(Non-)specificity across languages: constancy, variation, *v*-variation

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Plan

1. Introduction
2. Desiderata
3. The Framework
4. Applications
5. Appendix: Epistemic vs Deontic Modals & Epistemic Indefinites

Outline

A wealth of indefinites

Cross-linguistically, we witness a wealth of indefinite forms:

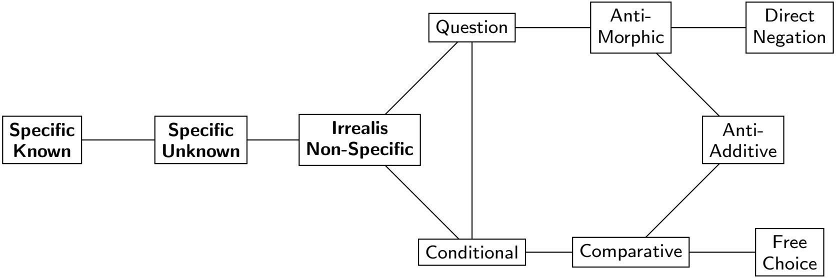
- English: *some*, *any*, *no*, ...
- Italian: *qualcuno*, *qualunque*, *nessuno*, *(un) qualche*, ...
- Dutch: *iets*, *enig*, *wie dan ook*, *niets*, ...
- German: *ein*, *irgendein*, ...
- Russian: *koe-*, *-to*, *-nibud*, ...
- Spanish: *algún*, *cualquiera*, *ningun*, ...
- Náhuatl/Mexicano (**Tuggy˙1979**): *yeka*, *sente*, *olgo*, ...
- Kannada: *-oo*, *-aadaruu*, ...
- ...

Why this variety? What do all these forms have in common? How to account for their differences in meaning and distribution?

Today's focus: scopal (specific vs non-specific) and epistemic (known vs unknown) uses of indefinites.

Haspelmath Map

Haspelmath (1997)'s map: a useful typological tool to capture the functional distribution of indefinites



Haspelmath's map (extended, Aguilar et al 2011)

Scopal vs epistemic specificity (Farkas, 1996)

- Scopal specificity: Indefinites marked for specificity tend to presuppose the existence of their referent, and introduce discourse referents:

(1) Ali wants to visit an Italian city.

a. **Specific**: There is a specific Italian city which Ali wants to visit [$\exists x/\Box$]

b. **Non-specific**: Ali wants to visit an Italian city, any Italian city would do [$\Box/\exists x$]

[Continuation *It is in the North-East* only possible for (1a)]

- Epistemic specificity: Indefinites marked for (un)known signal that the speaker does (not) know the identity of the referent

(2) A student called.

a. **Known**: The speaker knows which student called.
b. **Unknown**: The speaker doesn't know which student called.

Specific Known, Specific Unknown and Non-Specific

(3) a. **Specific known (SK):** scopal specific & epistemic specific

b. **Specific unknown (SU):** scopal specific & epistemic non-specific

c. **Non-specific (NS):** scopal non-specific

Illustration

(4) Ali wants to visit an Italian city.

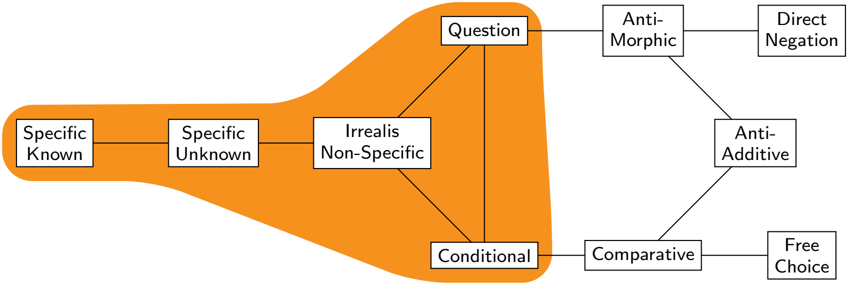
a. **SK**: There is a specific city which Ali wants to visit, and the speaker knows which

b. **SU**: There is a specific city which Ali wants to visit, but the speaker doesn't know which

c. **NS**: Ali wants to visit an Italian city, any Italian city would do

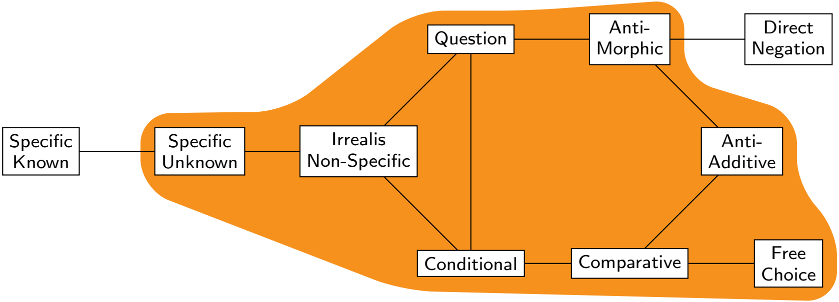
Cross-linguistically, languages developed lexicalized form with restricted distributions with respect to these uses.

Haspelmath Map



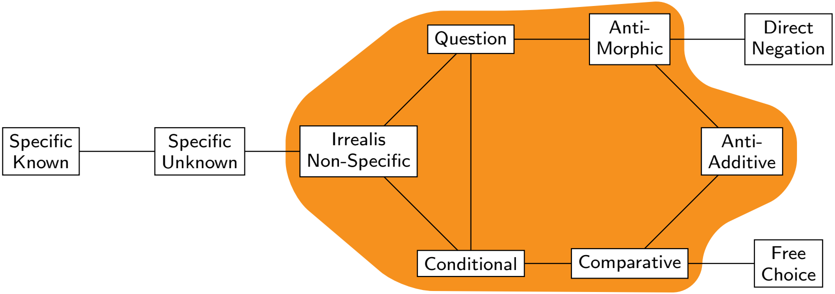
English *someone*

Haspelmath Map



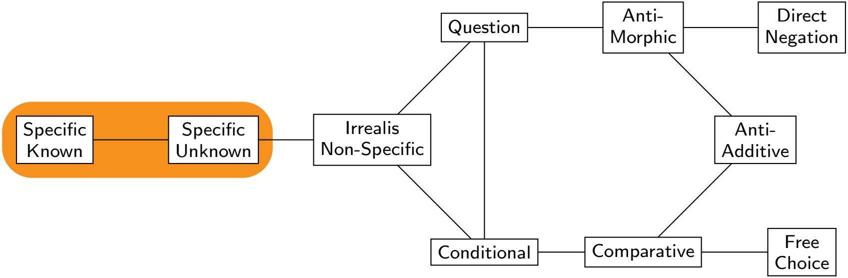
German *irgend-*

Haspelmath Map



Russian *nibud'*

Haspelmath Map



Kazakh *älde*

Outline

Our Goals

(1) a logical characterization of the specific known (SK), specific unknown (SU) and non-specific (NS) functions; and a principled explanation of their position on Haspelmath's implicational map;

(2) a formal account of the variety of marked indefinites encoding SK, SU, and NS; and their properties;

(3) a formal account of the contribution of so-called epistemic indefinites (e.g., Spanish *algún-*, Italian *un qualche*, German *irgend-* and Mandarin *shenme*).

Main idea: Indefinites are sensitive to *dependence* and *non-dependence* relationships in their value assignments (building on insights from Brasoveanu and Farkas 2011; Farkas and Brasoveanu 2020).

Implementation: Two-sorted team semantics with dependence atoms.

Marked Indefinites

Possible **marked indefinites** based on Specific Known (SK), Specific Unknown (SU) and Non-specific (NS):

TYPE OF INDEFINITE	FUNCTIONS SK	SU	NS	EXAMPLE
(i) unmarked	✓	✓	✓	Italian *qualcuno*
(ii) specific	✓	✓	✗	Georgian *-ghats*
(iii) non-specific	✗	✗	✓	Russian *-nibud*
(iv) epistemic	✗	✓	✓	German *irgend-*
(v) specific known	✓	✗	✗	Russian *koe-*
(vi) SK + NS	✓	✗	✓	unattested
(vii) specific unknown	✗	✓	✗	Kannada *-oo*

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(iv) epistemic	✗	✓	✓	German *irgend-*
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(vi) SK + NS	✓	✗	✓	unattested
(vii) specific unknown	✗	✓	✗	Kannada *-oo*

How to capture this variety?

Marked Indefinites

Possible **marked indefinites** based on Specific Known (SK), Specific Unknown (SU) and Non-specific (NS):

TYPE OF INDEFINITE	FUNCTIONS SK	FUNCTIONS SU	FUNCTIONS NS	EXAMPLE
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(iii) **non-specific**	✗	✗	✓	Russian *-nibud*
(iv) **epistemic**	✗	✓	✓	German *irgend-*
(v) **specific known**	✓	✗	✗	Russian *koe-*
(vi) SK + NS	✓	✗	✓	unattested
(vii) specific unknown	✗	✓	✗	Kannada *-oo*

Why (ii)-(v) common? Why (vi) unattested? Why (vii) rare?

Marked Indefinites

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(v) specific known	✓	✗	✗	Russian *koe-*
(vi) SK + NS	✓	✗	✓	unattested
(vii) specific unknown	✗	✓	✗	Kannada *-oo*

How to derive the restricted distribution of non-specific indefinites (ungrammatical in episodic sentences)?

Marked Indefinites

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(vi) SK + NS	✓	✗	✓	unattested
(vii) specific unknown	✗	✓	✗	Kannada *-oo*

How to characterize the obligatory ignorance inferences typical of epistemic indefinites? And the knowledge inference typical of specific known indefinites?

Marked Indefinites

Possible **marked indefinites** based on Specific Known (SK), Specific Unknown (SU) and Non-specific (NS):

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(vi) SK + NS	✓	✗	✓	unattested
(vii) specific unknown	✗	✓	✗	Kannada *-oo*

Why diachronically non-specific indefinites tend to turn into epistemic ones?

Marked Indefinites

Possible **marked indefinites** based on Specific Known (SK), Specific Unknown (SU) and Non-specific (NS):

TYPE OF INDEFINITE	FUNCTIONS SK	SU	NS	EXAMPLE
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(iii) non-specific	✗	✗	✓	Russian *-nibud*
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(vii) specific unknown	✗	✓	✗	Kannada *-oo*

Indefinites in general display exceptional scope behaviour. Why? How to account for their exceptional scope? What scope configurations are possible for marked indefinites (e.g. narrow, intermediate, wide)?

Outline

Language & Team

In team semantics, formulas are interpreted wrt **sets** of evaluation points (*teams*) rather than single points. Here a team is a set of assignment functions.

We use a **two-sorted** framework (a model is a triple $M = \langle D, W, I \rangle$):

(i) possible worlds in W introduced as second sort of entities (with special world variables which can be quantified over);

(iii) v as **designated variable** over worlds, representing alternative ways things might be (epistemic possibilities).

We will use (i) x, y for individual variables ranging over D; (ii) v, w for world variables ranging over W; and (iii) z, u as meta-variables ranging over both individual and world variables

Language:

$$\phi ::= P(\vec{z}) \mid \neg P(\vec{z}) \mid \phi \vee \psi \mid \phi \wedge \psi \mid \exists_{strict} z\phi \mid \exists_{lax} z\phi \mid \forall z\phi \mid dep(\vec{z}, z) \mid var(\vec{z}, z)$$

Team:

Given a model $M = \langle D, W, I \rangle$ and a sequence of variables $\vec{z}$, a team T over M with domain $Dom(T) = \vec{z}$ is a set of assignment functions mapping the world variables in $\vec{z}$ to elements of W and the individual variables in $\vec{z}$ to elements of D.

Teams as information states

Teams represent information states of speakers.

In initial teams only factual information is represented.

Initial team: A team T is *initial* iff $Dom(T) = \{v\}$.

- The *designated world variable* v captures the speaker's epistemic possibilities.
- Teams where v receives only one value are teams of *maximal information*.

Discourse information is then added by operations of assignment extensions.

v	x	w	y	...
v_1	a	w_1	b_1	...
v_2	a	w_2	b_2	...
...	a	...	...	...
v_n	a	w_n	b_n	...

Felicitous sentence: A sentence is *felicitous/grammatical* if there is an initial team which supports it.

Universal Extension

$$T[z_*] = \{i[e_*/z_*] : i \in T \text{ and } e_* \in Dom_*(M)\}$$

[where $* \in \{d, w\}$ & $Dom_d(M) = D$ & $Dom_w(M) = W$]

A **universal extension** of a team T with y, denoted by $T[y]$, amounts to consider all assignments that extend or differ from the ones in T only with respect to the value of y.

v	T
v_1	i_1
v_2	i_2

v	y	$T[y]$
v_1	→ d_1	i_{11}
	→ d_2	i_{12}
v_2	→ d_1	i_{21}
	→ d_2	i_{22}

($D = \{d_1, d_2\}$. Universal extensions are unique. They allow *branching*.)

Strict Functional Extension

$$T[h_s/z_*] = \{i[h_s(i)/z_*] : i \in T\}, \text{for some strict function } h_s : T \to Dom_*(M)$$

A **strict functional extension** of a team T with y, $T[h_s/y]$, assigns only one value to y for each original assignment in T.

v	T
v_1	i_1
v_2	i_2

With $D = \{d_1, d_2\}$ we have 4 possible strict functional extensions. No branching allowed:

v	y	$T[h_1/y]$
$v_1 \longrightarrow$	d_1	i_{11}
$v_2 \longrightarrow$	d_1	i_{21}

v	y	$T[h_2/y]$
$v_1 \longrightarrow$	d_2	i_{12}
$v_2 \longrightarrow$	d_2	i_{21}

x	y	$T[h_3/y]$
$v_1 \longrightarrow$	d_1	i_{11}
$v_2 \longrightarrow$	d_2	i_{21}

x	y	$T[h_4/y]$
$v_1 \longrightarrow$	d_2	i_{12}
$v_2 \longrightarrow$	d_1	i_{21}

Lax Functional Extension

$T[f_l/z_*] = \{i[e_*/z_*] : i \in T \ \&\ e_* \in f_l(i)\}$, for some lax function $f_l : T \rightarrow \wp(Dom_*(M)) \backslash \{\varnothing\}$

A **lax functional extension** of a team T with y, $T[f_l/y]$, amounts to assign one or more values to y for each original assignment in T.

v	T
v_1	i_1
v_2	i_2

v	y	$T[f_l/y]$
$v_1 \longrightarrow$	d_2	i_{12}
$v_2 \longrightarrow$	d_1	i_{21}
$v_2 \longrightarrow$	d_2	i_{22}

(With $D = \{d_1, d_2\}$, 9 possible lax functional extensions. Branching allowed.)

Semantic Clauses

$$M, T \models P(z_1, \ldots, z_n) \quad \Leftrightarrow \quad \forall j \in T : \langle j(z_1), \ldots, j(z_n) \rangle \in I(P^n)$$

$$M, T \models \neg P(z_1, \ldots, z_n) \quad \Leftrightarrow \quad \forall j \in T : \langle j(z_1), \ldots, j(z_n) \rangle \notin I(P^n)$$

$$M, T \models \phi \wedge \psi \quad \Leftrightarrow \quad M, T \models \phi \text{ and } M, T \models \psi$$

$$M, T \models \phi \vee \psi \quad \Leftrightarrow \quad T = T_1 \cup T_2 \text{ for teams } T_1 \text{ and } T_2 \text{ s.t. } M, T_1 \models \phi \text{ and } M, T_2 \models \psi$$

$$M, T \models \forall z \phi \quad \Leftrightarrow \quad M, T[z] \models \phi$$

$$M, T \models \exists_{\text{strict}} z \phi \quad \Leftrightarrow \quad \text{there is a strict } h_s : M, T[h_s/z] \models \phi$$

$$M, T \models \exists_{\text{lax}} z \phi \quad \Leftrightarrow \quad \text{there is a lax } f_l : M, T[f_l/z] \models \phi$$

$$M, T \models dep(\vec{z}, u) \quad \Leftrightarrow \quad \text{for all } i, j \in T : i(\vec{z}) = j(\vec{z}) \Rightarrow i(u) = j(u)$$

$$M, T \models var(\vec{z}, u) \quad \Leftrightarrow \quad \text{there is } i, j \in T : i(\vec{z}) = j(\vec{z}) \ \& \ i(u) \neq j(u)$$

Dependence and Variation Atoms

Dependence & variation atoms model (non-)dependency patterns between variables' values (Väänänen 2007; Galliani 2015):

Dependence Atom:

$$M, T \models dep(\vec{z}, u) \Leftrightarrow \text{ for all } i, j \in T : i(\vec{z}) = j(\vec{z}) \Rightarrow i(u) = j(u)$$

Variation Atom:

$$M, T \models var(\vec{z}, u) \Leftrightarrow \text{ there is } i, j \in T : i(\vec{z}) = j(\vec{z}) \,\&\, i(u) \neq j(u)$$

T	x	y	z	l
i	a_1	b_1	c_1	d_1
j	a_1	b_1	c_2	d_1
k	a_3	b_2	c_3	d_1

$dep(x, y)$ ✓ $var(x, z)$ ✓

$dep(\varnothing, l)$ ✓ $var(\varnothing, x)$ ✓

$dep(xy, z)$ ✗ $var(x, y)$ ✗

Indefinites as Existentials

We propose that:

1. Indefinites are **strict existentials** ($\exists_{s(trict)} x$).
2. They are interpreted *in-situ*.

Dependence atoms will be used to model the exceptional scope behaviour of indefinites, by specifying how their value (co-)varies with other operators.

Dependence and variation atoms will be used to capture the variety of marked indefinite forms, by specifying how their value (co-)varies with respect to the designated v variable.

(For scope, our system parallels Brasoveanu and Farkas (2011)'s treatment).

Outline

Application I: Exceptional Scope of Indefinites

Indefinites violate rules of standard quantifier behaviour, e.g, can escape syntactic islands (Reinhart, 1979)

(5) Every kid$_x$ ate every food$_z$ that a doctor$_y$ recommended.

a. WS $[\exists y/\forall x/\forall z]$: $\forall x \forall z \exists_s y(\phi \wedge dep(v, y))$

b. IS $[\forall x/\exists y/\forall z]$: $\forall x \forall z \exists_s y(\phi \wedge dep(vx, y))$

c. NS $[\forall x/\forall z/\exists y]$: $\forall x \forall z \exists_s y(\phi \wedge dep(vxz, y))$

v	x	z	y
v_1	...	...	b_1
v_1	...	...	b_1
v_1	...	...	b_1
v_1	...	...	b_1

WS: $dep(v, y)$

v	x	z	y
v_1	a_1	...	b_1
v_1	a_1	...	b_1
v_1	a_2	...	b_2
v_1	a_2	...	b_2

IS: $dep(vx, y)$

v	x	z	y
v_1	a_1	c_1	b_1
v_1	a_1	c_2	b_2
v_1	a_2	c_3	b_3
v_1	a_2	c_4	b_4

NS: $dep(vxz, y)$

Indefinites interpreted *in-situ*. Exceptional scope behaviour captured using dependence atoms.

How to account for the known vs unknown contrast?

Application II: Specific Known, Specific Unknown, Non-specific

constancy	$dep(\emptyset, x)$	v	x
		...	d_1
		...	d_1
variation	$var(\emptyset, x)$	v	x
		...	d_1
		...	d_2

v-constancy	$dep(v, x)$	v	x
		v_1	d_1
		v_2	d_2
v-variation	$var(v, x)$	v	x
		v_1	d_1
		v_1	d_2

Specific Known:
constancy $dep(\emptyset, x)$

v	...	x
v_1	...	d_1
v_2	...	d_1

Application II: Specific Known, Specific Unknown, Non-specific

constancy $\mapsto$ known	$dep(\varnothing, x)$	v	x
		$\ldots$	d_1
		$\ldots$	d_1
variation $\mapsto$ unknown	$var(\varnothing, x)$	v	x
		$\ldots$	d_1
		$\ldots$	d_2

v-constancy $\mapsto$ specific	$dep(v, x)$	v	x
		v_1	d_1
		v_2	d_2
v-variation $\mapsto$ non-specific	$var(v, x)$	v	x
		v_1	d_1
		v_1	d_2

Specific Unknown:
v-constancy $dep(v, x)$ + variation $var(\varnothing, x)$

v	$\ldots$	x
v_1	$\ldots$	d_1
v_2	$\ldots$	d_2

Application II: Specific Known, Specific Unknown, Non-specific

		v	x
constancy	$dep(\varnothing, x)$	...	d_1
		...	d_1
		v	x
variation	$var(\varnothing, x)$	...	d_1
		...	d_2

		v	x
v-constancy	$dep(v, x)$	v_1	d_1
		v_2	d_2
		v	x
v-variation	$var(v, x)$	v_1	d_1
		v_1	d_2

Non-specific:
v-variation $var(v, x)$

v	...	x
v_1	...	d_1
v_1	...	d_2

Application III: Variety of Indefinites

TYPE	FUNCTIONS SK	SU	NS	REQUIREMENT	EXAMPLE
(i) unmarked	✓	✓	✓	none	Italian *qualcuno*
(ii) specific	✓	✓	✗	$dep(v, x)$	Georgian *-ghats*
(iii) non-specific	✗	✗	✓	$var(v, x)$	Russian *-nibud*
(iv) epistemic	✗	✓	✓	$var(\varnothing, x)$	German *-irgend*
(v) specific known	✓	✗	✗	$dep(\varnothing, x)$	Russian *-koe*
(vi) SK + NS	✓	✗	✓	$dep(\varnothing, x) \mathbin{\vee\!\!\!/} var(v, x)$	unattested
(vii) specific unknown	✗	✓	✗	$dep(v, x) \wedge var(\varnothing, x)$	Kannada *-oo*

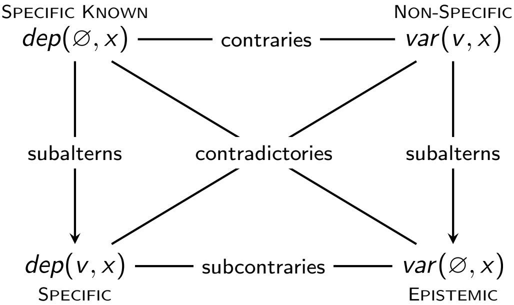
Why (ii)-(v) common? Why (vi) unattested? Why (vii) rare?

common
(ii)-(v): $\mapsto$ Dependence Square of Opposition

unattested
(vi) SK + NS: violation of convexity (Gardenfors 2014)

rare
(vii) specific unknown: increased complexity

Application III: Dependence Square of Opposition



DEPENDENCE SQUARE OF OPPOSITION

- Contraries: can be both false, but not both true.
- Contradictories: cannot be both true and they cannot be both false.
- Subcontraries: they cannot both be false but can both be true.
- Subalternation: A subalternates B iff A implies B.

Application III: Violation of convexity

- Convexity often assumed as a constraint of lexicalizations (Gardenfors 2014; Enguehard and Chemla 2021)
  - A space is convex just in case for every two points contained therein, the line connecting them lies entirely within the space.
- **Convex meanings (= sets of teams)**:
  - A set of teams P is convex iff for all T, T', T'' such that $T \subseteq T' \subseteq T''$, if $T \in P$ and $T'' \in P$, then $T' \in P$.
- The Boolean union of the formulas associated with the SK and NS cells in our map does not satisfy convexity:
  - SK + NS: $dep(\varnothing, x) \mathbin{\vee\!\!\!/} var(v, x)$ **[not convex]**
- The other two combinations instead define convex sets:
  - SK + SU: $dep(\varnothing, x) \mathbin{\vee\!\!\!/} (var(\varnothing, x) \wedge dep(v, x)) \equiv dep(v, x)$ [convex]
  - SU + NS: $(var(\varnothing, x) \wedge dep(v, x)) \mathbin{\vee\!\!\!/} var(v, x) \equiv var(\varnothing, x)$ [convex]
- A reasonable constraint on implicational maps: contiguous cells must denote convex properties (no gaps allowed!)
- This gives us a principled explanation of the specific ordering among functions assumed in the original Haspelmath's map: SK-SU-NS.

Application IV: Licensing of non-specific indefinites

Non-specific indefinites are **ungrammatical in episodic sentences** and they need an operator (e.g. a universal quantifier, a modal or an attitude verb) which licenses them:

(6)* *Ivan včera kupil kakuju-nibud' knigu.*
Ivan yesterday bought which-INDEF. book.

'Ivan bought some book [non-specific] yesterday.'

(7) *Ivan hotel spet' kakuju-nibud' pesniu.*
Ivan want-PAST sing-INF which-INDEF. song.

Ivan wanted to sing some song [non-specific].

Application IV: Licensing of non-specific indefinites

Recall that non-specific indefinites are strict existentials which trigger v-variation: $var(v, x)$.

$$\exists_s x \ (\phi \wedge var(v, x))$$

v
v_1
v_2

Application IV: Licensing of non-specific indefinites

Recall that non-specific indefinites are strict existentials which trigger v-variation: $var(v, x)$.

$$\exists_s x\ (\phi \wedge var(v, x))$$

v
v_1
v_2

v	x
v_1	a_1
v_2	a_2

$var(v, x)$ cannot be satisfied!

No initial team can support $\exists_s x\ (\phi \wedge var(v, x))$

$\Rightarrow$ Non-specific indefinites predicted to be infelicitous in episodic sentences

Application IV: Licensing of non-specific indefinites

Recall that non-specific indefinites are strict existentials which trigger v-variation: $var(v, x)$.

$$\forall y \exists_s x \ (\phi \wedge var(v, x))$$

v
v_1
v_2

v	y
v_1	b_1
	b_2
v_2	b_1
	b_2

Application IV: Licensing of non-specific indefinites

Recall that non-specific indefinites are strict existentials which trigger v-variation: $var(v, x)$.

$$\forall y \exists_s x\ (\phi \wedge var(v, x))$$

v
v_1
v_2

v	y
v_1	b_1
	b_2
v_2	b_1
	b_2

v	y	x
v_1	b_1	a_1
	b_2	a_2
v_2	b_1	a_1
	b_2	a_2

$var(v, x)$ satisfied!

Initial teams can support $\forall y \exists_s x\ (\phi \wedge var(v, x))$

$\Rightarrow$ Non-specific indefinites predicted to be felicitous in universally quantified sentences

Application IV: Licensing of non-specific indefinites

Non-specific indefinites can also be licensed by modals or attitude verbs:

(8)*	*On*	*kupil*	*kakoj-nibud'*	*tort.*
	He	buy-PAST	some-nibud	cake.

'He bought a cake.'

(9)	*On*	**mog**	*kupit'*	*kakoj-nibud'*	*tort.*
	He	can-PAST	buy-INF	some-nibud	cake

'He could buy a cake.

Application IV: Licensing of non-specific indefinites

Basic Idea:

Modals as **lax quantifiers** over worlds: $\Box_w \sim \forall w$ and $\Diamond_w \sim \exists_{l(ax)} w$

(10) Necessity Modal

a. You must take some-*nibud* book

b. $\forall w \exists_s x(\phi(x, w) \wedge var(v, x))$

(11) Possibility Modal

a. You may take some-*nibud* book

b. $\exists_l w \exists_s x(\phi(x, w) \wedge var(v, x))$

Application IV: Licensing of non-specific indefinites

We obtain the correct licensing behaviour!

$$\exists_l w \exists_s x(\phi(x,w) \land var(v,x))$$

v
v_1
v_2

v	w
v_1	w_1
	w_2
v_2	w_1

v	w	x
v_1	w_1	a_1
	w_2	a_2
v_2	w_1	a_1

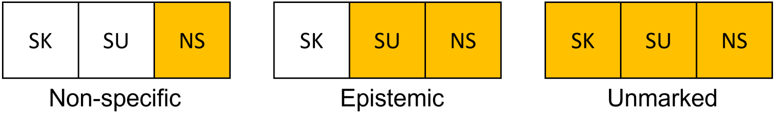
$var(v,x)$ satisfied!

Initial teams can support $\exists_l w \exists_s x(\phi(x,w) \land var(v,x))$

$\Rightarrow$ Non-specific indefinites predicted to be felicitous under (possibility) modals

Application V: From non-specific to epistemic

Frequent diachronic tendency: **non-specific** > **epistemic** (e.g. French *quelque* (Foulet 1919) and German *irgendein* (Port and Aloni 2015))



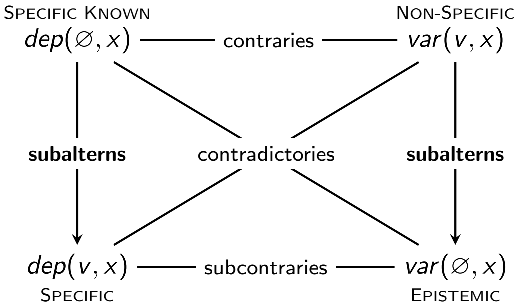
Haspelmath (1997)'s explanation: weakening of functions from the right (non-specific) of the functional map to the left (specific).

(12) **Weakening of functions (a)** > **(b)** > **(c)**
(a) non-specific
(b) non-specific + specific unknown = epistemic
(c) epistemic + specific known = unmarked

But then why diachronically we do not observe the change from (b) to (c)?

Application V: Dependence Square of Opposition

Our framework makes the notion of weakening precise in terms of **subalternation** in our square of opposition



By subalternation we predict the following possible diachronic developments:

(i) NON-SPECIFIC > EPISTEMIC (attested)

(ii) SPECIFIC KNOWN > SPECIFIC (conjectured)

But (ii) might violate another constraint on language change

Application V: concrete > abstract

- The representation of **known vs unknown** requires variables ranging over W, a domain of abstract entities
  - Without world variables: Specific ($dep(\emptyset, x)$) vs Non-specific ($var(\emptyset, x)$)
  - With world variables: Dependence Square of Opposition
- It is reasonable to conjecture that individual quantification precedes world quantification

  concrete > abstract

- This conjecture gives rise to different predictions concerning diachronic tendencies:

  (i) NON-SPECIFIC > EPISTEMIC (attested)

  (ii) SPECIFIC > SPECIFIC KNOWN (conjectured)

- Possibly both factors (weakening and concreteness) play a role explaining why only (i) is frequently attested

	weakening	**concreteness**
NON-SPECIFIC > EPISTEMIC	yes	yes
SPECIFIC > SPECIFIC KNOWN	no	yes
SPECIFIC KNOWN > SPECIFIC	yes	no

Final Proposal

We propose that:

1. Indefinites are **strict existentials**;
2. They are interpreted **in-situ**;
3. An unmarked/plain indefinite $\exists_s x$ in **syntactic scope** of $O_{\vec{z}}$ allows all $dep(\vec{y}, x)$, with $\vec{y}$ included in $v\vec{z}$:

$$O_{z_1} \ldots O_{z_n} \exists_s x(\phi \wedge dep(\vec{y}, x))$$

4. **Marked indefinites** additionally trigger the obligatory activation of particular dependence or variation atoms.

Final Proposal

$$O_{z_1} \ldots O_{z_n} \exists_s x(\phi \wedge \ldots)$$

Unmarked: $dep(\vec{y}, x)$, where $\vec{y} \subseteq v\vec{z}$

Specific known: $dep(\vec{y}, x)$ with $\vec{y} = \varnothing$

Specific: $dep(\vec{y}, x)$ with $\vec{y} = v$

Epistemic: $dep(\vec{y}, x) \wedge var(\vec{z}, x)$ with $\vec{z} = \varnothing$

Non-specific: $dep(\vec{y}, x) \wedge var(\vec{z}, x)$ with $\vec{z} = v$

Specific unknown: $dep(\vec{y}, x) \wedge var(\vec{z}, x)$ with $\vec{y} = v$ and $\vec{z} = \varnothing$

Application VI: Interaction with Scope

$$\forall z \forall y \exists_s x\ \phi$$

	WS-K $dep(\varnothing, x)$	WS $dep(v, x)$	IS $dep(vy, x)$	NS $dep(vyz, x)$
unmarked	✓	✓	✓	✓
specific $dep(v, x)$	✓	✓	✗	✗
non-specific $var(v, x)$	✗	✗	✓	✓
epistemic $var(\varnothing, x)$	✗	✓	✓	✓
specific known $dep(\varnothing, x)$	✓	✗	✗	✗
specific unknown $dep(v, x) \wedge var(\varnothing, x)$	✗	✓	✗	✗

Note that non-specific indefinites also allow intermediate readings (Partee 2004):

(13) *Možet byt', Maša xočet kupit' kakuju-nibud' knigu.*
may be, Maša want buy which-INDEF. book.

a. Narrow Scope: It may be that Maša wants to buy some book.

b. Intermediate Scope: It may be that there is some book which Maša wants to buy.

c. #Wide-scope: There is some book such that it may be that Maša wants to buy it.

Conclusion

We have developed a **two-sorted team semantics** framework accounting for indefinites cross-linguistically.

In this framework, **marked indefinites** trigger the obligatoriness of dependence or variation atoms, responsible for their scopal and epistemic interpretations.

We have applied the framework to characterize the **typological variety of indefinites** in the case of (non-)specificity.

We have then showed how this system can be used to explain several **properties and phenomena** associated with (non-)specific indefinites.

THANK YOU![1]

[1] Maria's part of this work was supported by (i) Nothing is Logical (NihiL), an NWO OC project (grant no 406.21.CTW.023) and (ii) PLEXUS, (Grant Agreement no 101086295) a Marie Sklodowska-Curie action funded by the EU under the Horizon Europe Research and Innovation Programme.

Outline

Epistemic vs Deontic

(14) **Epistemic** vs **Deontic**

a. John might be in Paris.

b. John is allowed to go to Paris.

Epistemic modals give rise to **epistemic contradictions**:

(15) #It is not raining and it might be raining.

Epistemic modals: epistemic possibilities of the speaker (encoded by v in our system).

Deontic modals: ‘normative’ rules, not necessarily compatible with the state of affairs in the actual world.

Inclusion Atoms

Indefinites: values of individual variables introduced by an indefinite
$\Rightarrow$ Dependence and Variation Atoms

Modals: values of world variables introduced by modals
$\Rightarrow$ Inclusion Atoms

Inclusion Atom:

$$M, T \models \vec{x} \subseteq \vec{y} \Leftrightarrow \text{ for all } i \in T, \text{ there is a } j \in T : i(\vec{x}) = j(\vec{y})$$

x	y	z
d_1	d_1	d_2
d_1	d_2	d_2
d_2	d_3	d_4
d_2	d_4	d_4

$x \subseteq y$ ✓
$xz \subseteq xy$ ✓
$y \subseteq x$ ✗

Epistemic vs Deontic

(16) Epistemic

a. # John might be in Paris and he is not in Paris.

b. $\exists_I w\ (P(j,w) \wedge w \subseteq v) \wedge \neg P(j,v) \models \bot$

(17) Deontic

a. John is allowed to be in Paris and he is not in Paris.

b. $\exists_I w\ (P(j,w) \wedge R(v,w)) \wedge \neg P(j,v) \not\models \bot$

v
v_1
v_2
v_3

v	w
v_1	v_1
v_1	v_2
v_2	v_1
v_2	v_2
v_3	v_1
v_3	v_2

Epistemic

v	w
v_1	w_1
v_1	w_2
v_2	w_1
v_2	w_2
v_3	w_1
v_3	w_2

Deontic

Basic Data

Epistemic indefinites (EIs) are well-studied in the semantic literature (Alonso-Ovalle and Menéndez-Benito 2015). They include Spanish *algún*, Italian *un qualche*, German *irgendein* and many more.

Cross-linguistically, two typical behaviours of EIs:

(18) **Undefeasible Ignorance Inference** (in episodic contexts)
Maria ha sposato un qualche dottore, #cioè Ugo.
Maria has married un qualche doctor, #namely Ugo

'Maria married some doctor, namely Ugo.'

(19) **Co-Variation**
Todos los profesores están bailando con algún estudiante.
all the professors are dancing with algún student.

'Every professor is dancing with some student.'

The ignorance reading is also available for (19), but less salient.

Basic Strategy

Note that the ignorance and co-variation reading of EIs parallel the specific unknown and non-specific uses that we considered.

Our proposal so far: EIs trigger $var(\varnothing, x)$. Is this sufficient to explain the distribution of EIs?

Yes!

(20) **Ignorance Inference**

a. *Maria ha sposato un qualche dottore.*
Maria has married un qualche doctor.

'Maria married some doctor.'

b. $\exists_s x(\phi(x, v) \wedge var(\varnothing, x))$

v	x
v_1	a_1
v_2	a_2

Supporting

v	x
v_1	a_1
v_2	a_1

Non-supporting

Scope and Ignorance

(21) **Co-Variation**
Jeder$_y$ Student hat irgendein$_x$ Buch gelesen.
everyone student has irgendein book read.

a. IGNORANCE (wide-scope):
$\forall y \exists_s x\ (\phi \wedge dep(v, x) \wedge var(\varnothing, x))$

b. CO-VARIATION/NON-SPECIFIC (narrow-scope):
$\forall y \exists_s x\ (\phi \wedge dep(vy, x) \wedge var(\varnothing, x))$

v	y	x
v_1	a_1	b_1
	a_2	b_1
v_2	a_1	b_2
	a_2	b_2

(49a)

v	y	x
v_1	a_1	b_1
	a_2	b_2
v_2	a_1	b_1
	a_2	b_2

(49b)

⇒ Our accounts integrates **scopal** and **epistemic** specificity and as such captures the contrast between ignorance and co-variation readings without further stipulations.

NPI

Some EIs display a NPI behaviour when they occur in (a subset of) downward-entailing contexts:

(22) *Niemand hat irgendeine Frage beantwortet.*
Nobody has irgend-one question answered.

'Nobody answered any question.'

(The specific unknown reading is marginal, and only available in particular pragmatic contexts.)

Negation and Implication

We adopt an intensional notion of negation, along the lines of Brasoveanu and Farkas (2011).[2]

(23) **Intensional Negation**

$$\neg\phi \Leftrightarrow \forall w(\phi[v/w] \rightarrow v \neq w)$$

(24) **Semantic Clause for Implication**

$M, X \models \phi \rightarrow \psi \Leftrightarrow$ for **some** $X' \subseteq X$ s.t. $M, X' \models \phi$ and X' is maximal (i.e. for all X'' s.t. $X' \subset X'' \subseteq X$, it holds $M, X'' \not\models \phi$), we have $M, X' \models \psi$

[Dependence Logics (Yang 2014; Abramsky and Väänänen 2009) employ different notions of implication (material, intuitionistic, linear and maximal). Here we adopt (a version of) the maximal implication.]

[2] Negation can be defined for the classical fragment of the language.

$$M, T \models x \neq y \Leftrightarrow \forall i \in T : i(x) \neq i(y)$$

Negation and Epistemic Indefinites

Desideratum: EIs under negation display an NPI behaviour (e.g., *any*).

EIs under negation as in (25) are supported when the initial team contains just $\{w_\varnothing\}$. (In $w_\varnothing$ John read no book, in w_a John read only book a, and so on.)

(25) a. John does not have *irgend*-book.

b. $\forall w(\exists_s x(\phi(x,w) \wedge dep(vw,x) \wedge var(\varnothing,x)) \rightarrow \mathbf{v} \neq \mathbf{w})$

v	w	x
$w_\varnothing$	$w_\varnothing$	—
$w_\varnothing$	w_a	a
$w_\varnothing$	w_b	b
$w_\varnothing$	w_{ab}	b

v	w	x
w_a	$w_\varnothing$	—
$\mathbf{w_a}$	$\mathbf{w_a}$	$\mathbf{a}$
w_a	w_b	b
w_a	w_{ab}	a

[maximal teams supporting antecedent in blue]

Negation and Specific Indefinites

Does the *some*/*all* distinction matters in the semantic clause for maximal implication?

For union-closed formulas, it does not. The difference is trivialized.

But not all formulas in our language are union-closed! Let's consider what happens in the case of specific (known) indefinites.

(26) a. John does not have some-SK book.

b. $\forall w(\exists_s x(\phi(x,w) \wedge dep(\varnothing, x)) \rightarrow v \neq w)$

As in (26), specific indefinites under negation are supported by $\{w_\varnothing\}$ (John has no book), and also by $\{w_a\}$ (John has book *a* and not *b*) or $\{w_b\}$. But not by $\{w_{ab}\}$ (John has both books).

Supporting and Non-Supporting Teams

(27) a. John does not have some-SK book.

b. $\forall w(\exists_s x(\phi(x,w) \wedge dep(\varnothing, x)) \rightarrow v \neq w)$

v	w	x
$w_\varnothing$	$w_\varnothing$	a
$w_\varnothing$	w_a	a
$w_\varnothing$	w_b	a
$w_\varnothing$	w_{ab}	a

v	w	x
$w_\varnothing$	$w_\varnothing$	b
$w_\varnothing$	w_a	b
$w_\varnothing$	w_b	b
$w_\varnothing$	w_{ab}	b

v	w	x
w_a	$w_\varnothing$	a
$\mathbf{w_a}$	$\mathbf{w_a}$	a
w_a	w_b	a
w_a	w_{ab}	a

v	w	x
w_a	$w_\varnothing$	b
w_a	w_a	b
w_a	w_b	b
w_a	w_{ab}	b

v	w	x
w_{ab}	$w_\varnothing$	a
w_{ab}	w_a	a
w_{ab}	w_b	a
$\mathbf{w_{ab}}$	$\mathbf{w_{ab}}$	$\mathbf{a}$

v	w	x
w_{ab}	$w_\varnothing$	b
w_{ab}	w_a	b
w_{ab}	w_b	b
$\mathbf{w_{ab}}$	$\mathbf{w_{ab}}$	$\mathbf{b}$

[only for $\{w_{ab}\}$ no maximal team supporting the antecedent also supports the consequent, therefore $\{w_\varnothing\}$, $\{w_a\}$ support (27b) but $\{w_{ab}\}$ doesn't.]

German *Irgend-*

German *irgend-* is quite distinctive from other EIs. It also displays a **free choice** reading, when stressed and under a modal:

(28) *Mary* *musste*$_w$ *irgendeinen*$_x$ *Doktor* *heiraten.*
Mary had-to irgend-one doctor marry.

Ignorance: 'Mary had to marry a particular doctor. The speaker does not know who.'
Free Choice: 'Mary had to marry a doctor, any doctor is a permissible option.'

How to represent free choice readings? For $D = \{a_1, a_2, a_3\}$:

v	w	x
	w_1	a_1
v_1	w_2	a_2
	w_3	a_3
	w_1	a_1
v_2	w_2	a_2
	w_3	a_3

Generalized Variation

We can generalize the variation atom to also model the degree k of variation (previously $k = 2$):

Generalized Variation Atom: (Väänänen 2022)
$M, T \models var_k(\vec{x}, y) \Leftrightarrow$ for all $i \in T : |\{j(y) : j \in T \;\&\; i(\vec{x}) = j(\vec{x})\}| \geq k$

$var_{|D|}(v, x)$

v	w	x
	w_1	a_1
v_1	w_2	a_2
	w_3	a_3
	w_1	a_1
v_2	w_2	a_2
	w_3	a_3

(For ignorance readings, a higher k in $var_k(\varnothing, x)$ might correspond to a higher degree of ignorance in the epistemic state of the speaker.)

German *Irgend-*

(29) *Mary* *musste*$_w$ *irgendeinen*$_x$ *Mann* *heiraten.*
Mary had-to irgend-one man marry.

a. <u>IGNORANCE</u>:
$\forall w \exists_s x\,(\phi \wedge dep(v, x) \wedge var_2(\varnothing, x))$

b. <u>FREE CHOICE</u>:
$\forall w \exists_s x\,(\phi \wedge dep(vw, x) \wedge var_{|D|}(v, x))$

The strengthening to $var_{|D|}(v, x)$ could be the result of prosodic prominence.

This leads to the hypothesis that *irgendein* is associated with $var_k(\subseteq v, x)$ and not simply $var_k(\varnothing, x)$.

Recall our diachronic discussion: *irgendein* used to be a pure non-specific. Conjecture: an intermediate or alternative weakening from non-specific uses?

$$var(v, x) \longrightarrow var(\subseteq v, x)$$
$$var(v, x) \longrightarrow var(\varnothing, x)$$

Conclusion

THANK YOU!

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