Institute for Logic, Language and Computation

Universiteit van Amsterdam

Everything and Nothing

Giorgio Sbardolini

TbiLLC 2025

- Linguistic data
- Philosophy of logic
- The Explanatory Question
- The Licensing Question

Negative Polarity

Licensing question, Explanatory question

Ladusaw's Generalization: weak Negative Polarity Items (wNPIs) like English *any* and *ever* are acceptable in DE (downward entailing) environments, and not acceptable in UE (upward entailing) environments (Ladusaw, 1979; Kadmon and Landman, 1993; Krifka, 1995; Chierchia, 2013). The interpretation of *any* and *ever* under negation is existential (Klima, 1964).

(1) a. *I ate **any** pizza.
b. I didn't eat **any** pizza. $\Rightarrow \neg\exists$

(2) a. *He has **ever** played with us.
b. He hasn't **ever** played with us. $\Rightarrow \neg\exists$

(3) a. *Everyone who was happy ate **any** pizza.
b. Everyone who ate **any** pizza was happy.

(4) a. *Everyone who won has **ever** played with us.
b. Everyone who has **ever** won, played with us.

Environments:

A function f is DE iff if $a \vDash b$ then $fb \vDash fa$. (to be generalized)
A function f is UE iff if $a \vDash b$ then $fa \vDash fb$.

Are NPIs addicted to DE or are they allergic to UE?

Standard View: Chierchia (2013). (Kadmon and Landman (1993); Krifka (1995), a.o.)

- Logicality of Language Hypothesis (Gajewski, 2007, 2011; Del Pinal, 2019): "Syntax interfaces with a logical apparatus to the point that things that 'feel' syntactically ill-formed really owe their status to their logical properties" (Chierchia, 2013, p. 10).
- *any* and *ever* denote ∃ with associated scalar alternatives.
- Implicature-derivation (by *exh*) generates triviality unless the NPI is in a DE environment.

- The Standard View is designed to explain why wNPIs are only acceptable in DE environments (DE addiction).

Neither UE nor DE

wNPIs are acceptable in non-monotone environments (Heim, 1987; von Fintel, 1999; van Rooy, 2003).

(5)
a. Only Mary said anything.
b. Did Mary say anything?
c. Exactly two students said anything.
d. If I saw any mosquito, I killed it.
e. Most people who ate any pizza loved it.

(6)
a. Only Mary ever wanted to leave.
b. Have you ever talked to Mary?
c. Exactly one student ever wanted to leave.
d. If he has ever seen an aardvark, he would know.
e. Most people who ever ate pizza loved it.

Both UE and DE

wNPIs are unacceptable in environments that are both UE and DE (Barker, 2018; Rothschild, 2015).

(7)
a. *Zero or more students read anything.
b. *At most one student and at least three students read anything.
c. ?The boy saw any girl.

So, *any* and *ever* are not addicted to DE, they are allergic to UE.

There is a "reductionist" program to turn every non-mon function into a DE function (von Fintel, 1999; Guerzoni and Sharvit, 2014; Nicolae, 2014). Chances of success are under debate (Homer, 2008, 2015, 2020; Barker, 2018).

Different kinds of wNPIs

Unlike *ever*, *any* is acceptable under generics, possibility modals, imperatives, relative clauses (*subtrigging*) (Linebarger, 1987; Dayal, 1998; Barker, 2018). Here we get (in some cases at least) a so-called "free choice" interpretation ($\forall\Diamond$).

(8) a. Any owl hunts mice.
b. *Owls ever hunt mice.

(9) a. Any student can solve this problem. $\Rightarrow \forall\Diamond$
b. *All students can ever solve this problem.

(10) a. Pick any apple. $\Rightarrow \forall\Diamond$
b. *Pick ever apple.

(11) a. I ate any pizza that I found on the table.
b. *I ever ate pizza that I found on the table.

Summary

- wNPIs are allergic to UE
- There is a distributional difference between *any* and *ever*
- Promising proposal: LOLH

Harmony

Prior (1961)

If *tonk* is in the language (and $\vDash$ is transitive) then $\vDash$ is trivial (Belnap, 1962; Dummett, 1981; Tennant, 2007; Steinberger, 2011; Tranchini, 2024).

$$p \vDash p \ tonk \ q \qquad \text{...same as } \vee$$
$$p \ tonk \ q \vDash q \qquad \text{...same as } \wedge$$

Harmony Hypothesis

wNPIs are universal if positive and universal if negative ("all or nothing"). Negation is Boolean.

$$[\![\text{ANY } x : Fx]\!]^{w,g} = 1 \text{ iff } [\![Fx]\!]^{w,g[x/d]} = 1 \text{ for all } d \in D \qquad \text{...same as } \forall$$
$$[\![\text{ANY } x : Fx]\!]^{w,g} = 0 \text{ iff } [\![Fx]\!]^{w,g[x/d]} = 0 \text{ for all } d \in D \qquad \text{...same as } \exists$$
$$[\![\neg\varphi]\!]^{w,g} = 1 \text{ iff } [\![\varphi]\!]^{w,g} = 0$$

"Everything and Nothing"

Prediction 1

$\neg\text{ANY} \equiv \neg\exists$
$[\![\neg\text{ANY } x{:}see(j,x)]\!] = 1$ iff $[\![\text{ANY } x{:}see(j,x)]\!] = 0$ iff $[\![see(j,x)]\!] = 0$ for all $d \in D$

Prediction 2

Disharmony: truth- and falsity-conditions are not incompatible.

$$\text{ANY } x : Fx \vDash Fa \qquad \text{by the truth-conditions of } any$$
$$\neg\text{ANY } x : Fx \vDash \neg Fb \qquad \text{by the falsity-conditions of } any$$

Suppose $\neg Fa$ and ANY x: Fx. Then Fa. Contradiction. Then $\neg$ANY x: Fx. Then $\neg Fb$.

Natural language is not trivial. Why? Because ANY is not *assertable*. (LOLH)

(12) a. Mary met any man ⊨ Mary met John.
b. Mary didn't meet any man ⊨ Mary didn't meet John.

(13) *Mary met any man.

- Asserting a premise ("supposing to be true") and asserting the conclusion, are necessary to reasoning.
- Natural language would be (Post) trivial if sentences of the form ANYx : Fx could be used in valid arguments. They cannot be so used.

Explanatory question

The grammar avoids the triviality engendered by disharmonious quantifiers by preventing them from being asserted, so that they can only be used restrictedly in inferences (LOLH). Consequently, wNPIs have a restricted grammatical distribution.

An argument from $\varphi_1, ..., \varphi_n$ to ψ is *Frege valid* iff:
(cf. von Fintel on *Strawson-validity*)

(a) $\varphi_1, ..., \varphi_n \vDash \psi$ (truth-preservation)

(b) $\varphi_1, ..., \varphi_n$ and ψ are asserted.

Some inferences are truth-preserving but not Frege-valid (12a/b).

UE allergy

Licensing Hypohtesis (1st version): a wNPI is grammatical only if it does not occur in an *assertoric* environment.

φ	$\neg\varphi$	$?\varphi$	$!\varphi$	$\Diamond\varphi$

The Origin Story

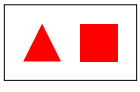
Why would disharmonious expressions exist?

wNPIs have (very!) simple meanings: there is a trade-off between harmony and complexity.

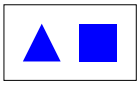
- For a *harmonious* quantifier with "simpler" truth-conditions ($\forall$) the falsity-conditions are more complex ($\neg\forall = \exists\neg$)
- The truth- and falsity-conditions of *disharmonious* quantifiers are equally simple.
- "Everything and Nothing"

(i) Homogeneity. There is cognitive pressure to avoid "split" models.

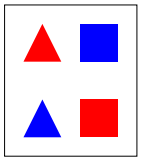
(14) a. The toys are red. $\Rightarrow \forall xRx$
b. The toys are not red. $\nRightarrow \neg\forall xRx, \Rightarrow \neg\exists xRx$



(1) Verifier



(2) Falsifier



(3) Falsifier (split)

(ii) Language change. *Ever* used to be a universal quantifier.

(15) a. Let me live here ever. (*The Tempest*, Act 4, I, 1623)
b. That we may ever live with thee in the world to come. (*Book of Common Prayers*, 1549)
c. They lived happily ever after.

also *everlasting, evergreen, forever*, ...

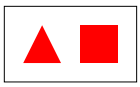
Italian wNPIs *mai* (*ever/never*) and *affatto* (*at all*) used to be universals.

(16) a. Una parte del mondo è, che si giace mai sempre in ghiaccio, ed in gelate nevi.
'A part of the world is **mai** (ever) always laying in ice and frozen snow.'
(Francesco Petrarca, *Rime*, Tomo I, Canzone II; 14th century)
b. Io m'ero cavato la sete affatto.
'I quenched my thirst **affatto** (at all).' (Benvenuto Cellini, *Vita*, 1563)

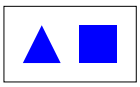
(iii) Implementation. Consider a *bona fide* universal quantifier.

$Qx : Fx$ is true at w iff every d in every part of w is F

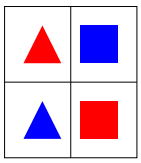
$Qx : Fx$ is false at w iff every d in some part of w is not-F



(1) Verifier



(2) Falsifier



(3) Falsifier (split)

No split! The effects of cognitive simplicity can be modeled as an operation on situations:

$$[[\varphi]]^{w,g} = 1]^{\star} \text{ iff } [[\varphi]]^{w,g} = 1 \text{ and for all } t \lhd w : t = w$$
$$[[\varphi]]^{w,g} = 0]^{\star} \text{ iff } [[\varphi]]^{w,g} = 0 \text{ and for all } t \lhd w : t = w$$

This has no consequences for the truth-conditions of Q: it remains a universal "in the positive". But it becomes universal "in the negative":

$$\begin{aligned}[[[Qx : Fx]]^{w,g} = 0]^{\star} &\text{ iff } [[Qx : Fx]]^{w,g} = 0 \text{ and for all } t \lhd w : t = w \\ &\text{iff } [[Fx]]^{t,g[x/d]} = 0 \text{ for some } t \lhd w \text{ for all } d \in D_t, \text{ and for all } t \lhd w : t = w \\ &\text{iff } [[Fx]]^{w,g[x/d]} = 0 \text{ for all } d \in D_w\end{aligned}$$

Q was a *bona fide* universal quantifier and it is now simpler but disharmonious.

Avoid assertion?

wNPIs avoid assertion by checking for properties of assertion and avoiding environments with those properties. Different wNPIs are sensitive to different properties of assertion (cf. (8), (9), (10), (11)).

Remark. If f is UE it satisfies (i)–(iv), but f may satisfy some of (i)—(iv) without being UE.

(i)	$f(p \wedge q) \vDash fp$	
(ii)	$f\forall x : \varphi x \vDash f\varphi a$	
(iii)	$fp \vDash f(p \vee q)$	
(iv)	$f\varphi a \vDash f\exists x : \varphi x$	(Barker, 2018)

$\Diamond$ and ! satisfy (iv) but are not UE (Ross's Paradox).

(17) a. Mary might steal my bike $\vDash$ Someone might steal my bike
b. You may take the train $\nvDash$ You may take the train or the airplaine

A function f is UE iff if $X \vDash Y$ then $fX \vDash fY$
(Zwarts, 1998) A function f is UE iff if $\{X_1, X_2, ...\} \vDash Y$ then $fX_i \wedge fX_2 \wedge ... \vDash fY$.

$p, q \vDash p \wedge q$ but $\Diamond p, \Diamond q \nvDash \Diamond(p \wedge q)$

Option 1: Avoid UE

Licensing hypothesis for English *any*. English *any* and elements of the *any*-series (*anybody, anyone, anything,* etc.) are grammatical only if they do not occur in a UE environment.

Prediction

Ungrammaticality in UE environments (plain assertions, scope of $\forall, \exists$,. ...): (1)a, (3)a, (7)a,b;
Grammaticality in non-UE environments (denials, questions, non-mon quantifiers, conditional antecedents, possibility, imperatives): (1)b, (3)b, (5)a,b,c,d, (8)a, (9)a, (10)a, (11)a.

Prediction

Free choice *any* predicted if we assume Possibility inference $\Diamond$ANY $xFx \vDash \Diamond Fa$:

(18) a. Mary might be anywhere.
$\Diamond$ANY $w : be(m, w)$
b. Mary might be anywhere $\vDash$ Mary might be in Paris and Mary might be in Amsterdam

$\Diamond$ANY x: $Fx \vDash \Diamond\forall x$: Fx but it is not Frege-valid! (Failure of Modal Instantiation)

Option 2: Avoid Barker

Licensing hypothesis for English *ever*. English *ever* is grammatical only if it does not occur in a Barker environment.

A function f is *Barker* iff (iv) holds, i.e., $f\varphi a \vDash f\exists x : \varphi x$.

Prediction

Ungrammaticality in UE environments (all UE environs are Barker): (2)a, (4)a;
Ungrammaticality in Barker environments (possibility modals, imperatives): (8)b, (9)b, (10)b, (11)b;
Grammaticality in non-Barker environments (denials, questions, non-mon quantifiers, antecedents of conditionals): (6)a,b,c,d.

Other options (Zwarts, 1998).

The Interpretation of any

(19) Only Mary said anything.

Non-mon quantifiers

$$[\![\text{ONLY } a\text{: } Fa]\!]_g^{M,w} \begin{cases} = \# & \text{if } [\![Fa]\!]_g^{M,w} = 0 \\ = 1 & \text{only if } \neg\exists x \neq [\![a]\!]_g^{M,w}([\![Fx]\!]_g^{M,w}) = 1 \end{cases}$$

- $[\![\text{ONLY } m\text{: ANY } y\text{: } say(m,y)]\!]_g^{M,w}$ is undefined if $[\![\text{ANY } y\text{: } say(m,y)]\!]_g^{M,w} = 0$ iff Mary said nothing.
- If $[\![\text{ONLY } m\text{: ANY } y\text{: } say(m,y)]\!]_g^{M,w}$ is defined and true then everyone other than Mary is such that $[\![\text{ANY } y\text{: } say(m,y)]\!]_g^{M,w}$ is false.

Polar Questions

(20) Did Mary meet any professor?

Naïve approach: $?(\text{ANY } x\text{: } Fx) := \{[\![\text{ANY } x\text{: } Fx]\!]_g^{M,w} = 1, [\![\text{ANY } x\text{: } Fx]\!]_g^{M,w} \neq 1\}$

This can't be. If someone asks whether Mary met any professor they cannot expect to receive the answer *Yes, Mary met any professor.*
However, if p does not contain disharmonious operators, asking whether p is true or not true is the same as asking whether p is false or not false.
Better approach: $?(\text{ANY } x\text{: } Fx) := \{[\![\text{ANY } x\text{: } Fx]\!]_g^{M,w} \neq 0, [\![\text{ANY } x\text{: } Fx]\!]_g^{M,w} = 0\}$

ANY *professor* x: $meet(m,x)$ is false iff Mary met no professor, and it is not false iff Mary met some professor.

Conclusion

- wNPIs are disharmonious
- they exist because they maximize cognitive simplicity (No Split!) at the cost of harmony (logical "coherence")
- By the Logicality of Language Hypothesis, the grammar blocks triviality by preventing wNPIs from *assertion* (UE environments, Barker environments)
- Assertion is targeted because of its role in reasoning (hence, in triviality derivation).

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