

Polarity

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Summary

This paper provides an overview of polarity phenomena in human languages. We discuss prominent paradigms such as *negative polarity*, *positive polarity*, and *free choice items*, and address core questions about their licensing, distribution and interpretation. We offer a characterization of polarity contexts as *nonveridical*, and single out negative contexts as a subset thereof. Within negative contexts, we making a distinction between *classically negative* and *minimally negative* contexts— which are downward entailing but not anti-additive or anti-morphic. We discuss, further, the differing distributions of negative polarity items and free choice items, and address their semantic properties. Overall, we identify two possible lexical sources of polarity sensitivity: (a) the presence of a *dependent variable*, and what type of dependent variable (type *e*, individual, or type *i*, world variable); and (b) whether the polarity item is *scalar* or not. Negative polarity items and free choice items, including *any* can be scalar, but not all NPIs are scalar. Finally, we discuss the issue of *exhaustivity* and conclude that it does not characterize *all* NPIs.

Keywords

Negative polarity items, negation, nonveridicality, minimal negation, free choice items, positive polarity, scalarity, dependent variable, exhaustivity, referential vagueness

1 The landscape of polarity items: negative polarity, positive polarity, free choice

Polarity is a pervasive phenomenon in natural language, and has received considerable attention since Klima's (1964) seminal work on English negation. The polarity sensitive item, or 'polarity item' (PI) for short, is an expression that it requires negation when it appears. The following is a classic contrast:

- (1) Nicholas didn't say anything.
- (2) *Nicholas said anything.
- (3) Nicholas hasn't ever talked to Ariadne.
- (4) *Nicholas has ever talked to Ariadne.

PIs exhibit *limited distribution*: the grammatical sentences with *anything*, *ever* contain negation; the ungrammatical sentences (indicated by *) lack negation. *Anything* and *ever* are labeled 'negative polarity items' (NPIs) because they need negation in order to be grammatical.

Polarity, then, illustrates a semantically driven grammatical constraint, and appears to be a universal of natural language. PIs are found in virtually every human language we consider, but artificial languages appear to lack PIs. From a purely logical perspective, polarity is an anomaly: why couldn't *Nicholas said anything* be used to convey *Nicholas said something* or *Nicholas said everything*? Why **Nicholas has ever talked to Ariadne* can't be used to say *Nicholas has once (or: always) talked to Ariadne*? PIs, logically superfluous or redundant, are abundant in the world's languages, and have featured quite prominently in linguistic theory.

In earlier works (Klima 1964, Fauconnier 1975, Horn 1972, Baker 1970, Ladusaw 1980, Linebarger 1980), the focus was on English NPIs; crosslinguistic studies in the 80s and 90s extended the empirical domain of polarity, and revealed a complexity that in the earlier works went unnoticed. Influential works were Giannakidou (1994, 1995, 1997, 1998, 1999, 2001) on Greek NPIs and free choice items; Zwarts (1981, 1986, 1995), Hoeksema 1994, 1999, on Dutch NPIs; Lin (1996) on Mandarin NPIs, Lahiri (1998) on Hindi NPIs. Haspelmath 1997 presented a study of indefinites in forty languages revealing the rich landscape of indefinites, including NPIs.

Below I give examples from Greek and Dutch—which will be, along with English, our main languages of illustration:

- (5) a. Dhen idhe *kanenan* o Janis. Greek
 not saw anybody the John
 John didn't see anybody.
 b. * Idhe *kanenan* o Janis.
- (6) a. Niemand heeft *ook maar iets* gezien. Dutch
 nobody has *even* something seen
 Nobody saw anything.
 b. *Jan heeft ook maar iets gezien.

Ook maar iets, and *tipota* are the Dutch and Greek NPI equivalents of *any* respectively. *Ook maar iets* contains *even* (though the *even* component often doesn't get interpreted literally, as shown in Giannakidou and Yoon 2016). Giannakidou 1997 talks about the *landscape* of polarity items, to emphasize the breadth and variation involved in polarity. Our discussion will reveal some crucial aspects of this variation.

NPIs are sensitive to the presence of negation, and this means that they need negation to be *licensed* (Ladusaw 1980, Giannakidou 1997). Licensing is two things: (a) the requirement itself that there be a negation (the licenser) in the sentence; and (b) an additional requirement that the NPI *be in the scope* of negation, which translates syntactically into a need for the NPI to be c-commanded (Reinhart 1976) by negation:

- (7) a. Bill didn't see any student.
 b. *Any student didn't see Bill .
- (8) a. $\neg \exists x$. student (x) \wedge see (Bill, x)
 b. $\exists x$. student (x) \wedge \neg see (Bill, x)

Any student can only be interpreted in the logical scope of negation (8a)— the scoping in (8b), where there is one person such that Bill didn't see (but others that he possibly saw), is impossible. Furthermore, appearance of the NPI to the left of negation is generally prohibited

(7b). Hence, we observe a mapping between the narrow scope condition and the syntactic requirement of c-command (see Giannakidou 1997, 1998 for extensive discussion; also Uribe-Etxebarria (1994), De Swart (2000) for empirical violations of the c-command condition still in line with narrow scope). In the example below, we see more effects of c-command:

- (9) a * The sister of no student said anything.
 b No student said anything.

No student licenses *any* in (9b) but not in (9a) despite its linear precedence because it does not c-command the NPI. NPIs manifest a dependency in both semantics and syntax, and thus present a prime case for studying the interaction between these two levels of grammatical representation.

In the early literature, NPIs were thought to be duals of *positive polarity* items (PPIs). PPIs are ‘repelled’ by negation and tend to escape its scope. PPIs were first identified as a class in Baker (1970), and are discussed more recently in Szabolcsi (2004), Nilsen (2003), Ernst (2009), and Giannakidou (2011). Expressions like *some*, *already*, *would rather*, and speaker oriented adverbs such as *unfortunately* have been identified as PPIs:

- (10) a. Bill didn’t buy some books.
 b. $\exists x$. book (x) \wedge \neg bought (b, x)
- (11) a. Bill would rather be in Montpellier.
 b. # Bill wouldn’t rather be in Montpellier.
- (12) a. John is here already.
 b. #John isn’t here already.
- (13) a. John unfortunately died.
 b. # John didn’t unfortunately die.

As shown, *some books* exhibits the scope outside negation that *any* lacks, and only that. *Would rather* and *already* are also odd with negation, and likewise *unfortunately*, an evaluative adverb. Metalinguistic denial (Horn 2001), however, can rectify PPIs (see Ernst 2009 for discussion): *John isn’t here ALREADY, we are still waiting for him*; hence ‘#’ reflects that the PPI is not ungrammatical, but infelicitous in the scope of negation. PPIs exhibit *limited interpretation*,

whereas NPIs have limited both interpretation *and* distribution (Giannakidou 2002). A failed NPI is ungrammatical, but a failed PPI is only infelicitous. The intended duality between NPIs and PPIs is therefore not an exact parallel, i.e. involving the same grammatical mechanism, but a handy metaphor to express the duality of relation with respect to negation: the NPI is *attracted* to negation, but the PPI *avoids* it and needs to scope above. Krifka 1995 offers a Gricean explanation stating that since under the scope of negation the specific form NPI is necessitated, using another form creates the implicature that the alternative scope is intended.

Recently, the NPI-PPI metaphor has been extended to characterize the way modal verbs interact with negation:

- (14) a Ariadne must not eat eggs. (MUST > NOT: Ariadne has an allergy)
 b Ariadne need not eat eggs (NOT > MUST: Ariadne may eat eggs if she wants to).

Iatridou and Zeijlstra 2013 characterize *must* as a PPI and *need* an NPI; German and Dutch also have NPI *need*-equivalent modals—*brauchen* (German) and *hoeven* (Dutch; van der Wouden 1994). The discussion of the polarity of modal verbs relates, crucially, to the quantificational force of the modal: the PPI modals are generally universal (*must*, *will*, and their equivalents; see Giannakidou and Mari 2016 for capitalizing on this fact). A Gricean explanation could also be given in view of the fact if the NPI-modal is not used, the hearer is forced to conclude that the alternative wide scope of the modal is intended.

The contrasting behavior of NPIs and PPIs prompted analyses of PPIs as *anti-licensed* by negation (Ladusaw 1980, Progovac 1994, Giannakidou 1997, 1998, Postal 2000,). Giannakidou (1997) formulates the contrast in the following way:

- (15) *Licensing and anti-licensing* (Giannakidou 1997)
 a. R (β , α) (Licensing)
 b. #R (β , α) (Anti-licensing)
 where R is the scope relation; α is the polarity item; β is negation

As indicated, licensing requires that α be in the scope of β , and #R is the opposite condition that α avoid the scope of β , or *anti-scope*. β is for now negation, but we will see next that the

set of licensers exceeds negation. The anti-scope condition is merely an indicator about where the PPI *cannot* occur, i.e. inside the scope of negation. It predicts that outside negation the PPI should be fine, and this results in a broad distribution of PPIs, sharing the same non-negative environments as NPIs.

Sensitivity to polarity, finally, goes *beyond* the polar opposition. There is a class of PIs known as *free choice items* (FCIs), which require typically modal and quantificational licensers, and which are blocked in the scope of negation if such a licenser is lacking, as is the case with simple past sentences, where reference is made to a single event. Giannakidou's 1997 calls this the *anti-episodicity* constraint. Below, examples with Greek (Giannakidou 1997, 1998, 2001), Spanish, and Catalan NPIs (Quer 1998, 1999) are given to illustrate the constraint:

- (16) a. *Idha *opjondhipote.* (Greek)
 saw.perf.1sg FCI-person
 *I saw anybody.
- b. *Dhen idha *opjondhipote.*
 not saw.perf.1sg FC-person
 Intended: I didn't see anybody.
- (17) * Expulsaron/Non expulsaron del partido a *cualquier* disidente.
 Expelled.3pl/ not expelled.3pl from-the party ACC FCI dissident
- (18) *Opjosdhipote* fititis bori na lisi afto to provlima. (Greek)
 Any student can solve this problem. (English)
- (19) *Opjadhipote* ghata kinigai pondikia. (Greek)
 Any cat hunts mice.

The ungrammatical sentences are episodic due to simple past tense. In Greek, Spanish, and Catalan, FCIs are distinct lexically from NPIs (for more on Greek FCIs see Vlachou 2007, Lazaridou-Chatzigoga 2009). FCIs tend to combine a *wh*-component with 'free choice' marking, which may contain focus particles (Greek *dhipote*, Dutch *ook maar*), volitional items (*vol*, *quiera* in Spanish, Catalan), or disjunction (Korean *na*).

- (20) a. Greek
 o-pjos-dhipote, lit. DEF-who-FC marker

- b. Catalan
qual-sevol, lit. wh-FC marker
- c. Spanish
cual-quiera, lit. wh-FC marker
- d. Dutch
wie dan ook, lit. who-then-too
- e. Korean
nwukwu-na, lit. who-or; *amwu-na* indefinite-or

Some FCIs can be *wh-indeterminates*, i.e. they can be wh-expressions, as in Korean above, that receive free choice but also interrogative and NPI use when combined with different particles. Another well known case is Mandarin *shenme*:

- (21) a. Yuehan zuotian mei-you mai shenme shu
 Yuehan yesterday not-have buy NPI book
 ‘Yuehan didn’t buy any books yesterday.’
- b. *Yuehan zuotian mai-le shenme shu.
 Yuehan yesterday buy-PERF NPI book
- (22) Yuehan zuotian mai-le shenme shu (ne)?
 John yesterday buy-PERF what book Q
 ‘What kind of books did John buy yesterday?’

East Asian languages are particularly keen on using wh-indeterminates for question words, NPIs and FCIs, prompting analyses based on interrogative semantics (Kratzer and Shimoyama 2002; see Giannakidou and Cheng 2006, Cheng and Giannakidou 2013 for criticism). FCIs, in European languages at least, do *not* have NPI or interrogative use (Giannakidou and Quer 2013):

- (23) a. *Idhes opjondhipote? Greek
 b. *Vas veure qualsevol? Catalan
 c. *Viste a cualquiera? Spanish

Did you see anybody?

FCIs are not just unusable as question words, they are simply bad in questions. Moreover, in Greek, the FCI *wh*-word must contain the definiteness marker *o* (homophonous to the definite article in Greek). The bare *wh*-word does not serve as the source for free choice as the contrast below shows:

- (24) [*o-pjos*]-*dhipote*; [*o-ti*]-*dhipote* (Greek)
 the-who.FCmarker the-what.FCmarker
- (25) **pjos-dhipote*, **ti-dhipote*

These asymmetries challenge the derivation of FCIs from question meaning, or at least challenge its generalizability beyond the *wh*-indeterminate class. In any case, it is clear that NPIs, FCIs, and *any* belong to the same landscape; and with *any*, free choice and NPI are collapsed into the same form which is morphologically unmarked for either.

FCIs express what Vendler (1967) called *freedom of choice*, a reading akin to “it doesn’t matter who” seen in the typical examples in (18, 19). Unlike NPIs, however, FCIs are not attracted to negation but to modal, generic and similar contexts. It is important to note that NPIs *also* appear in these contexts, as can be seen below:

- (26) Context: What should Ariadne do to pass the time?
 A: I Ariadne bori na diavasi *kanena vivlio*. (Greek)
 the Ariadne can subj. read.3sg NPI book
 Ariadne can read a book (some book or other/#any book whatsoever).

The NPI *kanena vivlio* gets interpreted with a similar ‘choice’ flavor, i.e. it doesn’t matter which book Ariadne reads. But unlike *any*, the choice is weaker, akin to *some or other*. This reading differs from the FCI reading *Ariadne can read any book*, which is a permission to read any book *whatsoever*, infelicitous as an answer to the question above. NPIs and FCIs thus share environments while having distinct semantics. We will elaborate on this point in section 6.

Overall, NPIs and FCIs raise the question of well-formedness that is determined by both syntax and semantics. The intuition is that sentences with failed NPIs, e.g., **Bill brought any presents*, **Bill talked to John either*, are not generated by the grammar. This distinguishes them from mere lexical mismatches or contradictions which are anomalous or infelicitous, but nevertheless grammatical sentences:

- (27) a. # Colorless green ideas sleep furiously.
b. # Jason has a population of 3 million.
c # Ariadne is tall and she is not tall.

The sentences are anomalous although we can somehow figure out what they would mean to be felicitous, e.g. *If Jason were a city, then it would have the population of 3 million*. And even with the contradiction, which is a fine sentence, a hearer will try to make something out of it, e.g. *tall* in one sense but *not tall* in another. Ill-formed NPIs and FCIs, however, are not generated by the grammar (see Ladusaw 1980, Giannakidou 1997, 1998, Giannakidou and Quer 2013). Since Chomsky (1957, 1964), the field has accepted that speakers' reactions to, and intuitions about, "odd" and "ungrammatical" sentences differ, and negative polarity, in all accounts that I know, is a *grammatical* constraint. Processing evidence reveals patterns suggestive of syntactic-semantic integration (Saddy et al. 2004, Drenhaus et al 2006, Steinhauer et al. 2010, Xiang et al. 2013). Remember, at the same time, that with PPIs we are not dealing with grammatical constraints, and experimental results could shed additional light to this difference between NPIs and PPIs.

The early literature postulated polarity conditions as global, composition external filters on sentences or grammatical representations like e.g. binding theory. Ladusaw 1983 talks about *semantic filtering*: a syntactically well-formed structure with *any* is filtered out semantically. But what in the lexical entry of *any* necessitates that it be subject to semantic filtering? In current theorizing, the idea of global semantic filtering is unsatisfactory because it is stipulative; we want to derive the limited distribution from the lexical make-up of the NPI or FCI. Early pioneers in this direction were Kadmon and Landman 1993, Israel 1996, Giannakidou 1977, 1998, Tovenia 1996, Krifka 1995, and Lahiri 1998. Giannakidou posits *sensitivity features* on NPIs and FCIs, i.e. morphological features such as the FCI marking noted earlier, intonational

features e.g. in the Greek *emphatic* NPIs, or abstract morphological features like Chierchia's $+\sigma$ feature, or [neg] in J. Lin (2015), and J. Ling et al. (2015).

With these in mind, we proceed now to discuss core issues in polarity literature. My goal is not to give a historical survey—the reader can consult the *Oxford Bibliography* for that, and the references indicated in the *Further readings* section of this article. Our focus is rather on current research. In section 2 we present the distribution of NPIs in contexts beyond negation. In section 3, the relation we study nonveridicality and negation, the two major licensors of NPIs and FCIs. In section 4, we ask the question of what makes a polarity item sensitive, and discuss *scalar* NPIs. In section 5, we discuss NPIs and FCIs containing *dependent variables*. In section 6, we address the issue of *exhaustification* and distinguish it from *referential vagueness* which is shown to characterize an important number of NPIs.

2. Polarity items: what licenses them besides negation?

NPIs belong to various syntactic categories: we have nominal *any*, *any boy*, as we saw, but there are also NPI adverbs and adverbials (*ever*, Dutch *ooit*; Hoeksema 1999; see (28, 29)), verbs (*hoeven*, *brauchen* (31)), modal infinitives in a Pontic dialect of Greek (Sitaridou 2014), focus particles (Greek *oute* (32), Giannakidou 2007, English *either* (30)), even negation itself (Greek *me*, Chatzopoulou 2012). We also have *minimizers*, NPIs denoting minimal amount making idiom-like statements:

- (28) a. Bill isn't here yet.
b. *Bill is here yet.
- (29) a. I haven't seen Bill in years.
b. * I saw Bill in years.
- (30) a. Bill doesn't like pasta either.
b. * Bill likes pasta either.
- (31) a. Je hoeft niet te komen. (Dutch)
you need not to come
You need not come.

- b. * Je hoeft te komen.
- (32) a. Dhen theli na dhi *oute* to idhio tou to pedi. (Greek)
 not want_{3sg} to see._{3sg} even.NPI the self his the child
 He doesn't want to see even his own child.
- b. *Theli na dhi **oute** to idhio tou to pedi.
 #He wants to see even his own child.
- (33) a. Bill didn't lift *a finger* to help me.
 b. She didn't say *a word* all night.

Thus, 'NPI' is a descriptive label saying that a linguistic expression needs the presence of negation. But NPIs appear also without negation in questions:

- (34) a. Heb je ook maar iets gezien? (Dutch)
 have._{2sg} you anything seen
 Did you see anything?
- b. Idhes {kanenan/tipota}? (Greek)
 saw._{2sg} anybody/anything
 Did you see {anybody/anything}?

What does negation and questions have in common? The answer is that they are both nonveridical (Giannakidou 1994, 1997, Zwarts 1995), but it took a few years for this discovery to come about; the first approaches focused on the role of negation, and could not handle NPIs in questions. *Any* in modal and generic contexts was dismissed as an FCI, and at that time irrelevant for negative polarity (Ladusaw 1980).

2.1 Negation, downward entailment

Negation emerges as the crucial licenser in Baker 1970, Fauconnier 1975, and Linebarger (1980, 1987, 1991). If there is no negation in the sentence, as in e.g. with *only*, emotive verbs, and *long after*, negation is implicated:

- (35) a Only Ariadne said anything.
 b Ariadne regrets that she said anything (at all).
 c Ariadne kept trying long after she had any chance of succeeding.

Only Ariadne said anything says both that Ariadne said something, and that nobody other than Ariadne did. Likewise, *Ariadne regrets that she said anything* triggers an inference that *Ariadne wishes she had not said anything*. Questions with *any*, it must be noted, do not trigger negative inference (Ladusaw 1980).

Ladusaw (1980) makes the discovery that *any* appears also with *few* and *every*, and proposed the following licensing condition:

- (36) a. Every [student who saw anything] contacted the police.
 b. {Few professors/*Many professors} invited any students.

(37) *Ladusaw's (1980) licensing condition*

An expression F licenses NPIs in its scope iff F is downward entailing.

Here is the definition of DE:

- (38) A function f is downward entailing iff for every X, Y : if $X \subseteq Y$, then $f(Y) \subseteq f(X)$

DE functions reverse the order of entailment, and support inference from sets to subsets, as in

(40). Order preserving inference, as in (39) is *upward* entailing:

- (39) Ariadne likes Syntax.

[[syntax]] \subseteq [[linguistics]]

\therefore Ariadne likes linguistics.

- (40) a Ariadne does not like linguistics.

[[syntax]] \subseteq [[linguistics]]

-
- ∴ Ariadne does not like syntax.
- b Few students like linguistics.
 $[[\text{syntax}]] \subseteq [[\text{linguistics}]]$
-
- ∴ Few students like syntax.
- (41) Every [student who likes linguistics] came to the party.
 $[[\text{student who likes syntax}]] \subseteq [[\text{student who likes linguistics}]]$
-
- ∴ Every student who likes syntax came to the party.

Few and the restriction of *every* validate DE—and Ladusaw’s idea initiated a fruitful research program (Hoeksema 1986; Zwarts 1986, 1996; van der Wouden 1994; Kas 1993; Dowty 1994; among many others), the most exciting part of which was that *monotonic* (upward or downward) inference is relevant for a grammatical phenomenon.

Zwarts (1996) further makes an important contribution by establishing a relation between DE and negativity. For Zwarts, DE is *minimal* negation, the threshold of negativity: it satisfies two of de Morgan relations as indicated in (42), and serves as the criterion for ‘being negative’. *Classical* negation, on the other hand, is DE plus a third law (*antiadditivity*), and *antimorphicity* which satisfies the full negation laws. This is the case with sentential negation, the strongest negation.

- | | |
|--------------------------|--|
| (42) Downward entailment | (a) $f(X \cup Y) \rightarrow f(X) \cap f(Y)$ |
| | (b) $f(X) \cup f(Y) \rightarrow f(X \cap Y)$ |
| Antiadditivity | (a) $f(X \cup Y) \leftrightarrow f(X) \cap f(Y)$ |
| | (c) $f(X) \cup f(Y) \rightarrow f(X \cap Y)$ |
| Antimorphicity | (a) $f(X \cup Y) \leftrightarrow f(X) \cap f(Y)$ |
| | (d) $f(X) \cup f(Y) \leftrightarrow f(X \cap Y)$ |

Few and the restriction of *every* satisfy only the DE relations, but *nobody*, and *not* are anti-additive and antimorphic respectively. Zwarts’s theory allows us to view negativity as a *continuum* or even a scale: the more laws an expression satisfies, the more negative it will be. The stringer the negation, the more *stereotypical* it is. NPIs can be likewise weaker or stronger depending on whether they are licensed by mere DE or stronger negation. *Any* is weak because it is licensed by *few/every*, but the Dutch *ook maar iets* appears strong—mere DE *weinig* ‘few’ does not suffice, it needs *niemand* ‘nobody’. The Greek NPI *kanenas* follows a similar pattern:

- (43) a. **Weinig*/ mensen hebben ook maar iets gezien. (Zwarts 1981)
 few people have.3pl anything seen
 Few people saw anything.
- b. *Niemand* heeft ook maar iets gezien.
 Nobody saw anything.
- (44) a. ?? *Liji anthropi idhan tipota.* (Greek; Giannakidou 1998)
 few people saw.3pl anything
 Few people saw anything.
- b. * *To poli 5 anthropi idhan tipota.*
 At most five people saw anything.

It appears, thus, that minimal negation alone is *not* a general licenser for all NPIs, unlike sentential negation (for more recent discussions see Hoeksema 2010, 2013).

2.2. Strong NPIs: negation dependent

Strong —or *strict* NPIs, as Giannakidou 1998, 2000 calls them—are NPIs that are narrowly licensed by classical negation (including *without* which is at least anti-additive; Giannakidou 1999). Such NPIs do not appear in questions or with DE quantifiers.

(i) NPI-EVEN

English contains one word *even*, but Rooth 1985 hypothesized that there is an NPI-*even* with negation. NPI *even* is found in many languages: e.g., Spanish *nisiquiera* (Herburger 2003),

German (*einmal*; Zwarts 2005), Korean *to* (J. H. Lee 2010, Giannakidou and Yoon 2016), and Greek (*oute*; Giannakidou 2007). I give below examples from Greek illustrating that NPI EVEN is not licensed by DE:

- (45) a. Dhen theli na dhi *oute* to idhio tou to pedi.
 not want_{3sg} subj see._{3sg} even.NPI the self his the child
 He doesn't want to see even his own child.
- b. ...xoris na theli na dhi to idhio tou to pedhi.
 Without wanting to see even his own child
- (46) a. * Liji fitites kalesan *oute* enan kathijiti.
 #Few students invited even one professor.
- b. * Idhe *oute* to idio tou to pedi?
 Did he see even his own child?

This constraint is largely shared by the other NPI-*evens* mentioned above.

(ii) *Minimizers in Greek, Japanese and Korean*

Minimizers in Greek, Japanese and Korean also show very narrow distribution (in contrast to English minimizers), and may contain NPI-EVEN. (For Japanese data, see Yoshimura 2007; Korean Giannakidou and Yoon 2014, C. Lee 1997, 1999).

- (47) *Dhen dhino dhekara jia to ti th' apojinis.*
 not give._{1sg} damn about the what will happen._{2sg}
 I don't give a damn about what will happen to you!
- (48) Kathotan eki *xoris na lei leksi!*
 He just stood there without saying a word.
- (49) *Dhinis dhekara ja to ti tha apojino?
 Do you give a dam about what will happen to me?
- (50) *Liji anthropi dhinoun dhekara.
 Few people give a damn.

- (51) Ku-nun pamsay *hanmati-to* ha-ci an-ess-ta.
 he-Top all night a word-NPI-even say-Comp Neg-Pst-Decl
 He didn't say a word all night.
- (52) * ku-nun pamsay hanmati-to ha-ess-ni?
 he-Top all night a word-NPI-even say-Pst-Q
 Did he say a word all night?

Minimizers involve focus and minimal amount expressions (Giannakidou 1997, 1998; Israel 2011), hence the use of EVEN is not unexpected. Albanian further employs EVEN with its strong NPIs (Xherija 2014), a strategy in common with other languages.

(iii) *N-words in strict negative concord*

The class of *n-words* (Laka 1990, Giannakidou 2006) cannot appear without negation. N-words appear in *negative concord*, while also serving as negative fragment answers:

- (53) a *(Non) ho visto nessuno. Italian (Zanuttini 1991)
 He didn't see anybody.
- b * Ho visto nessuno?
 Did he see anybody?
- (54) Q: Who did he see?
 A: Nessuno. 'Nobody'.

Negative concord is the phenomenon of apparent multiple negative exponents that are interpreted as one semantic negation (53). N-words can be marked with *n-* or intonation (Greek *n-words*, Giannakidou 1997, Chatzikonstantinou 2016). In addition, *n-words* require negation to be in the same clause, unlike *any* which is not as restrictive (see Zanuttini 1991, Haegeman 1995; Giannakidou 2006, Giannakidou and Zeijstra 2016, for overviews of the data):

- (55) *Gianni non ho detto que Maria ho visto nessuno.
 John not has said that Mari has seen n-person
 John did not say that Maria saw anybody.

To sum up, there are weaker NPIs (*any, kanenas, ook maar iets*) with broader distribution in mere DE (*few, every*) contexts, questions and modal contexts; and stronger NPIs requiring classical negation. Let us now see more non-negative environments where weak NPIs appear.

2.3 NPIs and FCIs in modal contexts and non-assertions

NPIs appear in imperatives, with modal verbs, subjunctive complements of propositional attitudes, habituals, *if*-clauses, and disjunctions (Giannakidou 1994, 1995, 1998, 1999, 2006). I illustrate with Greek and English *any* in order to keep things simple, but similar observations are reported for NPIs in Salish (Matthewson 1998), Chinese (Lin 1996, Giannakidou and Cheng 2013, J. Lin et al. 2015), Navajo (Fernald & Perkins 2006), Russian (Haspelmath 1997; Pereltsvaig 2000), Ossetic (Haspelmath 1997), Hindi NPIs (Lahiri 1998), Korean NPIs (Lee 1999, Giannakidou and Yoon 2014, 2016), Albanian (Xherija 2014), Benghali (Ullah 2016), and other languages. In these contexts FCIs can also appear. In English we have *any*.

- (56) a. Patise {kanena/opjodhipote} pliktro.
 press.imperative any.NPI/any.FCI key
 Press {some key or other/any} key.
- b. O Janis bori na milisi me {kanenan/opjondipote}.
 the John may subj talk.3sg with anybodyNPI/FCI
 John may talk to {some person or other/anybody}.
- c. O Janis ine prothimos na milisi me {kanenan/opjondipote}
 the John is willing subj talk.3sg with anybodyNPI/FCI
 John is willing to talk to {some person or other/anybody}.

NPIs and FCIs are distinct semantically in these contexts, a point further discussed in section 6. Modal environments are not negative or order reversing, yet they license NPIs and FCIs.

2.4 NPIs and FCIs in conditionals

Here we find again both NPIs and FCIs:

- (57) An kimithis me {kanenan/opjondhipote} tha se skotoso.
 if sleep.2sg with anyperson.NPI/FCI FUT you kill.1sg
 ‘If you sleep with {some guy or other/anybody}, I’ll kill you.’

If-clauses are not monotonic, as pointed out by Heim (1984): *If you go to Spain you will have a good time*, does not entail that *If you go to Spain and have an accident you will have a good time*. Von Stechow (1999) proposes the notion of *Strawson-DE*, as a way to produce DE inference by strengthening the meaning, but Giannakidou (2006) shows that if we do this we overgeneralize empirically. Strengthening and Strawson-DE also don’t help with NPIs in questions, with modals, generics and imperatives seen earlier, since these are not Strawson-DE.

2.5 NPIs and FCIs in habituals

Giannakidou 1995, 1997 noted that Greek NPIs and FCIs appear in habitual sentences with Q-adverbs of varying force (*usually, rarely, sometimes, never*). Again, we find both NPIs and FCIs:

- (58) I Eleni dhiavaze sinithos {kanena/opjodhipote} periodhiko (otan variotane).
 the Ellen read.imperf.3sg usually NPI/ FCI magazine
 Ellen used to read {some magazine or other/any} magazine when she was bored.

Similar data have been reported for Dutch, Mandarin, and the other languages mentioned earlier.

2.6 Disjunctions

NPIs and FCIs occur in disjunctions (Giannakidou 1998):

- (59) a. I bike mesa {kanenas/opjosdhipote} i afisame to fos anameno.
 either entered.3sg NPI /FCI.person OR left.1pl the light on
 Either {somebody/anybody} came in, *or* we left the light on.
 b. *Bike mesa {kanenas/opjosdhipote} ke afisame to fos anameno.
 * {Somebody/anybody} came in *and* we left the light on.

Disjunctions is nonveridical, but conjunction is veridical (it requires that both conjuncts be true; Zwarts 1995). Disjunction is an uncertainty operator, on a par with questions and modals.

2.7 Summary: overall distribution of NPIs and FCIs

I summarize here the distributions of the four major polarity item types we discussed: Greek-style weak NPIs, strong NPIs, FCIs and *any*.

Table 1 Distributions of weak NPIs (any, Greek NPIs), strong NPIs and FCIs

<i>Environments</i>	<i>Strong NPIs</i>	<i>Greek kanenas</i> NPI	<i>any</i>	<i>FCI opjosdhipote</i>
1. Negation/ <i>without</i>	OK	OK	OK	*
2. Questions	*	OK	OK	*
3. Conditional (if-clause)	*	OK	OK	OK
4. Restriction of <i>every/all</i>	*	OK	OK	OK
5. Downward entailing Quantifier	*	??	OK	OK
6. Modal verbs	*	OK	OK	OK
7. Nonveridical verbs (e.g. <i>want</i>)	*	OK	OK	OK
8. Imperatives	*	OK	OK	OK
9. Habituals	*	OK	OK	OK
10. Disjunctions	*	OK	OK	OK
11. <i>prin/before</i> clauses	sometimes	OK	OK	OK
12. Future	*	OK	OK	OK
13. Affirmative past sentences	*	*	*	*
14. Affirmative existential	*	*	*	*

The last two rows are the positive contexts where all PIs are excluded; the rest are the polarity contexts. In bold are the contexts that are not predicted by negation. A comprehensive theory of polarity sensitivity must explain what the semantic property is that *all* polarity contexts share.

3 Polarity contexts are nonveridical

The formal property that all polarity contexts share is *nonveridicality*. Montague 1969 discusses veridicality relying on *existence* with reference to perception verbs such as *see*; Giannakidou,

Zwarts, and more recently Giannakidou and Mari 2016 define it in terms of truth entailment (Giannakidou 2013a,b, establishes a relation between existence, truth, and inquisitiveness; Bernardi 2001 generalizes veridicality to a variety of types). Nonveridicality allows us to unify non-negative with negative licensers, which are characterized as *anti-veridical*.

3.1. Non-veridicality, negation, and uncertainty

A veridical context is one that allows the speaker to infer the truth of a sentence; a non-veridical context is one where truth inference seems to be suspended. Consider the difference below between adverbs such as *yesterday/(un)fortunately*, which create veridical contexts, and modal adverbs which create nonveridical contexts.

- (60) {Yesterday/Unfortunately} Mary saw a snake \Rightarrow Mary saw a snake
 (61) {Possibly/Maybe/Probably}, Mary saw a snake $\not\Rightarrow$ Mary saw a snake

A veridical expression allows inferencing to the *actual* truth of the sentence: *yesterday* and *unfortunately* are thus veridical. *Unfortunately* is called sometimes *factive* because it appears to presuppose the truth of the embedded sentence, factivity can therefore be understood as veridicality. Modal elements, on the other hand, are nonveridical: under a modal adverb or verb, it is unclear whether *p* is true. From *Mary possibly/probably saw a snake*, it doesn't follow that she did or did not see a snake. A speaker uses *Modal p* if she is not (absolutely) certain that *p* true. For this reason, modal adverbs and verbs have been characterized in the literature as *weak* (Karttunen 1970, Kratzer 1991, Giannakidou 1997, 1999, Portner 2009).

By *context*, we mean minimally a sentence *S* that denotes a proposition *p* *embedded* under a sentential operator *F*, as above. In objective terms, (non)veridicality is about whether *Fp* entails or presupposes *p*. Zwarts 2005, Giannakidou 1997, 1998, 1999 define veridicality as follows:

- (62) Veridicality and Nonveridicality
 An expression *F* is veridical iff $Fp \Rightarrow p$; if this is not the case, *F* is nonveridical.
 \Rightarrow means 'entails' or 'presupposes'

Veridicality depends on what is or is not the case, but also on what the speaker knows or believes to be the case. In this case, veridicality is *relative*, or *subjective* (Giannakidou 1994, 1998, 1999, 2013; Giannakidou and Mari 2016). Subjective veridicality is needed for discuss propositional attitude verbs, predicates of personal taste, evidentials, and similar phenomena; but the role of the knowledge or belief in assessing truth is apparent even in unembedded sentences, e.g. Harris and Potts (2009) assert that *all sentences are perspectival*. Giannakidou, and Giannakidou and Mari define veridicality subjectively as follows:

(63) Subjective veridicality

An expression F that takes a proposition p as its argument is subjectively veridical with respect to an individual anchor i and an epistemic state $M(i)$ iff Fp entails that i knows or believes p (i.e. $\forall w' [w' \in M(i) \rightarrow p(w')]$).

(64) Subjective nonveridicality

A function F that takes a proposition p as its argument is subjectively nonveridical with respect to an individual anchor i an epistemic state $M(i)$ iff Fp does not entail that i knows or believes p . In this case $M(i)$ is partitioned into p and *not* p worlds.

In the subjective definitions, it becomes clear that veridicality refers to epistemic states that universally support p (knowledge, belief, but also private states such as imagination, dream, and the like); non-veridicality refers to non-homogenous *uncertainty* states that only partially support p , and which also allow *non-p* worlds. Modal bases of modals, disjunctions, subjunctives, and imperatives are such contexts, hence it is no surprise that they license NPIs and FCIs. Questions are also uncertainty spaces: *Did Ariadne talk to anybody?* presupposes an epistemic state of the speaker with worlds where Ariadne saw somebody, and worlds where she didn't. Nonveridicality gives us the good result of being able to account for a long standing problem, namely why questions are a core NPI environment.

How about negation? Negation does not validate the veridicality schema $Fp \Rightarrow p$, it is therefore nonveridical; at the same time, negation entails *not* p , i.e. it is *antiveridical*:

(65) *Antiveridicality*

An nonveridical expression F is antiveridical iff $Fp \Rightarrow \neg p$.

Antiveridicality is the reversal of veridicality, the strengthening of the uncertainty into *certainty* that *not p*. The epistemic state associated with it is not veridical, since *p* is not supported, but it is homogenous *not p*. Apart from negation and negative quantifiers, *without* and *before* also allow antiveridical inference, as in *John worked without having any break*, or *John died before he saw any of his grandchildren*. For the nonveridicality of *before* see Sanchez-Valencia et al. 1994, Giannakidou 1997, and Xherija 2016, who proposes that *before* contains disjunction.

Nonveridicality, therefore, appears to characterize the contexts where NPI and FCIs appear, as formulated in the thesis below. A pictorial depiction is also given:

(66) *Polarity sensitivity as Nonveridical dependency*
 NPIs and FCIs appear in nonveridical contexts.

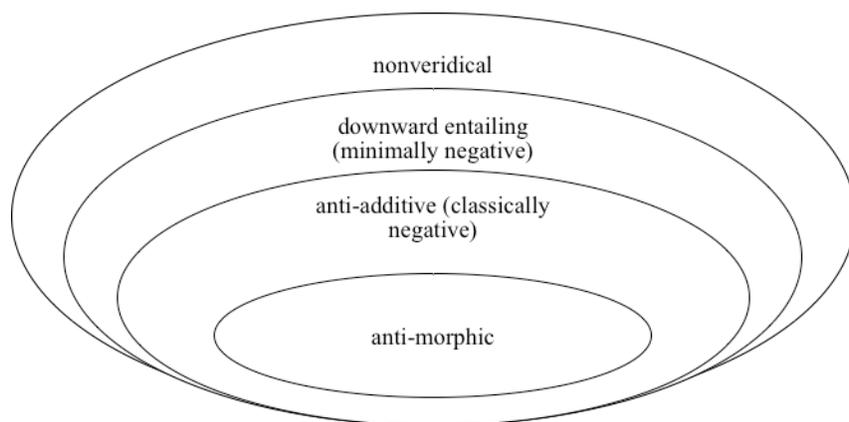


Figure 2: The Giannakidou/Zwarts Nonveridical Hierarchy of polarity contexts

As we see, nonveridicality is a conservative extension of negation, allowing a wider distribution of NPIs in non-negative contexts. For a proof that all DE environments are non-veridical see Zwarts (1995). Polarity sensitivity emerges empirically as a phenomenon that has to do not just with polar opposition, but also with truth undecidedness— and we can unify negative and non-negative licensers, something that was previously impossible. Nonveridicality also plays a decisive role in the selection of subjunctive mood and other non-assertive moods (see

Giannakidou 1995, 1998, 2009), it appears therefore to be a logical category with broader applications in grammar.

The veridicality judgment lies at the foundation of co-operative communication, as is revealed by the significance of Grice's maxim of *quality*. It is therefore not surprising that we find expressions in language (NPIs, FCIs) that are sensitive to it. Negative inference is also pretty basic: it is the ability to reverse the truth value (Horn 2001). Nonveridicality links logically uncertainty with negation, and in so doing, it unifies NPI-licensors as a natural class—a remarkable achievement that no other theory can do.

3.2. Veridicality conflict and secondary licensing of NPIs

Some NPIs, most notably *any* and English minimizers, appear in contexts that exhibit *veridicality conflict*. The data have been known since Baker and Linebarger, as mentioned earlier, and were treated in terms of implicit negation. I provide here some more examples:

- (67) She's still funny and cute and smart and I wish she gave a damn that we aren't friends anymore. I miss Candice. www.xanga.com/betweenIDs
- (68) a. I am glad he said a word!
b. I'm glad we got any tickets. (from Kadmon & Landman 1993)
c. Mary regrets that she lifted a finger.
d. Only Mary {gives a damn/said anything}.

English minimizers are *weak* NPIs, but have been referred to as *strong*.¹ The data with *only* and emotives are challenging, since emotives and *only* allow veridical inference, and are not DE (Atlas 1993, 1996; for recent overview see Beaver and Clark 2008):

¹ Minimizers (in all languages) trigger negative bias in questions (originally Borkin 1971). Negative bias is the expectation of a negative answer:

- (i) Do you give a damn about me?
Expected answer: No you don't.

The bias is typically attributed to an implicit *even* which can actually be overt= *Did he even say a word?*=and which is independent of the minimizer: *Is this even a real question?* See Giannakidou 2007 for more details.

- (69) a Only Bill left → Bill left.
 b Larry regrets that I bought a car → I bought a car
- (70) Larry regrets that I bought a car. -/→ Larry regrets that I bought a Honda.
 Because, in fact, I bought a Ferrari, and Larry might not regret this at all.

Von Fintel (1999) and Hoeksema (1986) weaken the DE inference to deal with the problem. If we know in the context that John ate spinach, then from *Only John ate a vegetable* (which presupposes that *John ate a vegetable*) we can infer that *Only John ate spinach*. Von Fintel calls this *Strawson-DE*. Giannakidou 2006 criticizes Strawson-DE as overpredicting NPIs, e.g., also in positive sentences: if I know that John ate spinach, then the assertion *John ate a vegetable* allows me to infer that *John ate spinach*. But this will not suffice to legitimize NPIs as **John ate any vegetables* remains ungrammatical.

Giannakidou also reminds us that Greek-style NPIs, weaker and stronger are blocked from *only* and emotives. The same holds for Spanish and Catalan:

- (71) a. *Xerome pou {dhinis dhekara/ipes tipota}.
 I am glad {you give a damn/you said anything}.
- b. *Mono i Maria {dhini dhekara/ipe tipota}.
 Only Mary {gives a damn/ said anything}.
- c. * I Maria metaniose pou kounise to daktilaki tis.
 Only literal interpretation: Mary regrets that she lifted her finger.
- (72) a. *María se arrepintió de haber movido (ni) un dedo.
 Mary regrets that she lifted a finger.
- b. *María se arrepintió de haber gastado (ni) un duro.
 María regrets having spent a red cent.

This crosslinguistic variation suggests that *only* and emotives are not typical licensers. Unlike the regular licensers, *only* and emotives combine a veridical (69) and a nonveridical component seen below, thus creating veridicality conflict.

- (73) a Only Bill said anything → Nobody other than Bill said anything.

- b Larry regrets that I bought a car → Larry wishes that I had not bought a car.

The negative clause is an entailment with *only*, and an implicature with emotives (Linebarger 1980, Giannakidou 2006). Giannakidou argues that in veridicality conflict situations, NPIs are not licensed, strictly speaking, but *rescued*. Giannakidou 1998 called this *indirect* licensing.

(74) *Rescuing by NEGATION* (Giannakidou 2006)

A PI α can be rescued in sentence S, if **the global context C** of S makes a negative proposition S' available, and (b) α is in the scope of negation in S'.

Rescuing is a *secondary* mode of licensing that relies on inferencing of the global context, may include presuppositions and implicatures. The positive presupposition of *only* blocks NPIs in Greek, Spanish and Catalan, and the negative implicature of emotives (*wish/expect that NOT*) licenses *any*. Horn (2002) further structures the global context with *assertoric inertia*: one component becomes assertorically inert, and another becomes salient. If the salient component contains negation, NPIs will be licensed. Compare, for instance *Ariadne barely said anything*— where *Ariadne didn't say much* is salient but the positive *Ariadne said something* is inert— to **Ariadne almost said something*, where the inert part is the negative *Ariadne didn't say anything*, therefore unable to license *any*. Assertoric inertia is helpful in constraining when rescuing will be successful. It is important to note that experimental evidence (Xiang et al. 2016) confirms indeed that, at least with emotive verbs, the neurophysiological status of NPIs differs from that found in nonveridical contexts. Duffley and Larivée 2015 show that NPIs with emotives are rare in corpora, compared to negations or questions. These observations support the view that rescuing is qualitatively different from licensing.

4 Lexical semantics of polarity: scalarity

We established that polarity as a phenomenon of natural language reveals sensitivity to negation and nonveridicality. Now it is time ask the question: what triggers this sensitivity? This question needs to be addressed individually for each NPI and FCI— but some general patterns of lexical

meaning were shown to play a major role. One such pattern is *scalarity*; the other is *dependent variable*. We talk about these in turn.

Many NPIs are *scalar* operators and affect rhetorical structure. Israel (1996, 2004, 2011) presents the most recent and comprehensive version of this idea. NPIs trigger pragmatic ordering which, with negation, results in rhetorically strong statements if the value of the NPI is minimal (*He didn't say a word*). NPIs can also create rhetorically weaker, *attenuating* statements; this happens if the NPI value is high (*He didn't read much*, vs. **He read much*). In both cases we have a correlation between the informational value of the NPI, ordered along a pragmatic scale, and negation. Scalar NPIs thus depend crucially on negation and negative inferencing. This observation is borne out by NPI-*any* for the most part, minimizers, and the other scalar NPIs discussed by Israel.

As pointed out at the beginning of the paper, however, the Greek *kanenas*, Mandarin *shenme*, Korean *rato*-NPIs are not scalar (Giannakidou 1998, 2011; Giannakidou and Quer 2013; Lin 1996; Giannakidou and Yoon 2014, 2016). Non-scalar NPIs do not affect rhetorical structure, but, as noted at the beginning, appear to express indeterminacy of reference. Scalar and non-scalar NPIs both appear in nonveridical contexts, but obviously for different reasons. Many non-scalar NPIs contain *dependent* variables. *Any*, Giannakidou argues, is both scalar *and* with a dependent variable.

4.1. Scalarity and widening

The scalar analysis originates in Fauconnier's 1974 discussion of superlatives and minimizers:

- (75) a John didn't hear *the slightest sound*.
 b John didn't hear *a single thing*.

The minimizer, and *the slightest sound* designate the lower end of (pragmatic) scales, where e.g. sounds are ordered based on how strong they are. If one cannot hear the slightest or one single sound, it follows that one cannot hear anything. In questions— *Did John hear a single thing?*— *negative bias* is produced: the question becomes rhetorical, begging a negative answer. *Any*, however, does not have negative bias in questions (Ladusaw 1980): *Did you see anything?* is a

genuine information question. So, there is an asymmetry between minimizers and *any* (though see Lee and Horn 1994 for an attempt to unify the two by positing *even* in *any*).

Kadmon & Landman 1993, and Krifka 1995 develop the scalar approach of *any*. Kadmon & Landman (1993) say that *any* contributes *widening*:

(76) *Widening of any*

In an NP of the form *any CN*, *any* widens the interpretation of the common noun phrase along some contextual dimension.

Widening is felicitous only if it produces *strengthening*. This is what licenses *any*:

(77) Licensing condition for *any*: *Strengthening*

Any is licensed only if the widening creates a stronger statement, i.e., only if the statement on the wide interpretation entails the statement on the narrow interpretation.

The idea is that widening has the purpose of strengthening the *any* statement—but this does not appear to be a property of *all* scalar NPIs, since *attenuating* NPIs also exist (*I don't like him much*). Strengthening, the claim goes, is satisfied in a negative context, but not in a positive one:

- (78) a. I didn't see any books on the table.
b. * I saw any books on the table.
c. I saw a linguistics book on the table.

Without negation, the widened statement does not entail the *c* statement, and strengthening fails, ruling out *any*. Strengthening is satisfied with negation, so *any* is fine. This reasoning could generalize in order reversing environments—but recall that *any* appears in non-monotonic contexts such as questions, modals, generics, imperatives, disjunctions.

Chierchia (2006, 2013) implements widening introducing subdomains, indicated below by the index *i*, for numbers between 1 and the maximum domain, here three:

- (79) a. *I saw any boy. (Chierchia's (47))

b. Meaning

$\exists w' \exists x \in D_{w'} [\text{boy}_{w'}(x) \wedge \text{saw}_w(I, x)] \quad D = \{a, b, c\}$

c. Alternatives

$\exists w' \exists x \in D_{w'} [\text{boy}_{i,w'}(x) \wedge \text{saw}_w(I, x)]$, where $1 \leq i \leq 3$

In a domain that consists of three boys, *any boy* quantifies over subdomains that contain one boy, two boys, and all three boys. These alternatives are said to be “active” with *any*, and to enrich plain meaning. The domain of individuals is not ordered, and in choosing among alternatives, speakers tend to go for the strongest one they have evidence for. In the case above, we end up saying that even the most broad choice of *D* makes the sentence true: “the base meaning will acquire an *even*-like flavor” (Chierchia 2006: 556). In Chierchia 2006, and 2013 positive sentences with *any* are ruled out as contradictions. However, *any* needs to be licensed grammatically, a fact that does not follow from this kind of reasoning.

4.2 Problems with purely pragmatic accounts

In all widening approaches, the failure of an NPI in a positive veridical sentence is of pragmatic nature. The first, rather obvious, problem lies precisely here: the ill-formedness that such an explanation predicts is weak: sentences with failed *any* do *not* have the same status as super weak, uninformative or contradictory sentences, none of which is judged ungrammatical. I can say *I talked to every student in the universe last night*, or *Ariadne kicked and ball and Ariadne didn't kick the ball*. These would be odd things to say, but the grammar doesn't rule them out.

Chierchia acknowledges the insufficiency of the pragmatic explanation, and proposes, in fact, a syntactic account of licensing: *any* has an uninterpretable *syntactic* feature $[+\sigma]$ (Chierchia 2006: 559) that must be checked against an operator that bears it. Negation and DE have the feature $[+\sigma]$, but it is unclear if non-negative nonveridical operators have it. For more critical points see Giannakidou 2011, 2016. Here it is pertinent to note that in Chierchia the semantics alone is not enough to deliver grammaticality in nonveridical contexts.

An additional problem with widening is that it is simply not true that *any* enlargens the domain. Below, we find *any* with a partitive phrase:

(80) Pick any of these cards.

Here we have *these cards*, and the use of *any* does not make us think of additional cards. Clearly, there is an intuition about exhausting the domain with *any*—shared with FCIs, as will be shown in section 6— but exhausting the domain is different from widening it. The literature has therefore been critical of the idea of widening as formulated in Kadmon and Landman, and use instead the concept of exhaustivity (for some recent criticism see Arregui 2008, Giannakidou and Quer 2013).

Let us move on now to NPIs that contain dependent variables.

5 Dependent variable NPIs and FCIs: semantics and syntax

Giannakidou (1998, 2001, 2011) and Giannakidou and Quer 2013 propose that NPIs may contain a *dependent* variable. The Greek NPIs, Mandarin, and Korean NPIs belong to this class (for recent discussion of *shenme* and the role of dependent variable in acquisition, see J. Ling 2015). By acknowledging dependent variables, the “anomalous” character of NPIs becomes part of referential ‘deficiencies’ that we know exist in grammar, for instance, with anaphoric nominals, anti-specific and obligatorily narrow scope indefinites, the genitive of negation in Russian (Partee 2008; Partee and Borschev 2004), English bare plurals (Carlson 1977), distributivity markers that need higher plurals to distribute over (Farkas 1998, Pereltsvaig 2008, Henderson 2014). I give here two well-known English examples:

- (81) a * The student ate a sandwich *each*.
b * Samantha danced with *himself*.

Each requires that there be a c-commanding plural to distribute over, and *himself* needs a c-commanding male antecedent. These syntactic needs are motivated semantically: *each* is distributive and a singular can’t distribute; and *himself* cannot refer by itself, it acquires reference from an antecedent. These semantic needs translate into syntactic requirements (c-command) with *each* and *himself*, resulting in ungrammatical if the requirement is not met. The idea of dependent variable for NPIs renders them part of this class of semantically driven syntactic

dependencies. Progovac 1994 was the first to suggest a similarity between pronouns and NPIs, and offered an account of NPIs in the style of binding theory.

Giannakidou and Giannakidou & Quer frame the issue in terms of an isomorphism between semantics and syntax. There are two kinds of variables in natural language, dependent and non-dependent. Dependent variables are lexically ‘deficient’, and can only be well-formed if they are found in an appropriate structural relation with another expression that will value them. The presence of a dependent variable therefore creates limited distribution. The dependent variable class includes NPI and FCI variables, but also the non-polarity variables mentioned earlier, as well as the temporal variable of the subjunctive mood (‘temporal’ polarity in Giannakidou 2009), subjects of control verbs such as *try*, *manage*, etc. (Grano 2012). What all these variables have in common is that they cannot be free; in order for them to become licit they need to be bound or identified with antecedents:

(82) *Dependent variable*, general case (Giannakidou 2011)

A variable v is dependent iff v cannot be interpreted as a free variable.

This framework imposes an isomorphism between semantics (dependent variable that cannot remain free) and morphosyntax (a dependent variable being a distinct syntactic object from a non-dependent variable). The dependent variable creates a semantico-syntactic dependency at the logical form, and therefore leads to grammatical and not simply interpretative, failure. As seen earlier, *himself* is ungrammatical because the anaphor contains a dependent variable that needs to be identified with a c-commanding antecedent, and the sentence lacks such an antecedent. Likewise, in **The student each ate an apple each* the word *each* creates a problem because it is a dependent distributive variable necessitating a plural nominal to distribute over.

In other words, the dependent variable is an element that establishes a *syntactic* narrow scope or co-dependency that is motivated semantically. Giannakidou 1998 argues that NPIs and FCIs contain dependent variables which cannot introduce a discourse referent. We can think of these variables as *non-deictic*:

(83) *Dependent non-deictic variable* of NPIs (based on Giannakidou 1998, 2011)

A variable v is *non-deictic* dependent iff (i) v cannot be interpreted as a free variable,

or (ii) it cannot introduce a discourse referent in the main context.

A non-deictic variable cannot be interpreted as a free variable, and it can also not be used to introduce a discourse referent. These restrictions, which can be viewed as presuppositions on the interpretation of the variable, ‘trap’ NPI variables in nonveridical contexts. This derives the narrow scope property of NPIs without further qualifications or a special NPI constraint. Semantic licensing— the ‘be in the scope of’ condition— and syntactic licensing (be in the c-command domain) become isomorphic. Nonveridical contexts are appropriate for non-deictic variables because in those contexts NPIs are not forced to introduce discourse referents. Giannakidou designates the dependent variable of the Greek NPI *kanenas* as x_d , and x_{ni} :

(84) $\llbracket \text{kanenas} \rrbracket = \mathbf{person}(x_d)$

Under negation, \exists -closure of x_d will be fine because x_d does not introduce a discourse referent under negation; the scope above negation is impossible because it would force introduction of a discourse referent. Den Dikken & Giannakidou (2002) analyze further *any*, and *wh-the-hell* phrases as NPIs along this line.

The free choice determiner contributes a dependent variable of type $s - w_d$ – and this variable brings about the anti-episodicity effect we observed: it rules out FCIs in episodic contexts because they do not contain a w binder (Giannakidou 1998, 2001). The w_d renders FCIs *intensional* indefinites necessitating the presence of modals, generics and other quantificational binders, thus capturing successfully the grammatical constraint on FCIs. FCIs have, in addition, a presupposition of *exhaustive* variation, which requires that they exhaust *all* values in the domain. This property is responsible for the quasi-universal flavor of free choice, and in some theories exhaustive variation is implemented by adding an actual universal quantifier (e.g. Kratzer and Shimoyama 2002, Aloni 2007, Menendez Benito 2010, Dayal 2015). *Any* appears to convey, in its FC reading, exhaustive variation—but the NPI use is not paraphrasable by a universal:

- (85) a Did you talk to anybody?
b Did you talk to everybody?
c Ariadne can talk to anybody (similar to: Ariadne can talk to everybody).

For more recent discussion and arguments against rendering FCIs to universal quantifiers, see Giannakidou 2001, Horn 2005, Giannakidou and Quer 2013.

The dependent vs. non-dependent variable contrast can be seen as type difference, or as the variables belonging to different systems. In such framing, the idea of colored variables (Gardent and Kolhase 1996) may be useful. In Giannakidou’s work and in Giannakidou and Quer 2013, the constraint that a variable cannot remain free was a presupposition, so the failures are presupposition failures. Presupposition failures do not generally lead to ungrammaticality, but a failure of this kind does— just like with anaphors, distributivity markers, etc— because the presupposition failure translates syntactically into a syntactic relation between NPI and licenser (checking, matching, or binding). NPIs and FCIs thus exhibit a true semantico-syntactic dependency, as said earlier and suggested also by experimental accounts.

6. Exhaustification and referential vagueness

In this last section, we address the debate about *exhaustivity* of NPIs. This is the view below:

(86) *Exhaustivity-for-all hypothesis*: “in contrast to ordinary or plain indefinites, with NPIs and FCIs we *have* to exhaustify” (Chierchia 2013:8, emphasis in the original)

This view surfaced recently in a number of works (Chierchia 2006, 2013, and works following that). Exhaustification is proposed, however, without empirical justification as the defining ingredient in *all* NPI/FCI classes. Giannakidou 2016, Giannakidou and Lin 2016 and Giannakidou and Yoon 2016, criticize this view, and defend the thesis that not all NPIs are exhaustified. Evidence from Greek, Korean, and Mandarin NPIs is presented showing that they contrast empirically in a number of significant ways with the intended exhaustified NPI *any*. Giannakidou 2016 further argues that we do not need exhaustification for *any*. We cannot go into details of this debate in this brief article, but I do want to give an idea of what the empirical differences are between *any* and the Greek, Mandarin and Korean NPIs that set them apart. These differences can serve as useful diagnostics for distinguishing NPIs.

Technically, Chierchia’s exhaustification uses two covert syntactic devices: O(nly) and the [+σ] feature that we talked about earlier. Both are posited *ad hoc*— a point for which the theory has been criticized also by Geurts 2009, 2010. Granting for the moment that *any* is the exemplar of ‘exhaustified’, and without any additional stipulations, exhaustification predicts behavior akin to *any*. Here are the core properties of *any*, observed in non-negative contexts where the FC reading is triggered:

1. *Any* has reduced tolerance to exceptions.
2. *Any* has free choice readings with modals, conditionals, and imperatives.
3. *Any* appears with a relative clause in an otherwise veridical sentence. In this case again a free choice reading arises.
4. *Any* has supplementary uses.
5. *Any* and FCIs are implausible with universal modal verbs.

Most of these facts are typical also for FCIs— which all agree are exhaustified, as we said, though not necessarily in the Chierchia way. Giannakidou 1998, 2001, as mentioned earlier, was the first to propose that FCIs have a presupposition of *exhaustive variation* which is responsible for their universal-like reading. The question, when it comes to NPIs, is: do all NPIs behave like *any* with respect to the above— and if not, what is the analytical advantage of maintaining exhaustification for all NPIs?

Here are a number of asymmetries within the NPI classes represented by *any* and the Greek NPI respectively. I limit consideration to the Greek NPI but see Giannakidou and Yoon 2016 and Giannakidou and Lin 2016 for the respective Korean and Mandarin data.

6.1 Greek NPI tolerates exceptives

Any does not combine with exceptive phrases, but the Greek NPI does:

- (87) Bori na mas idhe kanenas. Alla oxi o Giannis, aftos ine tyflos.
 can SUBJ us saw NPI-person but not the John, he is blind
 ‘*Someone* (no idea who) could have seen us. But not John; he is blind.

(88) Bori na mas idhe opjosdhipote.

can SUBJ us saw FCI-person

‘Anybody (whatsoever) could have seen us.’ # But not John! He is blind.

In the modal context, *any* receives free choice reading, which excludes the exceptive. The Greek NPI lacks this reading and tolerates exceptives.

6.2. Greek NPI gets non-free choice in imperatives

The Greek NPI tolerates exceptions also in the imperative. In fact, the imperatives with Greek NPIs and FCIs are substantially different:

(89) Fae kanena glyko!
eat.2sg.imp NPI cookie

‘Eat a cookie!’ (some or other)

(90) Fae opjodhipote glyko!
Eat.2sg.imp FCI cookie

‘Eat any cookie whatsoever!’

The Greek FCI and *any* induce a reading where the addressee comes to the dessert table with a great appetite, and the speaker invites her to try every option if she wishes to. By contrast, the Greek NPI invokes a context with average or little appetite, and is suggestion to eat some cookie or other. In a context where some cookies are off limits the NPI versions are good, but *any/FCIs* are bad:

(91) Fae {kanena/ #opjodhipote} glyko; ala oxi afta giati ine gia tin Mary.
eat NPI/#FCI cookie; but not these because are for the Mary

‘Eat a cookie (#any cookie); but not these ones because they are for Mary.’

6.3 No indiscriminative reading of Greek NPI in conditionals

If-clauses are good environments for NPIs and FCIs. The latter trigger the so-called *indiscriminative, just any* reading (see Haspelmath 1997, Duffley and Larivée 2010), and here is

variant of an example due to Larry Horn (2005). The Greek NPI, as we see, cannot convey the indiscriminative reading, but FCIs can.

(92) If you sleep with just anybody you are not being very selective.

(93) An koimasai me {opjondipote/*kanenan}, den ise ke poly epilektikos.
 If sleep.2SG with FCI/*NPI, not be.2SG very selective
 ‘If you sleep with (just) anybody you are not being very selective.’

6.4 No subtriggering of the Greek NPI

In veridical simple past sentences, all NPIs are ungrammatical. This is the defining feature of both NPIs and FCIs, but *any* improves with a relative clause— a phenomenon called *subtriggering* (LeGrand 1975). In subtriggering, *any* is interpreted with free choice (Dayal 1998, Giannakidou 2001, Horn 2005). The Greek NPI *kanenas* cannot be subtriggered:

(94) a. * John bought any book.

b. John bought any book that he could find.

(95) *O Janis aghorase kanena vivlio (pou vrike stin aghora). (Greek)
 the John bought.3SG NPI book REL found.3SG in-the-market
 Intended: ‘John bought any book that he found on the market.’

FCIs, like *any* can be subtriggered:

(96) O Janis aghorase opjodhipote vivlio *(vrike stin aghora).
 the John bought.3SG FCI book found.3SG in-the market
 ‘John bought any book that he found on the market.’

Hence, the subtriggering diagnostic reveals another difference between the Greek NPI and *any* that doesn’t follow from *exhasutificaiton for all*.

6.5 No supplementary use for the Greek NPI

Any and FCIs exhibit supplementary use (Horn 2005); but the Greek NPIs do not:

(97) Pick a card, any card! (English)

(98) Pare mia karta, {opjadhypote/#kamia} karta! (Greek)
take.IMP.2SG one card, FCI/#NPI card
'Take a card, any card!'

The effect is similar to the tolerance of exceptions noted earlier. It is again difficult to imagine how the contrast can follow from idea that *any*, *opjondihopote* and *kanenas* are all due to the same mechanism as *exhaustivity-for-all* would have it.

6. 6 Greek NPIs are fine with universal modal verbs

Finally, *any* and FCIs are implausible with universal modal verbs; but Greek NPIs are fine:

(99) a. #Ariadne must marry any lawyer. (English)

b. #I Ariadne prepri na pandrefti opjondhipote dikigoro.
the Ariadne must SUBJ marry FCI lawyer
Intended: 'Ariadne must marry any lawyer.'

(100) I Ariadne prepri na pandrefti kanena dikigoro. the
Ariadne must SUBJ marry NPI lawyer
'Ariadne must marry a lawyer, some lawyer or other.'

Overall, then, we found six asymmetries between Greek NPIs and *any* that don't follow from the exhaustivity for all. These asymmetries can serve as diagnostics for other NPIs too, as said earlier.

6.7. Alternatives need not be exhaustified: referential vagueness

We found considerable differences between the Greek type of NPI and *any* that do not follow if we assume a unified analysis. One, of course, could hold on axiomatically to uniformity and add ad hoc stipulations, resulting to a proliferation of ad hoc rules in addition to unjustified uniformity. Most researchers would be led to the conclusion that a system without these stipulations is superior to the Rube Goldberg contraption that such an analysis would end up constructing around itself. The alternative would be to take the above differences to suggest that not all NPIs are exhaustified. This is the avenue taken by Giannakidou and her co-authors. They argue that some NPIs have a presupposition not of exhaustivity, but of *referential vagueness*:

(101) *Referential vagueness: non-exhaustive variation*

(i) A sentence containing a referentially vague indefinite α will have a truth value iff:

$\exists w_1, w_2 \in W: \llbracket \alpha \rrbracket^{w_1} \neq \llbracket \alpha \rrbracket^{w_2}$; where α is the referentially vague indefinite.

(ii) The worlds w_1, w_2 are epistemic alternatives of the speaker: $w_1, w_2 \in M(\text{speaker})$, where $M(\text{speaker})$ is the speaker's belief state, the worlds compatible with what she believes/knows.

(iii) The speaker does not know which value is the actual value. (vagueness, ignorance)

(The epistemic state of the speaker is modeled standardly as a set of worlds $M(\text{speaker})$ compatible with what the speaker knows or believes in the base world w). Referential vagueness, just like free choice, expresses indeterminacy regarding the value of α , the speaker does not have a particular object in mind. This is the essence of anti-specificity (Giannakidou and Quer 2013). With referential vagueness, however, the speaker *is not making claims about the entire domain*, unlike with free choice. Hence in both cases we talk about presupposed variation, but only with free choice do we have exhaustive variation. Given the numerous NPIs crosslinguistically that behave similarly to Greek, we cannot have a comprehensive enough understanding of polarity if we ignore referential vagueness. Finally, note that referential vagueness is not a stipulated property of NPIs, but is independently shown to describe anti-specific, narrow scope indefinites such as Spanish and Catalan *algun* (see also Alonso-Ovalle and Menendez-Benito 2010), Greek *kapjos*, and similar items.

7 Conclusions

In this brief survey, we explored the rich landscape of NPIs and FCIs, and isolated some of the clearest and better-studied patterns. As noted at the beginning, polarity is a pervasive phenomenon in human language, but from a purely logical perspective, it is an anomaly: since we have “regular” quantifiers, why do we need polarity sensitive versions of them?

The preceding discussion allows several answers to this question. As dependent variables, NPIs and FCIs manifest referential deficiency observed also in other areas of grammar— for instance, with anaphors, question words, and narrow scope indefinites. From this perspective, we have NPIs and FCIs for the same reasons we have these devices: to encode linguistic dependencies that reveal the speaker’s epistemic judgment about whether a referent is or is not known to her. At the same time, FCIs and some NPIs can be scalar, i.e., manipulators of rhetorical force, as Israel 2011 very succinctly puts it. Overall, scalarity and referential dependency appear to be properties that language crucially encodes in the polarity system, but also elsewhere in grammar.

NPIs and FCIs emerge as expressions sensitive to nonveridicality and negation. Nonveridicality is uncertainty about truth. The veridicality judgment, i.e. how speakers extract truth inference from texts or speech to be certain or uncertain about truth, can actually be quite complex as shown in recent work by de Marneffe et al. 2012; but conceptually and cognitively, reasoning about the truth of sentences is a very basic property of human communication. The fact that we have linguistic expressions sensitive to nonveridicality, then, is hardly a surprise. Other linguistic devices sensitive to nonveridicality are the grammatical moods (subjunctive-indicative), modal verbs, and generally non-assertive devices such as the imperative, questions, and counterfactuals. NPIs and FCIs appear routinely in these contexts.

The negative judgment emerges, in this context, as a special case of nonveridical judgment. That NPIs are sensitive to negation, and some strictly require it, should again not come as a surprise since negation is cognitively quite basic, and in a fundamental way, is a hallmark of human language (Horn 2001). While nonveridicality is uncertainty about truth, negation is the strengthening of uncertainty to *certainty that not*. Finally, it is worth repeating that the category of *minimal* negation —i.e. mere downward entailment—plays very little role, by itself, in the

licensing of Pls. I do not know of any language that has NPIs that appear with *few* and in the restriction of *every*, but are excluded with *not*. And for well-known NPIs that appear in nonveridical contexts, such as Greek *kanenas*, Dutch *ook maar iets* minimal negation is sometimes not enough to license them.

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Anastasia Giannakidou, Nov. 23, 2016, Chicago (United States)

Further readings

Here I offer more reading suggestions about studies that I was not able to cover more fully in the text.

Collections on negation and polarity: syntax-semantics

Forget, Daniel, Paul Hirschbühler, France Martineau and María Luisa Rivero (eds.), 1997. *Negation: Syntax and Semantics*. pp. 209--230. John Benjamins, Amsterdam and Philadelphia.

Jack Hoeksema and Hotze Rullmann and Víctor Sánchez-Valencia and Ton van der Wouden (eds.), *Perspectives on Negation and Polarity Items*. 2001.

This volume comprises papers from the Groningen Wroshoph on Polarity that was held at the University of Gronigen in 1996, and contains syntax-semantics, pragmatics, and corpus studies of NPIs. Corpus studies started emerging around that time, mostly due to Jack Hoeksema's work on Dutch NPIs.

Horn, Laurence R. and Yasuhiko Kato 2000: *Negation and Polarity. Syntactic and Semantic Perspectives*. Oxford: Oxford University Press.

A collection of articles with emphasis on English and Japanese, including historical data.

Penka, Doris and Hedde Zeijlstra (eds). 2010. *Negation and Polarity Items*. *Natural Language and Linguistic Theory*, Volume 28, 4.

This recent collection is in a thesis-response format, and contains new research in syntax, semantics, and historical developments of NPIs

Horn, L., 2010. (ed.), *Expression of Negation*, Mouton, de Gruyter.

This work combines theoretical with typological approaches, along with data from corpus linguistics (e.g. Hoeksema's paper mentioned in the overviews above). Horn offers also an updates and quite comprehensive bibliography: "Negation in the new millennium: a bibliography", p: 289-232.

Negation, negative concord, Neg-raising

Penka, Doris. 2007. *Negative Indefinites*. University of Tübingen PhD dissertation.

This is a study of German n-words (such as *k-ein*) and their scopal properties. The main thesis is that they involve an indefinite component and negation, and there is also typological discussion.

De Swart, Henriette. 2010. *Expression and Interpretation of Negation: an OT typology*. Dordrecht: Springer.

This is an analysis of negative concord and negation within the framework of optimality theory. There is also discussion on the acquisition of negation.

de.Swart, Henriëtte . 2000. Scope ambiguities with negative quantifiers. In *Reference and Anaphoric Relations*, K. von Stechow and U. Egli.(eds.),109–132. Dordrecht: Kluwer.

Here a pragmatic explanation is attempted for the scope interaction of Germanic negative quantifiers, negation, and modal verbs.

Gajewski Jon. 2007. Neg-raising and polarity. *Linguistics and Philosophy* 30:289–328.

This paper discusses NPI-licensing in Neg-raising contexts. Specific features of presupposition projection are used to explain the licensing of strict NPIs under Neg-Raising verbs.

Horn, Laurence. 1978. Remarks on neg-raising. In *Pragmatics*, ed. Peter Cole, volume 9 of *Syntax and Semantics*, 129–220. Academic Press: New York.

In this classic and much cited paper, Horn identifies the phenomenon of Neg-raising, and offers a pragmatic explanation of it within his theory of Q and R-implicature.

Collins, C. and Paul Postal. 2014. *Classical Neg-Raising*. MIT Press.

Any: free choice or existential?

Carlson, Greg N. (1980). Polarity 'any' is Existential. In: *Linguistic Inquiry*, 11(4):799--804

Here Carlson proposes a separation of NPI and FCI *any*, with NPI-*any* being existential.

Davison, Alice 1981. *Any* as universal or existential. In: J. van der Auwera (ed.). *The Semantics of Determiners*. London: Croom Helm, 11–34.

This work is cited often as the source of some of the core diagnostics for free choice *any*, e.g. *almost/ absolutely* modification.

Dayal

Expletive negation as a polarity item

Espinal, Maria-Teresa. 2000. Expletive negation, negative concord, and feature checking. *Catalan Working Papers in Linguistics* 8: 47-69.

This is the first formulation of the idea that there is a correlation between expletive negation and nonveridicality/antiveridicality.

Espinal, M. Teresa. 2007. Licensing expletive negation and negative concord in Catalan and Spanish. In Floricic (ed.), 49–74.

Espinal continues to study Catalan and Spanish expletive negation. The approach is mainly syntactic.

Yoon, Suwon. 2012. *NOT in the Mood: The Syntax and Semantics of evaluative Negation*. PhD thesis, University of Chicago. This is an analysis of Korean expletive negation as a mood (subjunctive marker) licensed by nonveridicality.