Scalar implicatures, polarity phenomena, and the syntax/pragmatics interface (Chierchia 2004)

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Plan:

1. Explain Chierchia's localist approach to scalar implicature (SI)
2. Introduce intervention of negative polarity items (NPI)
3. Explain how Chierchia's approach to SI explains intervention.

1 Chierchia's localist approach to SI

Existing neo-Gricean view:

> Grammar (which includes syntax and semantics) is a computational system that delivers, say, pairs of phonetic representations and interpreted logical forms. The output of the computational system is passed onto the conceptual/pragmatic system that employs it for concrete communication. The computational system of grammar and the conceptual/pragmatic system are separate units and work in a modular way: each unit is blind to the inner workings of the other. (Chierchia, 39)

Chierchia's localist view, counter to the neo-Gricean view:

> Implicatures are not computed after truth conditions of (root) sentences have been figured out; they are computed phrase by phrase in tandem with truth conditions (or whatever compositional semantics computes). (Chierchia, 40)

1.1 Some relevant phenomena

1.1.1 Some troublesome cases for Gricean approach

(i). scalar term under propositional attitude operator:

(Chierchia (12)) John believes that some students are waiting for him

$\rightsquigarrow$ John believes that not all students are waiting for him.

(ii). scalar term under some sentential connective(s):

(Chierchia (21a)) Mary is either working at her paper or seeing some of her students

$\rightsquigarrow$ Mary is either working at paper or seeing some but not all of her students

(iii). scalar term under nonmonotone quantifiers:

(Chierchia (25)) Exactly two students wrote a term paper or made a class presentation

1.1.2 Cases of Scalar Implicature suspension:

(Chierchia (33a)) No student with an incomplete or a failing grade is in good standing

(Chierchia (38.a.i)) John doubts that Paul or Bill are in that room

1.1.3 Cases of Scalar Implicature Recalibration (Indirect SI):

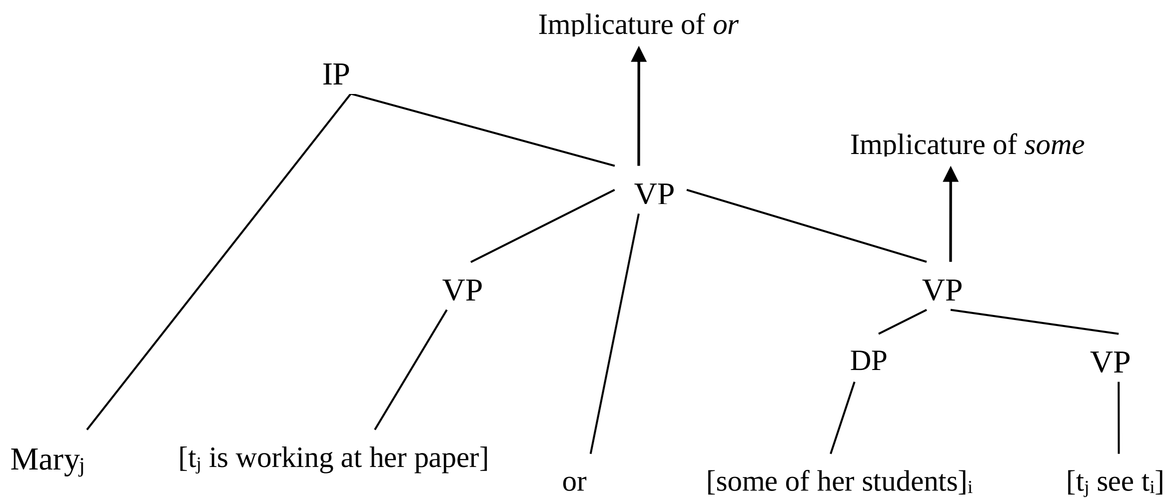
(Chierchia (55b)) No one read many papers $\rightsquigarrow$ Someone read some papers.

(Chierchia (61)) I doubt that most students will show up $\rightsquigarrow$ I think that some student will show up

1.2 Chierchia's machinery:

Illustration of the proposal (Chierchia, 47):

(Chierchia (27)) Mary is either working at her paper or seeing some of her students.



(Below we use mainly examples to show Chierchia's machinery. For more formal details, see Appendix.)

A. Defining Scalar Alternatives of an expression α: α^{ALT}

(i) Horn scales

(ii) Scalar alternatives of complex phrases

Examples:

[some]^{ALT} = {… some … every}

(Chierchia, Appendix) [J smokes or M smokes]^{ALT} = {smoke(J) or smoke(M), smoke(J) & smoke (M)}

(Chierchia (71)) [some student smokes or drinks]^{ALT} = {some (student) (smoke or drink), many (student) (smoke or drink), every (student) (smoke or drink)}

B. The immediately stronger item to α in α^{ALT}: $S(\alpha^{ALT})$

$S(\alpha^{ALT})$ = the weakest item of α^{ALT} which asymmetrically entails [[α]] (if such item exists)

Examples:

(Chierchia (72)): S((some student smokes or drinks)^{ALT}) = many student smokes or drinks

C. Defining Strong Meaning of expression α ($[[\alpha]]^S$):

Rough-and-ready way of computing:

(i) if $[[A]]$ is of type t, then $[[A]]^S = [[A]]$ & Not $[[S(A^{ALT})]]$

(ii) For an expression $A = B\ (C \wedge s \wedge D)$, s being a scalar item:

if B doesn't create DE, then $[[A]]^{S} = [[B]]^{S}([[C \wedge s \wedge D]]^{S})$ …
if B creates DE, then $[[A]]^{S} = [[B\,(C \wedge s \wedge D)]]^{S}$,
where the relevant scale is $\{\, [[B]]\,([[c]]) \mid c$ is an element of $(C \wedge s \wedge D)^{ALT} \}$…

E.g. *scalar implicature suspension:*
(from Chierchia (79)): α = doubt that John saw some students.
α = Not believe (some student$_i$ (John saw t$_i$))
$[[\alpha]]^{S}$ = $[[\text{Not believe}]]^{S}$ ([[some student$_i$ (John saw t$_i$)]]) …
$[[\alpha]]^{S} \neq [[\text{Not believe}]]^{S}$ ($[[\text{some student}_i \text{ (John saw } t_i)]]^{S}$)

E.g. *scalar implicature recalibration*
(from Chierchia (83)): α = doubt that John drinks and drives
α = Not believe (drink(J) & drive(J))
$[[\text{Not believe (drink(J) \& drive(J))}]]^{S}$ = $[[\text{Not believe}]]^{S}$ ([[drink(J) & drive(J)]]) & Not $[[S(\alpha^{ALT})]]$
α^{ALT} = {Not believe (drink(J) & drive(J)), Not believe (drink(J) or drive(J))}
$S(\alpha^{ALT})$ = Not believe (drink(J) or drive(J))
$[[\text{Not believe (drink(J) \& drive(J))}]]^{S}$ = Not believe (drink(J) & drive(J)) & believe (drink(J) or drive(J))
… so "doubt that John drinks and drives" ⇝ "believe that John drinks or drives".

1.3 Application of Chierchia's machinery:

(i). scalar term under propositional attitude operator:
(Chierchia (12)) John believes that some students are waiting for him
$[[(12)]]^{S}$ = John believes ((some students are waiting) & (not all students are waiting))

(ii). scalar term under sentential connective(s):
(Chierchia (21a)) Mary is either working at her paper or seeing some of her students
$[[(21a)]]^{S}$ = Mary$_i$ (((i is working at paper) or (i is seeing some but not all of her students)) & Not ((i is working at paper) & (i is seeing some but not all of her students)))

(iii). scalar implicature suspension and recalibration: (also see 1.2.C)
(Chierchia (61)) I doubt that most students will show up ⇝ I think that some student will show up
$[[\text{I doubt that most students will show up}]]^{S}$ = $[[\text{I Not believe (most students will show up)}]]^{S}$
(Not believe (most students will show up))^{ALT} = { Not believe (most students will show up), Not believe (some students will show up), ….}
S((Not believe (most students will show up))^{ALT})= [Not believe (some students will show up)]
$[[\text{I doubt that most students will show up}]]^{S}$= [I Not believe (most students will show up)] & [I believe (some students will show up)]

There is the intervention phenomenon concerning NPI, which seem to be explained well by Chierchia's localist proposal on SI.

2 NPIs and how they link up to this story

- Expected SI are suspended in exactly the same contexts where NPIs are good (DE contexts)

- Shown that SI are added only when they lead to strengthening
  When embedded under a DE operator, adding a SI inevitably weakens the statement, so SI are absent from these contexts
- Strengthening is directly relevant to existing accounts of NPIs: Kadmon & Landman (1993), Krifka (1995), Lahiri (1998)

- Summary of Kadmon & Landman (1993):
  Quantifiers are associated with domains: *everyone was late* ≠ everyone in the world was late
  English *any* is an existential quantifier that widens the domain that would normally be assumed
  Domain extension is limited to negative contexts, because there it causes strengthening
  In positive contexts, it would lead to weakening, and is therefore disallowed

  Let's call the normal domain *D* and the widened domain *D+*

  (Chierchia (102))

a.	*There is a student (in D) who doesn't know me.*	Stronger
b.	*There is a(ny) student (in D+) who doesn't know me.*	Weaker after domain extension therefore **any*

Formal underpinning of this intuition:
If for any set D,

(i) g(D) = D+

(ii) (D+) ⊇ D

then

(iii) $\exists_D\ x\ [\Phi]$ entails $\exists_{D+}\ x\ [\Phi]$

But under negation, this is reversed:

(iv) $\neg\ \exists_{D+}\ x\ [\Phi]$ entails $\neg\ \exists_D\ x\ [\Phi]$

We can confirm this by looking at the negated version of the same sentence

(Chierchia (105))

a.	*There isn't a student (*in D*) who doesn't know me.*	Weaker
b.	*There isn't a(ny) student (*in D+*) who doesn't know me.*	Stronger after domain extension therefore √ *any*

- Thus, SI and NPIs are both good in the same contexts: when they lead to strengthening

- But empirical facts show that they cannot be completely unified

2.1 Problem 1: NPIs show locality effects, SIs don't!

(Chierchia (107))
It is not true that there aren't any potatoes.
= ¬ [¬∃x potato(x)]

Value on standard domain D	= ∃x in *D* | potato(x)	Stronger
Value on widened domain D+	= ∃x in *D+* | potato(x)	Weaker after domain extension; therefore wrongly predicts **any*

- Thus, NPIs show roofing: only the first DE operator matters, whatever happens next has no impact

- If SI-suspension and NPI-licensing were exactly the same process, we should expect this roofing in SI too
- This is not the case

(Chierchia (108))
a. *It is warm outside.*
Implicature: *It is not boiling hot outside.*
b. *I doubt that it isn't warm outside.*
= I don't believe that [it isn't warm outside]

It isn't [warm and not boiling hot outside]	*Weaker than plain meaning*
I don't believe that [it isn't warm and not boiling hot outside]	*Stronger than plain meaning*

This is flip-flop – every higher operator matters; opposite to roofing

2.2 Problem 2: NPIs show intervention effects, SIs don't!

(Chierchia (109))
a. *I doubt that Sue has potatoes.*
b. *I **doubt** that Sue has **any** potatoes.*
c. *?? I **doubt** that <u>every</u> housemate of Sue has **any** potatoes.*
d. Control: *I doubt that every housemate of Sue has potatoes.*

(Chierchia (111))
a. *Every girl invited every boy three times.*
Implicature: *exactly three times*
b. ***Every** boy whom <u>every</u> girl invited has invited **three** times please stand up*.
No *exactly* implicature – *at least* reading

Another example:

a.	*Sue invited every boy **three** times.*	Three times and not more
b.	*I **doubt** that Sue invited <u>every</u> boy **three** times.*	Three or more times

2.3 Explaining roofing

2.3.1 STAGE 1: NPIs are exceptional; parasitic on indefinites.

- (Chierchia (113))
  Domain expansion must be universally closed. This must lead to strengthening of the meaning with the plain indefinite.

- (Chierchia (114))
  **Any man walked in.*
  Universal closure: for all *D*+, [some man walked in] Weaker
  Plain meaning: some man in *D* walked in Stronger
  Since the universal closure meaning is weaker, **any*

- (Chierchia (115))
  It is false that any man walked in.
  Universal closure: for all *D*+, [it is false that some man walked in] Stronger
  Plain meaning: it is false that some man in *D* walked in Weaker
  Since the universal closure meaning is stronger, √ *any*

- This can be represented using the variable binding operator **O** that introduces universal closure: (based on Chierchia (117))
  $\mathbf{O}_{\Delta,\, g}$ ¬ (any man_i in *D*+ | [t_i walked in])

2.3.2 STAGE 2: Features

- If all DE heads bear a feature +DE, the domain of a DE head is the same as scope of **O**.
- This explains roofing in the following standard syntactic way:
  Agree with closest c-commanding head

- (Chierchia (120))
  [. . . $\text{NEG}_{+\text{DE}}$ . . . [. . . $\text{NEG}_{+\text{DE}}$ . . . [. . . *NPI* . . .] . . .] . . .] (*Roofing)*

2.4 Explaining intervention

2.4.1 STAGE 1

- Intervenors are strange because they do not form a natural class:
  - strong quantifiers like *every*, *most*, *the*
  - numerals (but not numeral indefinites like *a*, *some*, bare plurals)
  - *and* (but not *or*)
    I **doubt that John ate the cake <u>and</u> drank **any** coffee.* *vs.*
    *I **doubt** that John ate the cake <u>or</u> drank **any** coffee.*
  - *because*-clauses (but not *if*-clauses)

- Therefore, the idea that they are all universal quantifiers like *every* (Lahiri 1998) won't work to characterize them

2.4.2 STAGE 2

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- Chierchia seeks the answer in implicatures
- The intervention of *everyone* is derived by considering implicatures

- (Chierchia (122)) – earlier accounts would go like this:
  a. *It is not the case that everyone has some potatoes.*
  = $\neg\ \forall$x some (potatoes in *D*) (λy has(x,y)) **Weaker**
  b. **It is **not** the case that <u>everyone</u> has **any** potatoes.*
  = *Univ. closure*: for all *D*+, [$\neg\forall$x some (potatoes in *D*+) (λy has(x,y))] **Stronger**
  Wrongly predicts √ *any*

- This is not the case if we consider implicature-rich strong meanings instead:
- (Chierchia (125))
  a. *It is not the case that everyone has some potatoes.*
  = $\neg\ \forall$x some (potatoes in *D*) (λy has(x,y)) $\wedge$ $\exists$x some (potatoes in *D*) (λy has(x,y))
  b. **It is **not** the case that <u>everyone</u> has **any** potatoes.*
  = *Univ. closure*: for all *D*+, [$\neg\forall$x some (potatoes in *D*+) (λy has(x,y))]

  Here, the sentence b. does not asymmetrically entail the sentence a.
  So adding *any* did not make it stronger, therefore correctly predicts **any*

- Thus, strong meanings become intervenors (you can't make a strong meaning any stronger by adding *any*).

- This is confirmed by the behavior of other intervenors from the list above:
- (Chierchia (128))
  a. *I doubt that John ate the cake and drank some coffee.*
  b. *I doubt that John ate the cake and drank some coffee, but I believe he did 1 of those 2 things.*
  c. **I **doubt** that John ate the cake <u>and</u> drank **any** coffee.*

  Here again, the c. sentence does not asymmetrically entail the b. sentence.
  So adding any did not make it stronger, therefore correctly predicts **any*

- Even the more peculiar intervenors like numerals make sense in this view:
  (Chierchia (132))
  a. *I doubt that I met eleven people who had read some of my poetry.*
  b. *I doubt that I met eleven people who had read some of my poetry, but I believe I met at least one person who had.*
  c. ** I **doubt** that I met <u>eleven</u> people who had read **any** of my poetry.*

  Same thing: again, the c. sentence does not asymmetrically entail the b. sentence.
  So adding any did not make it stronger, therefore correctly predicts **any*

- The troubling case of *because*-clauses as intervenors can be solved under a different syntactic account of *because* sentences. Chierchia sets this up using conjunction of two clauses:
- (Chierchia (143))
  a. *I **won't** marry a woman <u>because</u> I get **any** advantage out of it.*
     = [I will marry a woman]$_i$ ∧ ¬ CAUSE(I get advantage out of x_i)
  b. *I won't marry a woman because I get some advantage out of it.*

  This is similar to the others: the a. sentence asymmetrically entails the b. sentence. Therefore correctly predicts √ *any*.

  Conversely,

  c. **I **won't** marry a woman who has **any** money <u>because</u> I benefit from it.*
     = [I will marry a woman]$_i$ ∧ ¬ CAUSE(I get advantage out of x_i)
  d. *I won't marry a woman who has some money because I benefit from it.*

     Now, the c. sentence does not asymmetrically entail the d. sentence. Therefore correctly predicts **any*.

Appendix: Formal definitions

A. Defining Scalar Alternatives of an expression α: α^{ALT}

α^{ALT} =

if α is lexical, then

if α is in a scale <...>, then α^{ALT} = the scale <...>

otherwise, α^{ALT} ={α}

if α is [β γ], where β of functional type and γ of suitable argument type, then

if β^{ALT} is a singleton, then α^{ALT} = { [[β]]([[*c*]]) | *c* is an element of γ^{ALT}}

otherwise, α^{ALT} = { [[*b*]]([[γ]]) | *b* is an element of β^{ALT}}.........

B. The immediately stronger item to α in α^{ALT}: S(α^{ALT}) ($S_\alpha(\alpha^{ALT})$, to be clearer)

S(α^{ALT}) =

if α is not the strongest item in α^{ALT}, then

S(α^{ALT}) = α', α' being the weakest of α^{ALT} such that [[α']] asymmetrically entails [[α]]

if α is the strongest item in α^{ALT}, then

S(α^{ALT}) = The Contradiction

C. Defining Strong Meaning of expression α ($[[\alpha]]^S$):

a. if α is lexical, then $[[\alpha]]^S$ = [[α]] …

b. if [[α]] is of type t, then $[[\alpha]]^S$ = [[α]] & Not [[S(α^{ALT})]]

c. Strong Application (an upgraded version of Function Application):

if α = [β γ], where $[[\beta]]^S$ is of functional type and $[[\gamma]]^S$ of a suitable argument type, then

if [[β]] is not DE, then $[[\alpha]]^S$ = $[[\beta]]^S$ ($[[\gamma]]^S$) …?

if [[β]] is DE, then $[[\alpha]]^S$ = $[[\beta]]^S$ ([[γ]]) & Not [[S(α^{ALT})]]

(where the recalibrated α^{ALT} becomes {[[β]]([[*c*]]) | *c* is an element of γ^{ALT}})

(This is for *Implicature filtering and recalibration)* ….