Polarity phenomena in natural language:
Licensing, variation and compositionality

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1 Common paradigms of PIs and basic terminology

Hallmark property of PIs:

PIs have limited distribution: typically, they cannot appear in positive assertions with simple past (= positive episodic sentences).

 Negative PIs (NPIs)
(Earliest reference: Klima 1964)

(1) a Bill didn’t buy any books.
b * Bill bought any books. (versus: Bill bought {War and Peace/two books}).

(2) a * Bill has ever read War and Peace.
b Bill hasn’t ever read War and Peace.

(3) a Dhen idhe tipota o Janis. Greek
not saw anything the John
John didn’t see anything.
b * Idhe tipota o Janis.
John saw anything.

(4) a Niemand heeft ook maar iets gezien. Dutch
nobody has even something seen
Nobody saw anything.
b *Jan heeft ook maar iets gezien.
* John saw anything.

The NPI is licensed by negation, which is also characterized as the trigger of the NPI (Ladusaw 1979). Licensing normally translates into a be-in-the-scope-of condition:

(5) a ¬∃x. book (x) ∧ bought (b, x)
b ∃x. book (x) ∧ ¬ bought (b, x)

…Which often translates into overt c-command:

(6) a *Anydoby I didn’t see.
b [Three students]f I didn’t see.
Free choice items (FCIs)

(7) a. *Idha opjondhipote. (Greek; Giannakidou 2001)
    saw.perf.1sg FC-person
    *I saw anybody.’

b. *Dhen idha opjondhipote.
    not saw.perf.1sg FC-person
    Intended: ‘I didn’t see anybody.’

But FCIs remain bad with negation, as long as they remain in an episodic sentence:

(8) * (Non) Expulsaron del partido a cualquiera disidente.
    not expel.3pl from-the party ACC FC dissident
    Intended: ‘They expelled any dissident from the party.’
    Intended: ‘They didn’t expel any dissident from the party.’

(9) * (No) Li va comprar qualsevol ram.
    not her/him aux.3sg to.buy FC bouquet
    Intended: ‘S/he bought him/her any bouquet.’
    Intended: ‘S/he didn’t buy him/her any bouquet.’

(10) a * Hier Marie a apprécié n’importe quel livre.
    Yesterday, Marie didn’t appreciate any book.

b * Marie n’a pas lu n’importe quel livre.
    Mary didn’t read any books.

[However, not all FCIs are polarity sensitive:

irgendein (Kratzer and Shimoyama 2002).

(11) a Irgendjemand hat angerufen. (Kratzer and Shimoyama 2002: (6))
    irgend-one has called

b * Opjosdhipote telefonise. (Greek)

Episodicity overridden: subtrigging (LeGrand 1975)

(12) a Bill bought whichever book he liked.

b *Bill bought whichever book. (Horn 2000; Giannakidou and Cheng 2006)

Given the contrast in terms of negation, NPIs and FCIs must be sensitive to different things.
Positive polarity items (PPIs)
PPIs seem to be the opposite of NPIs (Baker 1970 originally; for more recent analyses see Szabolcsi 2004, Nilsen 2004, Ernst 2007):

(14) a Bill didn’t buy some books.
    b \( \exists x. \text{book}(x) \land \neg \text{bought}(b, x) \)

(15) a Bill would rather be in Montpellier.
    b # Bill wouldn’t rather be in Montpellier.

(16) a John is here already.
    b # John isn’t here already.

(17) a *John is here yet.
    b John isn’t here yet.

PPIs are thought of as anti-licensed by negation (Ladusaw 1979, Progovac 1994, Giannakidou 1998), but see Szabolcsi for trying to make anti-licensing a positive condition).

3 Core questions

PIs raise the question of well-formedness that is not purely determined by syntax.

What is the the nature of polarity ill-formedness?

(A) Status question

• Are polarity failures generally the same? E.g. Can they be reduced to the same source, lexical anomaly, presupposition failure, mere oddity, semantic-syntactic failure?


(B) Sanctioning question (aka the licensing question):

• Is there a common property shared by all environments where (N)PIs occur?
• Is the sanctioning property semantic or pragmatic?
• Is sanctioning one mechanism—licensing—or is it more refined?
• How does sanctioning translate into scope?

(C) Compositionality question (aka the sensitivity question)

• Goal: No composition external filters (as in Ladusaw 1979). The limited interpretation of the PI must be derived by the lexical semantics of the PI itself. Scope and syntax will follow.

3 Sanctioning question: very liberal distribution of *any*

*Any* is fine in many contexts other than negation.

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

3.1 Downward entailment

(19) *Ladusaw’s (1979) licensing condition*
α is a trigger for negative polarity items in its scope iff α is downward entailing.

(20) **DEFINITION 1** (Upward entailing function).
A function $f$ is upward entailing iff for every arbitrary element $X,Y$ it holds that: $X \subseteq Y \rightarrow f(X) \subseteq f(Y)$

(21) **DEFINITION 2** (Downward entailing function).
A function $f$ is downward entailing iff for every arbitrary element $X,Y$ it holds that: $X \subseteq Y \rightarrow f(Y) \subseteq f(X)$

(22)  a  Lucy does not like linguistics.
       [[syntax]] \subseteq [[linguistics]]

____________________________
\[ \therefore \] Lucy does not like syntax.
       b  Few students like linguistics.
       [[syntax]] \subseteq [[linguistics]]

____________________________
\[ \therefore \] Few students like syntax.

(23)  Every [student who likes linguistics] came to the party.
       [[syntax]] \subseteq [[linguistics]]

____________________________
\[ \therefore \] Every student who likes syntax came to the party.


However, problems arose immediately:

- **Problem 1**: Conceptually, it remained unclear for a long time why DE is relevant for PIs. In Ladusaw, the licensing condition had the status of a filter:
- **Problem 2**: (19) cannot capture the variation in PI distribution, e.g. the contrast we just saw in NPIs-FCIs. Or the contrast between *every* and *each/both* below:

(24)  a  */#/Each student who saw anything contacted the police.
       b  */#/Both students who saw anything contacted the police.

Giannakidou (1997: p.137: (181)): with “anaphoric definites” no FCIs, even with *every*:
(25) Context: Yesterday, some students came to my office. Many of them had information about the murder of Athanasiadis. S: # {Every/Each} student who know anything about the murder proved very useful.

It seems that, with determiners, it is not so much monotonicity that matters but existence (Lin 1996), i.e. whether the domain of the determiner is non-empty of not (Giannakidou 1997, 1998, 1999; see also Horn 1997).

- Problem 3: (19) is empirically inadequate. NPIs appear non-monotone environments such as: questions, in imperatives, with modal verbs, and subjunctive/infinitival propositional attitudes, or disjunctions (Giannakidou 1998, 1999, 2006).

(26) a If you talk to any students, just let me know.
b Did you see anybody?
c Press any key.
d John may talk to anybody.
e John is willing to talk to anybody.

3.2 Nonveridicality

Proposal: The semantic property that unifies NPI-licensing environments as a natural class is nonveridicality. (Giannakidou 1998, 1999, 2006, Zwarts 1995, Bernardi 2002; for the related notion of non-existence and that it is relative to NPI licensing see Lin 1996).

(27) DEFINITION 3. (Non)veridicality for propositional operators (Giannakidou 2006)
   i. A propositional operator F is veridical iff Fp entails or presupposes that p is true in some individual’s epistemic model M_E(x); otherwise F is nonveridical.
   ii. A nonveridical operator F is antiveridical iff Fp entails that not p in some individual’s epistemic model: Fp → ¬p in some M_E(x).

For nonveridicality see also: Montague 1969, defined as existence. For a recent attempt to unify non-existence and absence of truth entailment (or presupposition), as proposed in Def. 3 see Borschev et al 2007.

Zwarts 1995: DE ⊂ Nonveridical. Hence nonveridicality is proposed as an extension of DE, to unify PI licensors semantically as a natural class, and strengthen the semantic approach to NPI-licensing.

Protasis of conditionals

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

Directive intensional verbs (selecting subjunctive): notice the use of subjunctive, and see also Borschev et al. 2007 and earlier literature):
Modal verbs: notice again the use of subjunctive!

(29)    I    Ariadne  epemine na afisoume {opjondhipote/kanenan} na perasi mesa. 
the Ariadne insisted.3sg subj let.1pl  FCI-person/ NPI-person subj come.3sg in
‘Ariadne insisted that we allow anyone in.’ 
With kanenan: ‘Ariadne insisted that we allow some person or other to come in.’

(30)    Bori na anapse {opjosdhipote/kanenas} to fos. 
can.3sg subj lit.3sg  FCI-person/NPI-person the light
‘Anyone may have turned on the light.’ 
With kanenas: ‘It is possible that somebody or other turned on the light.’

(31)    Boris na dhanistis {opjodhipote/kanena} vivlio. 
can. 2sg subj borrow.2sg  FCI / NPI book 
‘You may borrow any book.’
With kanena vivlio: ‘You may borrow some book or other.’

Imperatives

(32)    Dhialekse {opjodhipote/kanena} vivlio. 
choose.2sg  FCI / NPI book 
‘Choose any book.’
With kanena vivlio: ‘Choose some book or other.’

(33)    Disjunction 
a I bike mesa kanenas i afisame to fos anameno. (disjunction) 
  either entered.3sg NPI OR left.1pl the light on 
  (??/#Either anybody came in OR we left the light on.) 
b *Bike mesa kanenas ke afisame to fos anameno. (conjunction) 
  * Anybody came in AND we left the light on.

Two facts to remember:

• Any and its Greek counterpart are sanctioned in nonveridical contexts. Still there are differences in the interpretation that we must account for.
• Not all NPIs are scalar: kanenas is not.

4.   At the same time: true NPIs!

4.1   Strict dependency

There is a class of items that are strictly licensed by negation and antiveridical expressions only.


(34)    a    John didn't come either. 
b    *Did John come either? 
c    *If John comes either, they’ll give us a table.
Minimizers in Greek: Only allowed with negation (Giannakidou 1998, 1999):

(35) 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!

(36) #/*An dhinis dhekara, tha me akousis.
(If you dive a damn, you’ll listen).

Minimizers in Spanish?

(37) (from Giannakidou 2006, due to Quer)
*María se arrepintió de haber movido (ni) un dedo.
(Mary regrets that she lifted a finger.)

mo-items in Japanese (Nakanishi 2007, Yoshimura 2007)

(38) a. Watasi-wa gakusei-o {dare-mo / hito-ri-mo} mi-nakat-ta.
   I-TOP student-ACC {who-MO / one-CL-MO} see-NEG-PAST
   ‘I didn’t see any students.’
      student-ACC {who-MO / one-CL-MO} see-if inform-IMP
      ‘If you see any student, inform me.’

{dare-mo / hito-ri-mo} seem to be admitted with negation only.

NPI even (Giannakidou 2007; for Spanish ni siquiera see Herburger 2003; likewise for German einmal, Zwarts 2005)

(39) a Dhen theli na dhi oute to idhio tou to pedi.
   not want3sg 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.
   c *Idhe oute to idio tou to pedi?
   d …xoris na dhi oute to idhio tou to pedi.
      without seeing even his own child.

All these are fine with antiveridical without. Finally:

The strict NPIs are out with DE (but not negative) quantifiers:

(40) *To poli pende fitites dhiavasan oute ena arthro.
    ‘At most 5 students read even one article.’
    (Greek; Giannakidou 2007)

(41) *Weinigen zullen ook maar iets bereiken.
    few will even something achieve
Notice the problem with EVEN + indefinite. This runs counter to Lahiri’s generalization! We come back.

4.2 English minimizers?

Minimizers in English (Fauconnier 1975, Horn 1972, etc.)

**English minimizers as a class behave more liberally than the strict NPIs we just identified.**

(42)  
\begin{tabular}{ll}
  a & Ruth didn’t *lift a finger* to help me. \\
  b & Ruth doesn’t *give a damn* about what I think. \\
  c & Did Ruth *lift a finger* to help? \\
  d & If you *give a damn*, you’ll listen.
\end{tabular}

Minimizers are fine with directive propositional attitudes:

[Retrieved with Google, 10/17/2006; gratia Jason Merchant]

(43) 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

(44) “I just *wish you gave a damn* about something besides your television set.” Mr. Smith’ threw the remote control across the room stomped out of the room ...www.deadmule.com/content/word.of.mule.php?content_id=952

(45) till the pianist finished, we left, and I dropped off tom and went home. *Now I wish I had said a word.* It would have come out lame though, I just know it. everything2.com/index.pl?node_id=1166781

Minimizers and *any* are fine also with *only*, and factive verbs (positive and negative):

(46)  
\begin{tabular}{ll}
  a & I am glad he said a word! \\
  b & I’m glad we got any tickets. (from Kadmon and Landman). \\
  c & Mary regrets that she lifted a finger. \\
  d & Only Mary {gives a damn/said anything}.
\end{tabular}

(47)  
\begin{tabular}{ll}
  a & *Xerome pou dhinis dhekara.  \\
      & I am glad you give a damn. \\
  b & */# Mono i Maria dhini dhekara.  \\
      & Only Mary dives a damn. \\
  c & # I Maria metaniose pou kounise to daktilaki tis.  \\
      & Only literal interpretation: Mary regrets that she lifted her finger.
\end{tabular}

But *only* and factives are veridical, and they are also not DE!

(48) Atlas (1991, 1993): *only a P* asserts:
\[
\exists x \forall y [(x=y \leftrightarrow Py) \& (Py \rightarrow y=a)]
\]
= Exactly one individual, and no one other than a, has the property P. Which *entails* the positive proposition: *P(a)*
(49) Atlas (1993, 1996) inspired LF:
\[
\text{ate.a.vegetable (Larry) } \land \neg \exists x [x \neq \text{Larry } \land \text{ate.a.vegetable}(x)]
\]

(50) Only Larry ate a vegetable \(-/\rightarrow\) Only Larry ate broccoli.
Larry may have eaten spinach, for instance.

(51) Larry regrets that I bought a car. \(-/\rightarrow\) Larry regrets that I bought a Honda.
Because, in fact, I bought a Ferrari, and Larry might not regret this at all.

Is this fatal for the semantic approach, as Linebarger argued (1980)?

5 \hspace{1cm} \textit{Only} and emotive factives: weakening DE, or refining sanctioning?

5.1 The limits of weakening DE
Defensive strategy: we try to render \textit{only} and negative factives DE somehow, by weakening DE:

(52) Weak DE \hspace{1cm} (Hoeksema 1986)
If a \(\in\) C and C \(\subseteq\) B, then \textbf{\textit{only}} a is B \(\rightarrow\) \textbf{\textit{only}} a is C.
where C is a property given by the context

(53) Strawson DE \hspace{1cm} (von Fintel 1999: 14)
A (partial) function f of type \(<\sigma, \tau>\) is Strawson-DE iff
for all x, y of type \(\sigma\) such that \(x \rightarrow y\), and f(x) is defined: f(y) \(\rightarrow\) f(x).

(54) Strawson validity \hspace{1cm} (von Fintel 1999: (19))
An inference \(p_1, \ldots, p_n \therefore q\) is \textbf{\textit{Strawson-valid}} iff the inference \(p_1, \ldots, p_n\), S \(\therefore q\)
is \textbf{\textit{classically valid}}; where S is a premise stating that the presuppositions of all the statements
involved are satisfied.

Thus:

(55) a. Broccoli is a vegetable. \hspace{1cm} (C \(\subseteq\) B; x \(\rightarrow\) y)
b. John ate broccoli. \hspace{1cm} (a is C; f(x) defined)
c. **Only John ate a vegetable.**
d. \(\therefore\) Only John ate broccoli.

(56) a. Honda is a car. \hspace{1cm} (C \(\subseteq\) B; x \(\rightarrow\) y)
b. John bought a Honda. \hspace{1cm} (a is C; f(x) defined)
c. **Larry** \{regrets/is surprised\} that John **bought a car**.
d. \(\therefore\) Larry \{regrets/is surprised\} that John bought a Honda.

However:

Strawson and weak DE overgenerate: they allow any context inference to influence the reasoning pattern

(57) Only John ate a vegetable.
Presupposes: Someone ate a vegetable. (Horn 1996)
Asserts: Nobody other than John ate a vegetable.

5.1.1 NPIs are wrongly predicted to be OK with other focus structures:

(58) a. Broccoli is a vegetable.  
    b. John ate broccoli. (f(x) defined; j ∈ C)  
    c. It was John who ate a vegetable. →_Strawson DE-entails It was John who ate broccoli.

(59) a. Broccoli is a vegetable.  
    b. John ate broccoli. (f(x) defined; j ∈ C)  
    c. [John]F ate a vegetable. →_Strawson DE-entails [John]F ate broccoli.

(60) a * It was John who talked to anybody.  
    b * [John]F talked to anybody.

(61) * Even John ate any broccoli. (Horn 1989)

(62) Presupposition of even (Karttunen and Peters 1979)  
    Existential presupposition of even:  
    ∃x [x ≠ John ∧ C(x) ∧ ate (x, broccoli)], and

5.1.2 NPIs are wrongly predicted to be OK even in positive sentences…  
…If inference to the subset is given in the context:

(63) a. Broccoli is a vegetable.  
    b. John ate broccoli. (f(x) defined; j ∈ C)  
    c. John ate a vegetable →_Strawson DE-entails John ate broccoli.

(64) * John ate any vegetable.

© This is too liberal!

5.1.3 No way to distinguish between positive and negative factives

(65) a. Honda is a car. (C ⊆ B; x → y)  
    b. John bought a Honda. (a is C; f(x) defined)  
    c. Larry _is glad/ regrets_ that John bought a car.  
    d. :: Larry _is glad/ regrets_ that John bought a Honda.

☞ Giannakidou 2006: this runs counter to the attempt to only render negative factives Strawson DE.

5.1.4 Only and factives are not general licensors for NPIs:

☞ Giannakidou 1998, 2006:

(66) * Monon o Janis δini δekara.  (Greek)  
    only the John give.3sg damn
(Only John gives a damn.)

(67) * I Maria metanjose pou kunise to δaxtilaki tis.
the Maria regret.3sg that moved.3sg the little.finger hers
(Mary regrets that she lifted a finger.)

(68) a * Eklisome pu exi {opjonδipote/kanena} filo.
be-surprised.1sg that has FC / NPI friend
(I’m surprised she has any friend.)

b * Monon o Janis exi {opjonδipote/kanena} filo.
(Only John has any friend.)

And notice that the opjonδipote, kanenas NPIs are of the more liberal variety, hence we cannot invoke a “stronger” status to rule them out.

5.2 Alternative: any is not licensed but rescued with only and factives!

Giannakidou 2006:

| Any and minimizers are not always licensed; sometimes they can be tolerated in a context because that context gives rise globally to a nonveridical inference. |

(69) Rescuing by nonveridicality
A PI α can be rescued in the scope of a veridical expression β in a sentence S, if (a) the global context C of S makes a proposition S' available which contains a nonveridical expression β; and (b) α can be associated with β in S'.
Where “association with a nonveridical proposition” means “be in the scope of a nonveridical expression at a level other than LF”, however we are to define it, perhaps at the expressive Emph-layer (suggested in Yoshimura 2007, building on Potts’s work).

This clause builds on what I called indirect licensing in earlier work (Giannakidou 1998, 1999), and:

Rescuing happens in violation of scope at LF!

(see also the related notion of assertoric inertia, Horn 2002).

Some clarifications

• The global context C of S is the set of propositions that arise from S without necessarily being entailed by it. C thus contains the assertion (entailments), and presuppositions, implicatures.

• The stricter PI classes will only be licensed via scope at LF.

• In the case of only, the nonveridical proposition is an entailment (the non-cancelable exclusive conjunct); in the case of emotive factives it is possibly a conventional implicature.
Implications

- Necessary to keep the syntax (LF) "clean" of implicatures: if global information were available at LF, it should be accessible to licensed PIs too, thus making licensing possible, contrary to fact.

- The empirical difference between licensing and rescuing can thus be taken as an argument for the standard neo-Gricean view (pace Chierchia 2002, 2006; for a recent critique on more general grounds see Russell 2007), and also in line with Potts (2005) where conventional implicatures are computed at a level distinct from the truth conditional "at-issue" meaning.

6 Compositionality: Why are NPIs banned from veridical contexts?

And: Why are the various kinds of NPIs and FCIS permitted in exactly the contexts they are?

Two approaches:

- The unitary source position (Kadmon and Landman 1993, Krifka 1995, Chierchia 2006, Lee and Horn 1994, Lahiri 1998): Underlying unifying idea: there must be one source of ill-formedness and this source is scalarity: NPIs and FCIs are scalar, and it is this scalarity that makes them somehow polarity sensitive.

- The diversity position: Giannakidou 1998, 2001, 2006: the source of ill-formedness is not uniform, in fact we shouldn’t expect it to be!

6.1 Scalarity, domain widening, even: Kadmon and Landman

(70) Meaning of any (Kadmon and Landman 1993)
\[ \text{any CN} = \text{the corresponding indefinite NP or CN with the additional semantic/pragmatic characteristics (widening, strengthening) contributed by any.} \]

(71) Widening of any (Kadmon and Landman 1993)
In an NP of the form any CN, any widens the interpretation of the common noun phrase along some contextual dimension.

(72) Licensing condition for any: Strengthening
\[ \text{Any is licensed only if the widening that it induces creates a stronger statement, i.e. only if the statement on the wide interpretation entails the statement on the narrow interpretation.} \]

(73) a I didn’t see any book on the table.
b * I saw any book on the table.

6.2 Problems with widening:

Widening is not always present with FCIs (Krifka 1995, and others later):
Pick any one of these 5 cards. (partitive, specific set of cards)

Consider any arbitrary number.

Not all NPIs are scalar: kanenas

Not all scalar PIs improve with negation: any (good) and FCIs (bad) with negation. Recall:

*Idha opjondhipote. (Greek; Giannakidou 2001)
saw.perf.1sg FC-person
*I saw anybody.

*Dhen idha opjondhipote.
not saw.perf.1sg FC-person
Intended: ‘I didn’t see anybody.’

Asymmetry within the class of NPIs and FCIs: all are scalar, but not all are polarity sensitive.

Whoever saw a fly in his soup complained to the manager.

Irgendein hat angerufen.

Anyone complained to the manager.

Widening alone cannot rule out NPIs in positive episodic sentences (Giannakidou 2001). It is the composition external requirement of strengthening that works as a filter to rule NPIs out.

So, the widening approach is ultimately non-compositional!

6.3 Chierchia 2006

The NPI introduces alternatives:

*I saw any boy. (Chierchia’s (47))

Meaning
∃w′∃x∈D_w[boy_w′(x) ∧ saw_w(I, x)]

Alternatives
∃w′∃x∈D_w[boy_i,w′(x) ∧ saw_w(I, x)], where 1 ≤ i ≤ 3

Key assumptions:
• Active alternatives must be used to enrich plain meaning.
• In choosing among alternatives, speakers do tend to go for the strongest one they have evidence for. In the case above, we end up saying that even the most liberal (i.e., broad) choice of D makes the sentence true: “in other words, the base meaning will acquire an even-like flavor” (Chierchia 2006: 556).

Implicature
∃w′∃x∈D_w[boy_w′(x) ∧ saw_w(I, x)] ⊆ c
∃w′∃x∈D_w[boy_i,w′(x) ∧ saw_w(I, x)], where 1 ≤ i ≤ 3 and p ⊆ c q = p is stronger (hence, less likely) than q relative to the common ground c
“Given the way domains are chosen, (48) is logically false: all of the alternatives are logically stronger than the statement in b; therefore, the latter statement cannot be less likely than its alternatives. Sentence (47a) enriched by implicature (48) is inconsistent, whence its deviance.” (Chierchia 2006: 556).

But this is too weak: logically false statements are not ungrammatical (Giannakidou 2001, 2007)!

Hence, domain widening does not provide the correct foundation for capturing the correct distribution and interpretation of NPIs.

6.4 Lahiri’s generalization

Underlying idea: NPIs (and FCIs) contain EVEN.

Lahiri 1998: the low-likelihood presupposition of EVEN creates a conflict when combined with ONE in a positive sentence. The conflict is resolved in negative and DE contexts in general, thus NPIs will be admitted only in these contexts. This is a general claim about NPIs (and FCIs).

Fact: Though attractive, Lahiri’s generalization is empirically unsustainable.

6.4.1 With negation, low scalars do NOT always improve

Greek evens and even-NPIs (Giannakidou 2007)

(79)  a I Maria efaje the Maria ate akomi ke even to pagoto. (positive EVEN)
     b *I Maria efaje the Maria ate oule even to pagoto. (NPI-EVEN)
     c ?#I Maria efaje the Maria ate esto even to pagoto. (flexible scale EVEN)

(80)  Presupposition of akomi ke

∃x [x ≠ ice-cream ∧ ate(Maria, x)], and
∀x [x ≠ ice-cream → likelihood (Maria eating x) > likelihood (Maria eating ice-cream)]

Akomi ke associates with the lowest end of a likelihood scale (just like Kartunnen and Peters suggested)

(81)  [[akomi ke (x) (P)] = 1 iff P(x)= 1; (assertion)

∃y [y ≠ x ∧ P(y)] ∧
∀y[y ≠ x → likelihood (P(y)) > likelihood (P (x))]

With one:

(82)  ?#Akomi ke ENAS fititis irthe.

??Even ONE student arrived.
The incompatibility with one persists with negation, even if akomi ke appears overtly above it:

(83) a # Akomi ke ENAS fititis dhen irthe.
     even one student didn’t arrive.
b Oute ENAS fititis dhen irthe.
     Not even one student arrived.

(84) # Akomi ke enan fititi dhen idha.
     even one student I didn’t see.

(85) a # ΄∃ n [n ≠ one ∧ n students arrived] ∧ ∀n [n ≠ one →
     likelihood (n students arriving) > likelihood (one student arriving)]
b # ΄∃ n [n ≠ one ∧ it is not the case that n students arrived] ∧ ∀n [n ≠ one →
     likelihood (n students not arriving) > likelihood (one student not arriving)]

Giannakidou 2007: one is the most likely, and not the least likely, cardinality, hence there will always be a problem when combining it with an EVEN that lexically requires a low-likelihood item.

Low-scalar flexible even also does not improve with negation (Giannakidou 2007)

(86) # O Janis dhen milise esto (ke) me tin Maria.
     the John not talked.3sg even with the Maria
     John didn’t talk to even Maria.

(87) O Janis dhen miliseoute me tin Maria.
     the John not talked.3sg even with the Maria
     John didn’t talk even to Maria.

(88) \[\text{esto (ke) (x) (P)}\] = 1 iff \( P(x) = 1; \)
     \( \exists y [y \neq x ∧ C(y) ∧ ¬P(y)] \land \)
     \( \exists Q_{\text{scalar}} [C(Q) ∧ ∀y [y \neq x → Q(y) > Q(x)]] \)
     (presupposition)

(89) \[\text{NOT oute (x) (P)}\] = 1 iff \( ¬P(x) = 1; \)
     \( \exists y [y \neq x ∧ C(y) ∧ ¬P(y)] \land \)
     \( ∀y [y \neq x → \text{likelihood (P(x)) > likelihood (P(y))}] \)
     (presupposition)

Hence:

Whether or not an NPI containing EVEN improves with negation may be a matter of lexical choice for that NPI, and is not generally predictable by low-likelihood.

6.4.2 Even-NPIs are out with simple DE, but not negative, quantifiers

Giannakidou 2007:

(90) *To poli pende fitites dhiavasan oute ena arthro.
     ‘At most 5 students read even one article.’

Greek
(91) *To poli pende* pedhia efagan *esto* ena pagoto.
(?)At most five children ate even one ice-cream

(92) *To poli pende fitites aghorasan* *akomi ke ena vivlio.*
? At most five students bought even one book.

(93) *Weinigen* zullen *ook maar iets* bereiken. Dutch
few will even something achieve

Japanese
(94) a. Watasi-wa gakusei-o {dare-mo / hito-ri-mo} mi-nakat-ta.
I-TOP student-ACC {who-MO / one-CL-MO} see-NEG-PAST
‘I didn’t see any student.’
student-ACC {who-MO / one-CL-MO} see-if inform-IMP
‘If you see any student, inform me.’

The non-improvement indicates that DE, at least in some languages, is not a sufficient condition for the occurrence of EVEN ONE and even.

6.4.3 Improvement in non-veridical contexts does not follow

…Not from Lahiri’s reasoning. Also, the differences in meaning between FCIs and NPIs do not follow.

7 Alternative: dependent variables

Giannakidou 1998, 2001: enrich the ontology of variables and include dependent ones.

Basic observation: some variables cannot be existentially closed in the ordinary way. NPIs and FCIs that are polarity sensitive contain such variables.

Thus the difference between polarity sensitive and non-polarity sensitive elements is sortal.

7.1 NPIs: dependent individual variables

(95) Idha enan fititi.
saw.1sg a student
‘I saw a student.’

(96) a [[a student]] = student(x)
b $\exists x \ [\text{student}(x) \land \text{saw}(I, x)]$ Existential closure (Heim 1982)

Giannakidou 1998, 2001: certain PIs are indefinites introducing variables which cannot undergo these standard procedures.
DEFINITION 4 — Dependent Indefinites (cf. Giannakidou 1998: 140)
An indefinite is dependent iff the variable $x_d$ it contributes cannot introduce a discourse referent in the actual world.

An indefinite with a dependent $x_d$ variable is inherently non-referential, it will thus always take narrow scope and cannot be used as a topic.

This means that $x_d$ cannot be $\exists$-closed by the default existential quantifier (either text-level or in the nuclear scope) in a veridical context. $\exists$-closure will generally be fine in the scope of a nonveridical operator, because the nonveridical operator ensures that $x_d$ will not be forced to introduce a discourse referent in the actual world. The variable $x_d$ can also be bound by the nonveridical operator.

Questions to be explored:

- How does the notion of dependent definite relate to Partee’s 1986 theory of NP-interpretation and shifts?

Genitive of negation in Russian (Partee and Borschev 2004, Borschev et al. 2007): property-type hypothesis for Russian genitives:

(98) Russian gen is “preferentially” interpreted as property-type $<e,t>$.

Given that dependent indefinites are all non-referential and narrow scope.

- Is being interpreted in $et$ co-extensive with being dependent?
- Does the type-driven approach allow us to formalize the appropriate distinctions? Perhaps a hierarchy of non-referential NPs?

If indeed the property of dependence is a manifestation of the general constraints of NP-intpretation, as we would hope, then NPIs of this type are not special in any mysterious way. Good result!

7.2 FCIs: dependent world variables

Giannakidou 2001, Giannakidou and Cheng 2006: FCIs are intensional indefinites. They contain a dependent variable $w_d$ that must be bound by an operator that can bind such a variable—a Q, modal, or intensional operator. In an episodic context (veridical or not) there is no such operator, the variable remains unbound, and the FCI is uninterpretable.

(99) $[[\text{opjosdhipote fititis}]] = \text{student}(x)(w_d)$

(100) *Idha opjondipote ston kipo. 
$not \text{ saw.1sg anybody in-the garden}$

(101) *Dhen idha opjondipote ston kipo. 
$not \text{ saw.1sg anybody in-the garden}$
The world variable \( w_d \) cannot be assigned the default value of the actual world, and since there is no world-binder in episodic sentences, FCIs are uninterpretable and the structures are ruled out.

Hence, in this account:

It is the presence of an unbound \( w \) variable that renders items containing it unusable in episodic sentences.

\[ \# \exists !e \exists x [\text{person} (x, w_d) \land \text{saw} (I, x, e) \land \text{in-the-garden} (e)] \]

\[ \# \neg \exists !e \exists x [\text{person} (x, w_d) \land \text{saw} (I, x, e) \land \text{in-the-garden} (e)] \]

\[ \exists x \text{ [person} (x, w_d) \land \text{saw} (I, x, e) \land \text{in-the-garden} (e)] \]

\[ \neg \exists x \text{ [person} (x, w_d) \land \text{saw} (I, x, e) \land \text{in-the-garden} (e)] \]

\[ \# \exists !e \exists x \]

\[ \# \neg \exists !e \exists x \]

\[ \exists !e \exists x \]

\[ \neg \exists !e \exists x \]

\( \exists !e \exists x \)
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