:** A function f of type $\langle \sigma, \tau \rangle$ is Strawson upward-entailing (SUE) iff for all x, y of type σ such that $x \Rightarrow y$ and $f(y)$ is defined: $f(x) \Rightarrow f(y)$.

(69) (67c) $\stackrel{\text{Strawson}}{\Rightarrow}$ (67b) (SUE)

This property of preserving truth in both directions appears to be the source of anti-licensing, and thus an amendment to the licensing condition suggests itself (this idea was first put forward in Lahiri 1998 about Hindi correlatives; see also Cable 2002 and Guerzoni and Sharvit 2007). One should exclude from the list of suitable licensers the singular definite article, *both*, and in general, those functions which are Strawson downward-entailing and Strawson upward-entailing at the same time:

(70) **Von Fintel-Lahiri's Licensing Condition:** An NPI is only grammatical if it is in the scope of an α at LF such that $\llbracket \alpha \rrbracket$ is SDE, non SUE.¹³

Note that this solution, which restricts the class of suitable licensers, has nothing to say about the fact that having a negation above the definite determiner doesn't lead to licensing (*NEG >> THE_{SG} >> NPI):

(71) *Context:* Two students are selling their linguistics books. Only one of the two has books on NPIs.

*I don't think the student who has any books on NPIs is selling them.

This is yet another instance where von Fintel's licensing condition for weak NPIs needs to be strengthened: *any* is in the scope of negation, which is SDE, non SUE, and yet it is not grammatical. It is not desirable to add a negative rule (an anti-licensing condition) to the effect that a weak NPI should *not* be in the scope of an SDE, SUE operator like singular *the*. This rule would be immediately falsified by the following grammatical sentence, a THE_{SG} >> NEG >> NPI configuration:

(72) *Context:* There is some student who doesn't have books on NPIs.
The student who doesn't have any books on NPIs passed all his syntax exams.

¹³This condition adequately captures the contrast between plural *the* and singular *the*: the former is SDE, non SUE and licenses NPIs, while the latter is SDE, SUE, and doesn't license them:

- (i) a. *The student who has any books on NPIs is selling them.
b. The students who have any books on NPIs are selling them.

[Guerzoni and Sharvit 2007, ex. 29 p. 12]

SDE, non SUE operators are a superset of DE operators. Despite such examples, Hoeksema 2008 and Homer 2011 argue that plural *the* doesn't in general license NPIs; on this issue, see also Gajewski and Hsieh 2014 and Gajewski 2016.

2.5 Operators vs. environments

So it seems that restricting attention to licensers makes us miss something: the problem with *any* in (66a) and (71) seems to have to do, not with the properties of operators above it, but rather with the environment it finds itself in. Even though in (71) it is in the scope of negation, there is an element in its syntactic environment, namely *the*, which causes it to be anti-licensed; the respective position of the two elements is crucial, as licensing happens under the scope $\text{THE}_{SG} \gg \text{NEG} \gg \text{NPI}$ (72). Gajewski (2005, 2007, 2011) and Homer (2008, 2009, 2011, 2019) after him argue that licensing of NPIs is not operator-based (as in Laka 1990, Progovac 1994, von Stechow 1999, Kato 2000, Guerzoni 2006, a.o.), i.e. it does not depend on a configurational relation between an NPI and an operator. It is instead environment-based (see also Chierchia 2004). In other words, when checking for monotonicity, it is crucial that downward inferences be licensed in the very position NPIs appear in at LF. It is in fact the monotonicity of the environment that matters. But what does it mean to talk about the monotonicity of an environment, such as a syntactic constituent? Monotonicity (DEness, anti-additivity) is a property of functions: Gajewski (2005) (building on Heim 1984, Zwarts 1996 and Heim 2003 a.o.) shows that the function whose monotonicity is relevant obtains by abstracting over the position occupied by a given polarity item in a certain constituent:¹⁴

- (73) A constituent A is DE with respect to the position of α ($[\alpha] \in D_\sigma$) iff the function $\lambda x_\sigma. \llbracket A[\alpha/v_{\langle\sigma,i\rangle}] \rrbracket^{g[v_{\langle\sigma,i\rangle} \rightarrow x]}$ is DE.
 $A[\alpha/\gamma]$ is the result of replacing α with γ in A.

Consider the LF in (75): the maximal constituent is DE w.r.t. the position of the NPI *any*, because the function f , defined in (76) by abstraction over the position of *any*, is DE due to the presence of negation inside it (Gajewski 2005, p. 34):

- (74) John didn't see any dogs.
(75) [not [any dogs]] John saw t₁]
(76) $f := \lambda x_{et,ett}. \llbracket [\text{not } [v_{\langle et,ett,2 \rangle} \text{ dogs}]] \text{ John saw } t_1 \rrbracket^{g[v_{\langle et,ett,2 \rangle} \rightarrow x]}$

We verify the DEness of the function by a standard inference test:

- (77) a. $\llbracket \text{at least two} \rrbracket \Rightarrow \llbracket \text{any} \rrbracket$ ¹⁵
b. $f(\llbracket \text{any} \rrbracket) \Rightarrow f(\llbracket \text{at least two} \rrbracket)$
c. 'It's not the case that John saw any dogs' entails 'It's not the case that John saw at least two dogs'.

Mutatis mutandis, we can easily define UEness, SDEness, SUEness, and Strawson anti-additivity for constituents. If we inspect the simplified LF for (71) in (78), we see that there are multiple constituents γ containing *any*, e.g. NP, DP, and the matrix TP to name only a few. And it is possible to show that no matter which such constituent we look

¹⁴His motivation for offering an environment-based proposal comes from the licensing of strict NPIs in the complement of neg-raising predicates, e.g. *want* and *think*.

¹⁵This is assuming that *any*, like *some*, is an existential quantifier over individuals; remember that ' \Rightarrow ' stands for cross-categorical entailment.

at, it is either UE w.r.t. the position of *any* (witness NP, which contains no DEness inducer) or SDE, SUE w.r.t. its position (witness matrix TP, which contains *not*).

(78) *LF: $[_{TP} \text{ not } [_{CP} [_{DP} \text{ the } [_{NP} \text{ student who } [_{TP} [\text{any books}] \text{ I } [_{VP} \text{ have } t_1]]]]]] \text{ sell}]$
(cf. (71))

I leave it to the reader to verify that the function f' defined below is SDE, SUE:

(79) $f' := \lambda x_{et,ett} \cdot \llbracket [_{TP} \text{ not } [[\text{the } [\text{student who } [[v_{\langle et,ett,2 \rangle} \text{ books}] \text{ I } [\text{have } t_1]]]]]] \text{ sell}] \rrbracket^g[v_{\langle et,ett,2 \rangle} \rightarrow x]$

Observe by contrast that in LF (80) (for sentence (72)) the TP inside the relative clause is DE w.r.t. the position of *any*:

(80) LF: $[_{TP} [_{CP} [_{DP} \text{ the } [_{NP} \text{ student who } [_{TP} \text{ not } [\text{any books}] \text{ I } [_{VP} \text{ have } t_1]]]]]] \text{ pass}]$
(cf. (72))

One can easily check that the function f'' defined below is DE:

(81) $f'' := \lambda x_{et,ett} \cdot \llbracket [_{TP} \text{ not } [v_{\langle et,ett,2 \rangle} \text{ books}] \text{ I } [\text{have } t_1]] \rrbracket^g[v_{\langle et,ett,2 \rangle} \rightarrow x]$

Gajewski 2005 offers the following environment-based licensing condition, which can be appropriately modified to incorporate Strawson-entailment:

(82) **NPI Licensing condition (Gajewski 2005):** An NPI α is licensed in a sentence S only if there is a constituent A of S containing α such that A is downward-entailing (or SDE, non SUE) with respect to the position of α at LF.¹⁶

So if *any* needs either a DE environment or an SDE, non SUE one, it is expected to be grammatical in (72) (where at least one such environment exists, cf. (81)), but ungrammatical in (71). Gajewski's condition doesn't require that an NPI be in the scope of a certain kind of function-denoting expression, as in operator-based systems: instead it makes direct reference to the monotonicity of environments; and it demands that there be one constituent with the appropriate monotonicity w.r.t. the position of the NPI. Importantly, it is not required that the sentence as a whole be of the right monotonicity w.r.t. the NPI: only one constituent has to be. The environment-based approach predicts that NPIs can be licensed by a combination of expressions which, without denoting DE functions themselves, create a DE environment (as argued for e.g. in Heim 2003 about NPIs in *than*-clauses); it also makes room for the potential disruptive effect that expressions in the same constituents as the NPI might have on the downward-monotonicity of the constituents in question (see §2.6 about presupposition triggers and §3.2 about scalar implicature triggers).

There are more reasons why an environment-based approach is preferable. Homer (2011, 2019) shows that French weak NPIs, e.g. *quoi que ce soit* 'anything', are subject to so-called flip-flop:

¹⁶Such a condition, and all the conditions built upon it, raise a compositionality issue: how can a constraint, seemingly attached to a lexical item, make reference to the larger linguistic context the item appears in?

- (83) *Il n' est pas impossible que Jean ait fait quoi que ce soit
 it NE is NEG impossible that Jean have.SUBJ done what that this be.SUBJ
 pour l' aider.
 to her help
 Intended: 'It is not impossible that Jean did anything to help her.'
- (84) Il est impossible que Jean n' ait pas fait quoi que ce soit
 it is impossible that Jean NE have.SUBJ NEG done what that this be.SUBJ
 pour l' aider.
 to her help
 'It is impossible that Jean didn't do anything to help her.'

'Flip-flop' refers to the fact that a sentence containing an NPI can be made unacceptable by adding to it a DE expression, and acceptable again by adding yet another one, and so forth. Because grammar doesn't count, from the point of view of an operator-based approach licensing is not expected to depend on the number (odd or even) of DE operators that an NPI is in the scope of. But flip-flop is predicted to happen if NPIs are sensitive to the monotonicity of their environment, as the environment-based approach holds. One has to construct examples in which two DE operators are 'close enough' to each other in order to witness it: in (83) negation and the negative predicate *impossible* are both contained in all the same Polarity Phrases (assuming that Pol¹⁷ is the head which hosts negation in its specifier; Pol sits between T and v), whereas they are separated by a clause boundary in (84). I claim that in each clause γ of a sentence S , only the constituents that contain the Pol head of γ are accessible for the computation of the licensing of *quoi que ce soit*: this adds a restriction to Gajewski's licensing condition (82). The matrix VP of (83) in particular is not a so-called 'domain' of *quoi que ce soit* (i.e. a constituent in which its licensing can be assessed), even though it is DE w.r.t. the position of *quoi que ce soit* at LF; matrix PolP is a domain of this NPI, and in (83) it is UE w.r.t. it, due to the presence of negation in it.

- (85) LF of (83): * $[_{TP} [_{PolP} pas [_{VP} impossible [_{CP} [_{TP} Jean [_{PolP} [_{VP} [quoi que ce soit] l faire t_1]]]]]]]]]$

All the domains of *quoi que ce soit* in (83) (in the embedded clause and in the matrix clause) are UE w.r.t. its position. In the grammatical (84) on the other hand, *quoi que ce soit* has at least one domain that is DE w.r.t. its position, namely the embedded PolP (the matrix PolP is UE).

- (86) LF of (84): $[_{TP} [_{PolP} [_{VP} impossible [_{CP} [_{TP} Jean [_{PolP} pas [_{VP} [quoi que ce soit] l faire t_1]]]]]]]]]$

Similar facts can be replicated with some but not all English speakers, using the NPI *any*. With stronger NPIs, e.g. *a single*, they are replicated with all speakers (I show that flip-flop occurs with Positive Polarity Items as well; see also Nicolae 2012a,b):

- (87) a. *It is not impossible that John did a single thing to help her.
 b. It is impossible that John didn't do a single thing to help her.

¹⁷Positing a polarity head Pol is in line with Laka's (1990) analysis, where Sigma plays the same role.

Note that Homer 2019 doesn't explain why certain constituents are accessible while others are not.

- (88) **Homer's (2019) Licensing Condition of NPIs:** An NPI π is licensed in sentence S only if there is a domain A of π in S which has the monotonicity properties required by π w.r.t. the position of π .

This environment-based condition can easily subsume the von Fintel-Lahiri condition for weak NPIs: it is simply a matter of specifying that English weak NPIs require an SDE, non SUE *environment* (rather than *operator*).

2.6 Presuppositions again: Disruption by presupposition

A key prediction of the environment-based approach is that in a given constituent γ containing an NPI π , there can be an expression whose contribution to meaning turns the environment of π into a non-monotonic one. Homer (2008, 2009, 2011) argues, against the generalization that presuppositions are innocuous for NPI licensing (58) at the root of von Fintel's condition (57), that the presupposition trigger *aussi* 'too' in French can have a disruptive effect on NPIs (not all English speakers have this judgment regarding *too*). Observe (89a), where the NPI is bad (while the non-NPI indefinite *quelque chose* is grammatical); *aussi* is an anaphoric presupposition trigger, and as such, its presupposition must be satisfied in the linguistic context:

- (89) *Context:* Marie read a novel.
- a. Marie a lu un roman, mais je ne pense pas que [Jean]_F
 Marie has read a novel but I NEG think NEG that Jean
 ait lu quelque chose/ *quoi que ce soit lui aussi.
 have.SUBJ read something/ what that this be.SUBJ him too
 'Marie read a novel, but I don't think that [Jean]_F read something too.'
 - b. *Presupposition of the quelque chose variant of (89a):* Somebody other than Jean read something.

Now let's replace *aussi* with *non plus* 'either':

- (90) *Context:* Marie didn't read anything.
- a. Marie n' a rien lu, et je ne pense pas que [Jean]_F
 Marie NEG has nothing read, and I NEG think NEG that Jean
 ait lu quoi que ce soit lui non plus.
 have.SUBJ read what that this be.SUBJ him either
 'Marie didn't read anything, and I don't think that [Jean]_F read anything either.'
 - b. *Presupposition of (90a):* Somebody other than Jean didn't read anything.

I argue that *aussi* 'too' is a disruptor while *non plus* 'either' is not.¹⁸ *Aussi* and *non plus* differ very minimally: both are focus particles, and as such they associate with a

¹⁸The argument involves among other things showing that there is no incompatibility between *aussi* and the superordinate negation, and that focus *per se* is not at fault.

constituent and evoke a set of alternatives, but the polarity of their presupposition is different (compare (89b) and (90b)). Let's verify the monotonicity of the environment (for simplicity, we can just consider the whole sentence, since we want to include negation, the only DEness inducer):

- (91) *Je ne pense pas que [Jean]_F ait lu quoi que ce soit lui aussi.
- a. $\llbracket \text{novel} \rrbracket \Rightarrow \llbracket \text{book} \rrbracket$
 - b. Je ne pense pas que [Jean]_F ait lu un **livre** lui aussi.
I NEG think NEG that Jean have.SUBJ read a book him too
Assertion: I don't think that Jean read a book.
Presupposition: Somebody other than Jean read a book.
 - c. Je ne pense pas que [Jean]_F ait lu un **roman** lui aussi.
I NEG think NEG that Jean has read a novel him too
Assertion: I don't think that Jean read a novel.
Presupposition: Somebody other than Jean read a novel.
 - d. (91b) $\not\Rightarrow$ (91c) (not DE)
 - e. (91b) $\xrightarrow{\text{Strawson}}$ (91c) (SDE)
 - f. (91c) $\not\Leftarrow$ (91b) (not SUE)

It is not the case that all the situations which make (91b) true, i.e. situations in which (i.) I don't think that Jean read a book and (ii.) someone other than Jean read a book, are situations in which somebody other than Jean read a novel. In other words, there are situations in which (91b) is true but (91c) is undefined. The entailment doesn't go through: the NPI is in a non-monotonic environment. However, and this is an objection I raise against the use of Strawson-entailment, the NPI is in an SDE, non SUE environment (the whole sentence), and yet it is not licensed. The same procedure for checking the monotonicity of the position of the NPI applies, *mutatis mutandis*, to (90a): the NPI is in a DE environment, and licensed. The mere presence of a presupposition trigger is not what causes the disruption: instead it is the presupposition itself which sometimes ruins the monotonicity of the environment.¹⁹

Additional cases of 'disruption' by presupposition are discussed in Homer 2008, 2009. In particular, *quoi que ce soit* (and all other NPIs) in the complement clause of a French cognitive factive predicate like *savoir* 'know' or *se rendre compte* 'realize' cannot be licensed by a superordinate negation (see Gajewski 2011, and Chierchia 2013:ch. 7, 2019; similar facts hold in Italian; in English, weak NPIs are licensed).

¹⁹Note that there is at least one position in the sentence that the presupposition of *aussi* doesn't make non-monotonic, namely its own focus (in the syntactic sense of the word *focus*); and as expected, this is a position where a weak NPI is licensed (Homer 2011):

- (i) *Context:* Marie invited Pierre, who is not taking any classes with anyone.
- a. Je ne crois pas que Marie ait aussi invité [qui que ce soit de la classe de Jean]_F.
I NEG think NEG that Marie have.SUBJ also invited who that this be.SUBJ of the class of Jean
'I don't think that Marie invited [anyone in Jean's class]_F too.'
 - b. *Presupposition:* Marie invited someone who is not in Jean's class.

- (92) *Jean ne sait pas que Marie a lu quoi que ce soit.
 Jean NEG knows NEG that Marie have.IND read what that this be.SUBJ
 Intended: ‘Jean doesn’t know that Marie read anything.’

- (93) I didn’t realize that anybody was hurt. [Linebarger 1980, ex. (134a)]

Homer (2008, 2009) also argues that singular *the* is a disruptor (71), because of its presupposition. The empirical picture which emerges from such facts, if one believes that presuppositions can have a disruptive effect, is a complex one. In English, French and Italian, presuppositions can generally disrupt the licensing of strict NPIs; for weak NPIs, only certain presuppositions have this anti-licensing effect (for example, the presupposition of *it*-clefts doesn’t). And only comparing these three languages, the set of disruptive presuppositions varies (but in an orderly fashion: across the three languages, the sets are ordered by a proper subset relation). Disruption by presupposition thus varies along two dimensions, namely the presuppositions themselves (e.g. *too* vs. *it*-clefts) and the strength of NPIs (weak vs. strict). For Homer 2008, 2009, the recourse to Strawson-entailment is unwarranted, and a conservative approach based on plain downward-entailment is to be preferred: having a Strawson-based licensing condition for weak NPIs and a non Strawson-based one for strict NPIs is not an option (*contra* Gajewski (2011)), because even weak NPIs can be anti-licensed by presuppositions.

Seeing licensing as environment-based is at odds with the picture of licensing inherited from Klima. It no longer makes sense to view licensing as a relation between a polarity item and its licenser: our Questions 1 and 2 turn out to be ill-defined. An NPI must fit in an environment, i.e. be interpreted in a position such that downward inferences are warranted in this very position. This suggests that the specific contribution to meaning the NPI makes is helped, in a manner to be determined, by downward-entailingness. We now turn to theories of NPIs which explain what this specific meaning is, and how downward-entailingness helps its composition with the rest of the sentence. In other words, we finally address our Question 3. It bears saying that the accounts presented in the following section target indefinite NPIs, and are less well suited to explain the polarity sensitivity of other categories, such as NPI modal verbs (*hoeven* ‘need’ in Dutch, auxiliary *need* in English) or NPI phasal adverbs (such as *yet*).

3 Deriving polarity sensitivity

3.1 Kadmon and Landman 1993

Observe the following dialogue (where B is a cook for fifty people):

- (94) a. Speaker A: Will there be French fries tonight?
 b. Speaker B: No, I don’t have potatoes.
 c. Speaker A: Maybe you have just a couple of potatoes that I could take and fry in my room?
 d. Speaker B: Sorry, I don’t have ANY potatoes.

This example illustrates a prominent feature of *any*, which Kadmon and Landman take to be a key to understanding its distribution, namely a reduced tolerance to exceptions.

What Speaker B conveys by using (stressed) *any* in her second utterance is that she doesn't have potatoes, even of the sort that could normally be discounted. While her first negative statement could countenance exceptions, the second one, the claim goes, doesn't. The first property then which distinguishes *any NP* from *a NP* is that the former 'extends the interpretation' of the NP restrictor, along some pragmatically relevant dimension: this is called 'widening', and it is a semantic property inherent to *any*.²⁰ In our example, the domain in B's second utterance is widened to include quantities of potatoes that are not initially relevant to the discussion, i.e. groups of three or four potatoes. Along with widening, the second distinctive property of *any* is pragmatic. An *any*-statement must be logically stronger, after widening, than the corresponding statement without widening. This is in essence a competition principle called 'strengthening'. *Any* is licensed only if the widening it triggers leads to a statement that asymmetrically entails the statement on the narrow interpretation.²¹ In a UE environment, this condition fails:

- (95) a. We have potatoes of some kind (cooking or other). ('wide' interpretation)
 b. \nRightarrow We have cooking potatoes. ('narrow' interpretation)

In DE environments (under negation, or in the restrictor of a universal quantifier), strengthening can happen felicitously:

- (96) a. We don't have potatoes, cooking or other. ('wide' interpretation)
 b. \Rightarrow We don't have cooking potatoes. ('narrow' interpretation)

Kadmon and Landman's 'widening + strengthening' theory is among the first to do away with licensing conditions altogether: NPIs do not need to be licensed; instead they make a contribution to meaning which can lead to infelicity when a pragmatic condition, namely strengthening, is not met. Downward-entailingness is just ancillary to this operation. Chierchia's (2013) account, to which we turn now, rests on similar premises but rejects the notion of widening as a primitive.

3.2 Chierchia 2013

This is a theory which does mainly two things (many more in fact). (i) It answers the question: why is *any* an NPI? In a nutshell, the presence of *any* triggers a semantic enrichment (a process of exhaustification), which can only succeed in a DE environment (in the spirit of Krifka 1990, 1992, 1995, which it builds upon). And (ii) it offers an account of intervention effects (the Linebarger ones, e.g. (36), and the presupposition ones, cf. §2.6).

²⁰Kadmon and Landman argue that stress is neither sufficient nor necessary for widening.

²¹Krifka (1995), among others, objects that the condition is non-compositional, since it places a constraint on the larger linguistic context an NPI appears in. We expressed a similar concern about environment-based licensing conditions, see fn. 16 on p. 21.

3.2.1 An alternative-based system

Central to Chierchia's theory is the claim that *any* activates alternatives and that an implicature ensues, which can contradict the assertion. These are the core tenets of the account developed by Krifka (1990, 1992, 1995), a scalar approach to NPIs.

Many expressions in language activate alternatives (scalar terms like *or* activate scalar alternatives). But the alternatives *any* activates are a bit special, and this activation of alternatives is not immediately observable. But we sometimes get a glimpse of it, although indirectly. The cases in point are cases where *any* receives a certain kind of focus, *contrastive* focus. This happens e.g. when we compare two sentences which only differ in the form of the indefinite, as in (97a) and (97b), or when we put stress on the NPI (98):

- (97) a. I will never vote for a Republican.
b. I will never vote for any Republican.
- (98) a. Speaker A: Do you have an egg? [modeled after (94)]
b. Speaker B: No.
c. Speaker A: Maybe a pickled one?
d. Speaker B: I don't have ANY egg.

In these two instances we observe the widening effect of *any* already described by Kadmon and Landman (1993) (*any* shows 'proclivity to emphasis or exception intolerance'). Chierchia proposes the following negative characterization: the domain of quantification associated with *any* (e.g. the set of eggs quantified over by *any*) *cannot be smaller than* the domain of quantification associated with *a*. In isolation and without stress on *any*, an *any*-statement doesn't give rise to such an effect (this is a point where Chierchia departs from Kadmon and Landman (1993)). The activation of the alternatives of *any* is always at play but often undetectable: only under contrastive stress does it become detectable, through the widening effect. In Rooth's (1985, 1992) classic theory of focus, a contrastively focused item must find in the surrounding discourse an antecedent (this is an 'anaphoric' constraint), which has to be an element of the set of its *focal alternatives*, distinct from the assertion itself: for example when we put stress on *new* in (99a), we get a set of focal alternatives of the form {Bill was wearing an A coat: $A \subseteq \text{ADJ}$ } and it is required that an element of this set be provided in the linguistic context. This is indeed the case, witness [John was wearing an old coat] (this condition fails in (100a)).

- (99) a. John was wearing an old coat. Bill was wearing a NEW one.
b. [John was wearing an old coat] \in {Bill was wearing an A coat: $A \subseteq \text{ADJ}$ }
- (100) a. ??John was riding a bike. Bill was showing off a NEW coat.
b. [John was riding a bike] \notin {Bill was showing off an A coat: $A \subseteq \text{ADJ}$ }

Now, the intuition that Chierchia formalizes is that the focal alternatives to an *any*-statement must be statements whose associated domain of quantification is a subset of the domain associated with *any*. In other words, an *any*-statement is compared to statements where one quantifies over a set of things that is included in the domain of things quantified over in the *any*-statement. The formal ingredients are the following.

We suppose that *any*, just like *a*, is an existential generalized quantifier: the ordinary semantic value that it contributes is the same as that of *a*, as shown in (101) and (103):

$$(101) \llbracket \text{any}_{F,D} \rrbracket = \lambda P. \lambda Q. \exists x \in D [P(x) \wedge Q(x)]$$

(102) There aren't any cookies left.

$$(103) \llbracket \text{There aren't any}_{F,D} \text{ cookies left} \rrbracket = \neg \exists x \in D [\text{cookies}'(x) \wedge \text{left}'(x)]$$

Furthermore we assume that *any* carries an inherent focal feature, marked with subscript 'F' (with no necessary phonological realization). Because of this lexical feature, *any* associates with a set of alternatives which vary in terms of the size of the domain of quantification (the *D* variable is contextually supplied; 'D' is for domain; all indefinites have domain alternatives). We stipulate that these are necessarily *subdomain* alternatives (notice that the superscript 'F' on the interpretation function is to indicate that we calculate the focus semantic value of the argument, i.e. a set of values of the same type as the argument):

$$(104) \llbracket \text{any}_{F,D} \rrbracket^F = \{ \lambda P. \lambda Q. \exists x \in D' [P(x) \wedge Q(x)]: D' \subseteq D \}$$

Through the compositional mechanism of pointwise functional application (Hamblin 1973, Kratzer and Shimoyama 2002), the alternatives 'expand' to form the set of alternatives to (102), ALT:

$$(105) \llbracket \text{There aren't any}_{F,D} \text{ cookies left} \rrbracket^F = \text{ALT} \\ = \{ \neg \exists x \in D' [\text{cookies}'(x) \wedge \text{left}'(x)]: D' \subseteq D \}$$

We now go back to our earlier example (98) and we equip the two indefinites with domain variables, D1 and D2:

- (106) a. Speaker A: Do you have an_{D1} egg?
b. Speaker B: I do not have ANY_{D2} egg.

Rooth's anaphoric constraint is easily met in this context:

- (107) a. $\llbracket \text{I don't have an}_{D1} \text{ egg} \rrbracket \in \llbracket \text{I don't have any}_{F,D2} \text{ egg} \rrbracket^F$
b. $\llbracket \text{I don't have an}_{D1} \text{ egg} \rrbracket \in \{ \neg \exists x \in D' [\text{egg}'(x) \wedge \text{have}'(I, x)]: D' \subseteq D2 \}$

The focal alternative present in context represents a subdomain alternative of the *any*-statement (D1 has to be a subset of D2). This derives the widening effect observed in the dialogue. The widening effect is the signature of the activation of alternatives, more specifically *subdomain* alternatives.²²

The next question is: does polarity sensitivity follow from this? In other words, what is the role of negativity? Suppose that alternatives cannot remain 'idle' once activated, i.e. that they must be *exhaustified*, i.e. factored into meaning using a covert focus sensitive operator. In the case at hand, the exhaustifier will be **O** (a covert, non presuppositional counterpart of *only*), present in the syntax; **O** takes two arguments, a set of

²²Chierchia uses stress on *any* to reveal the nature of the alternatives it invokes, namely subdomain alternatives. Note that stressing *any* (this is also true of Greek *kanenas*) makes its distribution more limited. Krifka (1992) highlights this effect: he argues that stressed *any* and *any... at all* are strong NPIs.

propositions C (a set of alternatives) and a proposition p ; it asserts p and excludes all the alternatives to p in C that p doesn't entail (hence the term 'exhaustification'):

$$(108) \quad \mathbf{O}_C(p) = p \wedge \forall q \in \text{ALT}(p)[p \not\Rightarrow q \rightarrow \neg q]$$

\mathbf{O} is also used to derive scalar implicatures (Chierchia et al. 2008): a sample derivation of a scalar implicature is provided below, and we see \mathbf{O} operating on scalar alternatives:

(109) a. I saw some student.

b. *Scalar implicature*: I didn't see many students.

$$(110) \quad \llbracket (109a) \rrbracket = \exists x \in D[\text{student}'(x) \wedge \text{saw}'(I, x)]$$

$$(111) \quad \llbracket (109a) \rrbracket^F = \text{ALT} \\ = \{\text{I saw a student, I saw many students, I saw most students, I saw every student}\}$$

$$(112) \quad \mathbf{O}_C[\text{I saw some student}] = [\text{I saw some student}] \wedge [\neg \text{I saw many students}]$$

When we apply the same procedure to *any*, \mathbf{O} exhaustifies relative to domain alternatives. And we derive a contradiction unless *any* is in a DE environment. Assume that the set of students is made up of three individuals, a , b and c : we form subdomain alternatives with subsets of $\{a, b, c\}$, namely $\{a, b\}$, $\{a, c\}$ and $\{b, c\}$:

(113) a. I didn't see any student.

b. $[\neg \exists x \in \{a, b, c\}[\text{student}'(x) \wedge \text{saw}'(I, x)]]$

$$(114) \quad \text{ALT: } \{\neg \exists x \in \{a, b\}[\text{student}'(x) \wedge \text{saw}'(I, x)], \neg \exists x \in \{b, c\}[\text{student}'(x) \wedge \text{saw}'(I, x)], \\ \neg \exists x \in \{a, c\}[\text{student}'(x) \wedge \text{saw}'(I, x)]\}$$

(113a) entails its alternatives, so no alternatives get negated:

$$(115) \quad \text{a. } \mathbf{O}_C[\text{I didn't see any}_{[+D]} \text{ student}] = \mathbf{O}_C[\neg \exists x \in \{a, b, c\}[\text{student}'(x) \wedge \text{saw}'(I, x)]] \\ \text{b. } \neg \exists x \in \{a, b, c\}[\text{student}'(x) \wedge \text{saw}'(I, x)] \wedge \forall q \in \text{ALT}[[\neg \exists x \in \{a, b, c\}[\text{student}'(x) \\ \wedge \text{saw}'(I, x)] \not\Rightarrow q] \rightarrow \neg q]$$

Exhaustification doesn't return a sensible result in the absence of negation (as desired): each of the subdomain alternatives has to be negated (because they are not entailed), leading to contradiction:

(116) a. *I saw any student.

b. $\mathbf{O}_C[\text{I saw any}_{[+D]} \text{ student}] = \mathbf{O}_C[\exists x \in \{a, b, c\}[\text{student}'(x) \wedge \text{saw}'(I, x)]]$

c. $\text{ALT: } \{\exists x \in \{a, b\}[\text{student}'(x) \wedge \text{saw}'(I, x)], \exists x \in \{b, c\}[\text{student}'(x) \wedge \text{saw}'(I, x)], \\ \exists x \in \{a, c\}[\text{student}'(x) \wedge \text{saw}'(I, x)]\}$

d. $\exists x \in \{a, b, c\}[\text{student}'(x) \wedge \text{saw}'(I, x)] \wedge \forall p \in \text{ALT}[[\exists x \in \{a, b, c\}[\text{student}'(x) \\ \wedge \text{saw}'(I, x)] \not\Rightarrow p] \rightarrow \neg p]$

That I saw an element of the set $\{a, b, c\}$ does not entail that I saw an element of the set $\{a, b\}$, or of the set $\{b, c\}$, etc. Building upon Gajewski 2002, Chierchia proposes that the problem with this result is that it is trivial, specifically 'G-trivial' (as in 'Grammar-based L-trivial'), i.e. its semantic value is constant and doesn't depend on the choice of lexical items:

- (117) **G-triviality:** A sentence ϕ is G-trivial *iff* for any situation s and model M $\llbracket \phi' \rrbracket^{M,s} = \text{same}$ (where same is either True or False) and ϕ' is obtained from ϕ by an *arbitrary* substitution of its lexical terminal nodes.

G-trivial statements are ungrammatical, for example exceptive constructions with *some* (following von Stechow's (1993) analysis):

- (118) a. *Some student but John smokes. (G-trivial)
 b. John smokes and doesn't smoke. (not G-trivial)

Under this view, the ungrammaticality of non-licensed NPIs is not rooted in syntactic ill-formedness, but in semantic deviance.

To summarize, the NPI behavior of *any* is a by-product of a requirement that the alternatives activated by this indefinite be exhaustified. The focal alternatives of *any* are always active, hence the need to exhaustify them, using a covert formative. The output of this exhaustification is G-trivial unless it occurs when *any* is in a downward-entailing environment, for example in the scope of negation. In this system, there is simply no 'licensing condition' of *any*. Negative polarity is not a primitive: it derives from a non polarity related requirement, namely, the requirement to 'use up' active alternatives.

3.2.2 Intervention effects

Having exhaustification done by a silent formative in the syntax allows Chierchia to address the challenge of Linebarger's intervention effects (§1.3). The crucial ingredient (a common trait to a series of articles and books, i.e. Chierchia 2004, 2006, 2013) is that Linebarger's interveners (*and, every, necessarily, always, because...*) are strong scalar terms, which trigger an indirect scalar implicature in a DE environment.²³

- (119) a. John didn't play the guitar and drink coffee.
 b. *Indirect scalar implicature:* John either played the guitar or drank coffee.
 (120) a. John didn't see every student.
 b. *Indirect scalar implicature:* John saw some student.

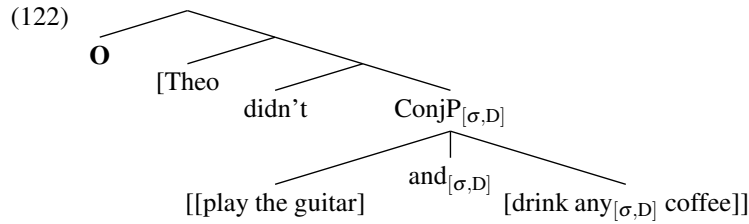
Because the indirect implicature gets factored into meaning, the subsequent exhaustification of the domain alternatives occurs in a non DE environment, leading to contradiction.²⁴ I illustrate the intervention mechanism with an example where the intervener is a conjunction:

- (121) *Theo didn't play the guitar and drink any coffee. [Chierchia 2013, p. 381]

Observe this tree:

²³On intervention effects, see also Chapter 69 of this *Companion*.

²⁴For some interveners, the case that they are scalar items is more complicated than for others, for example for *because*, which Chierchia analyzes essentially as conjunction.



The exhaustifier sits at the top of the tree and it enters in an agreement relation with its target. *Any* carries two features, D and σ , rather than one; so does *and* (the scalar item that intervenes). These features are a domain feature and a scalar feature. **O** thus does two exhaustifications, which are ordered in a sequence: first the exhaustification of scalar alternatives, then the exhaustification of domain alternatives (this order is crucial; recursive exhaustification is independently motivated, as it is used to derive Free Choice effects with disjunction in the grammatical approach to scalar implicatures, Fox 2007). The result of the first exhaustification is:

- (123) a. Abbreviations:
 First conjunct: p; Second conjunct: $\exists\{a,b\}$, assuming a domain with two coffees
 b. Set of scalar alternatives = $\{\neg(p \wedge \exists\{a,b\}), \neg(p \vee \exists\{a,b\})\}$
 c. Output of the first exhaustification = $\neg(p \wedge \exists\{a,b\}) \wedge (p \vee \exists\{a,b\})$

O operates on the output of this ‘pre-exhaustification’ (exhaustification with respect to the D-alternatives), and a contradiction is derived:

$$(124) \text{ Output of the second exhaustification} = \neg(p \wedge \exists\{a,b\}) \wedge (p \vee \exists\{a,b\}) \wedge p \wedge \exists\{a,b\} \\ = \perp$$

The intervention effect of *every* is thus explained. In this system, the agreement relation between the exhaustifier **O** and its target is important: because the scalar feature has prominence on the D feature, **O** cannot check the value D on its target without first checking σ , due to minimality (Rizzi 1990); if it was possible to exhaustify in the opposite order, no contradiction would arise. A number of interesting consequences follow: in particular, minimality can explain why *every* doesn’t cause an intervention effect if it is lower in the structure than *any* at LF.²⁵

3.3 Lahiri 1998

The kind of link that Chierchia describes between an NPI and a focus sensitive operator can be observed directly in some languages. Hindi-Urdu is one such language. In

²⁵Feature geometry is also invoked to explain why the direct scalar implicature triggered by *few* or *at most five* does not create an intervention effect:

- (i) Few students read anything.
 \rightsquigarrow Some students read something.

his influential article, *Focus and Negative Polarity in Hindi*, precursor of Chierchia’s theory, Lahiri shows how the limitations on the distribution of the NPI *ek bhii* result from a conflict between an implicature triggered by the particle *bhii* ‘even’ and the truth-conditional meaning of the sentence. After *only*, or rather its silent counterpart **O**, let’s see how *even* can be the determining factor of the distribution of an indefinite associated with it.

- (125) a. *ek bhii aadmii aayaa
 any man came
 Intended: ‘Some man came.’
 b. ek bhii aadmii nahī: aayaa
 any man not came
 ‘No man came.’

In *ek bhii*, *ek* is analyzed as a cardinality predicate, equivalent to *one*. Under association with *even*, focus alternatives are produced. And two implicatures obtain. First an additive inference, to the effect that an element of the set of alternative propositions, distinct from the proposition uttered itself, is true:

- (126) $\exists p: p \in \text{ALT} \wedge p(w) = T \wedge p \neq a$
 (with *a* the proposition asserted, *w* the world of evaluation, and ALT the set of focus induced alternatives to *a*)

A second inference ranks the proposition uttered as the least likely among the alternatives:

- (127) $\forall p[[p \in \text{ALT} \wedge p \neq a] \rightarrow \text{likelihood}(p) > \text{likelihood}(a)]$ [from Krifka 1995]

The focus alternatives to the predicate *one* are other cardinality predicates (*two*, *three*, etc.), all stronger than *one*, which is the weakest of all, being true of anything that exists. The alternatives expand in the usual manner, by pointwise functional application. And then an operation takes place on the resulting alternative propositions; this operation is akin to an exhaustification. When the assertion is (125a), (127) demands that the likelihood that one person came is less than the likelihood that *n* people came, for any *n* different (hence greater than) one. But this is incoherent, leading to oddity (for Lahiri then, who does not appeal to G-triviality, (125a) is semantically deviant rather than ungrammatical). In a DE context however, we do not derive a contradiction (125b). First, observe the LF Lahiri postulates:

- (128) [bhii 1 [nahī: [koi_F t₁] 2 [t₂ aayaa]]]

The particle has moved past negation at LF, in accordance with the scope theory of *even* (Karttunen and Peters 1979, Wilkinson 1996). This time then, and because of this particular structure, we rank the proposition that no one came as less likely than any of its alternatives (that less than two people came, that less than three people came...). This is perfectly coherent: the prejacent of *even* entails all its alternatives and it is thus less likely than them. Note that Lahiri’s account also derives, in a unified manner, the interpretation of *ek bhii* as a Free Choice item in generic contexts.

There are thus two ways of exhaustifying the alternatives activated by an indefinite, with **O** or with an overt equivalent of *even* in Hindi. Chierchia claims that the *even* way is also at play in English, with a covert counterpart of *even* **E**, in the case of minimizers like *lift a finger*. These are known to have an *even* flavor, and they trigger a negative bias in questions, also observed with overt *even*:

(129) Did John lift a finger to help her?

Proposals such as Chierchia's and Lahiri's provide a justification for DEness in licensing, which is the main tenet of the Ladusaw approach. Polarity sensitivity is contingent on a semantic operation involving an indefinite, but the indefinite is not intrinsically 'polarized'.

3.4 Downward-entailingness not necessary after all?

But if NPIs don't have an intrinsic 'need' for DEness, the next step might be to question the importance of DEness itself. Maybe the semantic operation that targets NPI indefinites can sometimes happen coherently outside of downward-entailing environments? Crnič (2014) argues that this indeed the case. He observes the following contrasts:²⁶

- (130) a. Exactly two congressmen read the constitution even ONCE.
 b. #Exactly four hundred congressmen read the constitution even ONCE.
- (131) a. Exactly three students said anything in my seminar.
 b. #Exactly ten of my twelve students said anything in my seminar.

(130) features weak *even* (*even* associated with a weak indefinite) which in upward-monotonic contexts is infelicitous:

(132) #John read the book even ONCE.

The likelihood implicature (or, in Crnič's own terms, the scalar presupposition) of (132) is that John reading the book once is less likely than John reading the book n times, for all $n > 1$. This is incoherent: logically stronger propositions are at most as likely as the logically weaker ones (by virtue of a 'principle of coherence'). But in a sentence with a non-monotonic quantifier such as *exactly two congressmen*, and assuming that *even* can move past this quantifier at LF and strand its associate (133), an interesting result obtains.

(133) [even [exactly two congressmen [read the constitution once_F]]]

Because of non-monotonicity induced by the subject DP, the alternatives (that exactly two congressmen read the constitution once, that exactly two congressmen read the

²⁶An anonymous reviewer points out that other NPIs, e.g. minimizers, are not licensed by non-monotonic quantifiers:

- (i) *Exactly two students said a word.
 Bad under the 'minimizer' reading of *a word*.

constitution twice, etc.) are logically independent: consequently none entails the preja-cent. Moreover, the scalar presupposition is plausibly satisfiable: in contexts compat-ible with our shared assumptions, that exactly two congressmen read the constitution once is indeed less likely than that exactly two congressmen read the constitution twice. Intuitive likelihood judgements change when cardinalities change: Crnič demonstrates how, and thus derives the oddness of (130b).

Coming back to NPIs (131), the contrast (already discussed by Linebarger (1987), Rothschild (2006)) has the same origin, for the simple reason that *any* is associated with a covert *even* (rather than **O** as in Chierchia 2013), assuming that alternatives to *any* are number indefinites (one, two, three, etc.). There are thus non DE environments where *any* is acceptable, and this fact can be derived in a principled manner, based on independent evidence.

Conclusion and outlook

Major headway has been made in the study of NPIs over the past three decades. We now have a better grasp of the potential sources of polarity sensitivity. It is no longer conceived of as a primitive, and plausible explanations are offered that derive it from principles and mechanisms known to play a role elsewhere in grammar. As long as negative polarity was seen as a primitive, there was little reason to doubt that it was a unified phenomenon. But now that the polarity sensitivity of indefinites is better understood, the question of the diversity of NPIs, intra- and crosslinguistically, becomes increasingly interesting. What is common between an NPI indefinite and NPIs from other semantic classes, e.g. phasal adverbs like *yet*? Certainly not a lexical quirk, but then what? In what sense is it the same phenomenon at all? And how is it related to neighboring polarity related phenomena, such as scalar implicatures, epistemic indefinites, free choice items, positive polarity items, neg-words...?

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