(Non-)specificity across languages: constancy, variation, $\nu$-variation

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Semantics and Linguistic Theory (SALT32)
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Plan

1. Introduction
2. Desiderata
3. The Framework
4. Applications
5. Epistemic Indefinites
6. Conclusion
Outline

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6. Conclusion
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, ningún, ...*

Náhuatl/Mexicano (Tuggy 1979): *yeka, sente, olgo, ...*

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**Today’s focus:** scopal (specific vs non-specific) and epistemic (known vs unknown) uses of indefinites.
Haspelmath's map: a useful typological tool to capture the functional distribution of indefinites:

Haspelmath (1997)'s map
Specific Known, Specific Unknown and Non-Specific

We focus on three main uses in the area of (non)specificity:

(1)  a. **Specific known**: Someone called. I know who.
    b. **Specific unknown**: Someone called. I do not know who.
    c. **Non-specific**: John wants to go somewhere else.
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**Specific vs non-specific**: indefinites marked for specificity tend to presuppose the existence of their referent, and they can have discourse referents.

**Known vs unknown**: indefinites marked for (un)known signal that the speaker does (not) know the identity of the referent.
Hasepelmaph Map

Specific Known

Specific Unknown

Irrealis Non-Specific

Question

Anti-Morphic

Direct Negation

Anti-Additive

Conditional

Comparative

English someone
Haspelmath Map

German *irgend-*
Hasepmlathom Map

Specific Known -- Specific Unknown

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Russian *nibud’*
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Kazakh älde
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Our Goals

(1) the logical characterization of the specific known (SK), specific unknown (SU) and non-specific (NS) uses;

(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 epistemic indefinites (irgend-).
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**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).
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Implementation: Two-sorted team semantics with dependence atoms.
Possible **marked indefinites** based on Specific Known (SK), Specific Unknown (SU) and Non-specific (NS):

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</tr>
<tr>
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Why non-specific have a restricted distribution (unavailable in episodic contexts)?
Marked Indefinites

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How to characterize the obligatory ignorance inferences typical of epistemic indefinites?
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Why diachronically non-specific indefinites tend to turn into epistemic ones?
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Why (vi) is unattested and (vii) rare?
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What scope configurations are possible for marked indefinites (e.g. narrow, intermediate, wide)?
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Language & Team

In team semantics, formulas are interpreted wrt *sets* of evaluation points (*teams*) and not single evaluation points.
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Here, we use a two-sorted framework (a model is a triple $M = \langle D, W, I \rangle$):

(i) possible worlds introduced as second sort of entities (special variables $\nu_1, \nu_2$ for worlds which can be quantified over);

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$\phi ::= P(\bar{x}) | \phi \lor \psi | \phi \land \psi | \exists_{\text{strict}} x \phi | \exists_{\text{lax}} x \phi | \forall x \phi | \text{dep}(\bar{x}, y) | \text{var}(\bar{x}, y)$
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Team:

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

The world variable $v$ captures the speaker’s epistemic possibilities.

Teams where $v$ receives only one value are teams of *maximal information*.

\[
\begin{array}{c}
v \\
v_1 \\
v_2 \\
\vdots \\
v_n
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<td>$a$</td>
</tr>
<tr>
<td>$\nu_2$</td>
<td>$a$</td>
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<tr>
<td>$\ldots$</td>
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**Felicitous sentence:** A sentence is *felicitous/grammatical* if there is an initial team which supports it.
Universal Extension

\[ T[y] = \{ i[d/y] : i \in T \text{ and } d \in D \} \]

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

<table>
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<th>( T )</th>
<th>( T[y] )</th>
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<tr>
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<td>( i_1 )</td>
<td>( i_{11} )</td>
</tr>
<tr>
<td>( \nu_2 )</td>
<td>( i_2 )</td>
<td>( i_{12} )</td>
</tr>
<tr>
<td>( \nu_2 )</td>
<td>( d_1 )</td>
<td>( i_{21} )</td>
</tr>
<tr>
<td>( \nu_2 )</td>
<td>( d_2 )</td>
<td>( i_{22} )</td>
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\( (D = \{ d_1, d_2 \}. \text{ Universal extensions are unique.}) \)
A **strict functional extension** of a team $T$ with $y$, denoted by $T[h/y]$, amounts to assign only one value to $y$ for each original assignment in $T$.

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>$\nu_1 \rightarrow d_1$</td>
<td>$i_{12}$</td>
</tr>
<tr>
<td>$\nu_2 \rightarrow d_1$</td>
<td>$i_{21}$</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>$\nu$</th>
<th>$T[h_2/y]$</th>
</tr>
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<tbody>
<tr>
<td>$\nu_1 \rightarrow d_2$</td>
<td>$i_{12}$</td>
</tr>
<tr>
<td>$\nu_2 \rightarrow d_2$</td>
<td>$i_{21}$</td>
</tr>
</tbody>
</table>

With $D = \{d_1, d_2\}$ we have 4 possible strict functional extensions:
Lax Functional Extension

\[ T[f/y] = \{ i[d/y] : i \in T \text{ and } d \in f(i) \}, \text{ for some function } \]
\[ f : T \to \mathcal{P}(D) \setminus \{\emptyset\} \]

A **lax functional extension** of a team \( T \) with \( y \), denoted by \( T[h/y] \), amounts to assign one or more values to \( y \) for each original assignment in \( T \).

<table>
<thead>
<tr>
<th>( \nu )</th>
<th>( T )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \nu_1 )</td>
<td>( i_1 )</td>
</tr>
<tr>
<td>( \nu_2 )</td>
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</table>

<table>
<thead>
<tr>
<th>( \nu )</th>
<th>( y )</th>
<th>( T[f/y] )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \nu_1 )</td>
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<td>( i_{12} )</td>
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<tr>
<td>( \nu_2 )</td>
<td>( d_1 )</td>
<td>( i_{21} )</td>
</tr>
<tr>
<td></td>
<td>( d_2 )</td>
<td>( i_{22} )</td>
</tr>
</tbody>
</table>

(With \( D = \{d_1, d_2\} \) we have 9 possible lax functional extensions)
Semantic Clauses

\[ M, T \models P(x_1, \ldots, x_n) \iff \forall j \in T : \langle j(x_1), \ldots, j(x_n) \rangle \in I(P^n) \]

\[ M, T \models \phi \land \psi \iff M, T \models \phi \text{ and } M, T \models \psi \]

\[ M, T \models \phi \lor \psi \iff T = T_1 \cup T_2 \text{ for teams } T_1 \text{ and } T_2 \text{ s.t. } M, T_1 \models \phi \text{ and } M, T_2 \models \psi \]

\[ M, T \models \forall y \phi \iff M, T[y] \models \phi, \text{ where } T[y] = \{ i[d/y] : i \in T \text{ and } d \in D \} \]

\[ M, T \models \exists_{\text{strict}} y \phi \iff \text{there is a function } h : T \to D \text{ s.t. } M, T[h/y] \models \phi, \text{ where } T[h/y] = \{ i[h(i)/y] : i \in T \} \]

\[ M, T \models \exists_{\text{lax}} y \phi \iff \text{there is a function } f : T \to \mathcal{P}(D) \setminus \{ \emptyset \} \text{ s.t. } M, T[f/y] \models \phi, \text{ where } T[f/y] = \{ i[d/y] : i \in T \text{ and } d \in f(i) \} \]

\[ M, T \models \text{dep}(\vec{x}, y) \iff \text{for all } i, j \in T : i(\vec{x}) = j(\vec{x}) \Rightarrow i(y) = j(y) \]

\[ M, T \models \text{var}(\vec{x}, y) \iff \text{there is } i, j \in T : i(\vec{x}) = j(\vec{x}) \land i(y) \neq j(y) \]
Dependence Atoms

Dependence atoms (Väänänen 2007; Galliani 2015) model dependency patterns between variables’ values:

**Dependence Atom:**

\[ M, T \models \text{dep}(\vec{x}, y) \iff \text{for all } i, j \in T : i(\vec{x}) = j(\vec{x}) \Rightarrow i(y) = j(y) \]

**Variation Atom:**

\[ M, T \models \text{var}(\vec{x}, y) \iff \text{there is } i, j \in T : i(\vec{x}) = j(\vec{x}) \land i(y) \neq j(y) \]
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<td>( b_1 )</td>
<td>( c_1 )</td>
<td>( d_1 )</td>
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<tr>
<td>( j )</td>
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<td>( c_2 )</td>
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<td>( a_3 )</td>
<td>( b_2 )</td>
<td>( c_3 )</td>
<td>( d_1 )</td>
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</table>

\( \text{dep}(x, y) \checkmark \)
Dependence Atoms

Dependence atoms (Väänänen 2007; Galliani 2015) model dependency patterns between variables’ values:

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<tr>
<td>( j )</td>
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<td>( k )</td>
<td>( a_3 )</td>
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<td>( c_3 )</td>
<td>( d_1 )</td>
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</tr>
<tr>
<td>( \emptyset )</td>
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<td>( d )</td>
<td>( f )</td>
<td>( g )</td>
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<table>
<thead>
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<th>( l )</th>
<th>( \text{dep}(\emptyset, l) )</th>
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<tbody>
<tr>
<td>( ✓ )</td>
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<td></td>
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Dependence atoms (Väänänen 2007; Galliani 2015) model dependency patterns between variables’ values:

**Dependence Atom:**

\[ M, T \models \text{dep}(\vec{x}, y) \iff \text{for all } i, j \in T : i(\vec{x}) = j(\vec{x}) \Rightarrow i(y) = j(y) \]

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\[ M, T \models \text{var}(\vec{x}, y) \iff \text{there is } i, j \in T : i(\vec{x}) = j(\vec{x}) \& i(y) \neq j(y) \]

<table>
<thead>
<tr>
<th>T</th>
<th>x</th>
<th>y</th>
<th>z</th>
<th>l</th>
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<tbody>
<tr>
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<td>a₁</td>
<td>b₁</td>
<td>c₁</td>
<td>d₁</td>
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<tr>
<td>j</td>
<td>a₁</td>
<td>b₁</td>
<td>c₂</td>
<td>d₁</td>
</tr>
<tr>
<td>k</td>
<td>a₃</td>
<td>b₂</td>
<td>c₃</td>
<td>d₁</td>
</tr>
</tbody>
</table>

\[ \text{dep}(\emptyset, l) \checkmark \]

\[ \text{dep}(x, y) \checkmark \]

\[ \text{dep}(xy, z) \times \]
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Dependence atoms (Väänänen 2007; Galliani 2015) model dependency patterns between variables’ values:

**Dependence Atom:**

\[
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\]

**Variation Atom:**

\[
M, T \models var(\vec{x}, y) \iff \text{there is } i, j \in T : i(\vec{x}) = j(\vec{x}) \& i(y) \neq j(y)
\]

<table>
<thead>
<tr>
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<th>z</th>
<th>l</th>
</tr>
</thead>
<tbody>
<tr>
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<td>a₁</td>
<td>b₁</td>
<td>c₁</td>
<td>d₁</td>
</tr>
<tr>
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<td>c₂</td>
<td>d₁</td>
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<tr>
<td>k</td>
<td>a₃</td>
<td>b₂</td>
<td>c₃</td>
<td>d₁</td>
</tr>
</tbody>
</table>

\[
\text{dep}(x, y) \checkmark \quad \text{var}(x, z) \checkmark
\]

\[
\text{dep}(\emptyset, l) \checkmark \quad \text{dep}(xy, z) \times
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\[ M, T \models \text{var}(\vec{x}, y) \iff \text{there is } i, j \in T : i(\vec{x}) = j(\vec{x}) \land i(y) \neq j(y) \]

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<th>( z )</th>
<th>( l )</th>
<th>( \text{dep}(x, y) )</th>
<th>( \text{var}(x, z) )</th>
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<td>( b_1 )</td>
<td>( c_1 )</td>
<td>( d_1 )</td>
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<tr>
<td>( k )</td>
<td>( a_3 )</td>
<td>( b_2 )</td>
<td>( c_3 )</td>
<td>( d_1 )</td>
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<td>✗</td>
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</tbody>
</table>
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Dependence atoms (Väänänen 2007; Galliani 2015) model dependency patterns between variables’ values:

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<tr>
<th>T</th>
<th>x</th>
<th>y</th>
<th>z</th>
<th>l</th>
<th>\text{dep}(x, y)</th>
<th>\text{var}(x, z)</th>
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</thead>
<tbody>
<tr>
<td>i</td>
<td>a₁</td>
<td>b₁</td>
<td>c₁</td>
<td>d₁</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>j</td>
<td>a₁</td>
<td>b₁</td>
<td>c₂</td>
<td>d₁</td>
<td>\text{dep}(\emptyset, l)</td>
<td>✓</td>
</tr>
<tr>
<td>k</td>
<td>a₃</td>
<td>b₂</td>
<td>c₃</td>
<td>d₁</td>
<td>\text{dep}(xy, z) ✗</td>
<td>\text{var}(x, y) ✗</td>
</tr>
</tbody>
</table>
Outline

1. Introduction
2. Desiderata
3. The Framework
4. Applications
5. Epistemic Indefinites
6. Conclusion
We propose that:

(i) Indefinites are strict existentials \((\exists_{s(trict)} x)\).
Indefinites as Existentials

We propose that:

(i) Indefinites are **strict existentials** ($\exists_{\text{strict}} x$).

(ii) They are interpreted *in-situ*.
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**Dependence atoms** can be used to model the scope behaviour of indefinites, by specifying how their value (co-)varies with other operators.
Indefinites as Existentials

We propose that:

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(ii) They are interpreted *in-situ*.

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

(For scope, our system parallels Brasoveanu and Farkas (2011)’s treatment).
Application I: Exceptional Scope

(2) Every kid\(_x\) ate every food\(_z\) that a doctor\(_y\) recommended.

a. WS \([\exists y/\forall x/\forall z]: \forall x \forall z \exists s y (\phi \land \text{dep}(v, y))\)

b. IS \([\forall x/\exists y/\forall z]: \forall x \forall z \exists s y (\phi \land \text{dep}(vx, y))\)

c. NS \([\forall x/\forall z/\exists y]: \forall x \forall z \exists s y (\phi \land \text{dep}(vxz, y))\)

\[
\begin{array}{cccc}
\nu & x & z & y \\
\nu_1 & \ldots & \ldots & b_1 \\
\nu_1 & \ldots & \ldots & b_1 \\
\nu_1 & \ldots & \ldots & b_1 \\
\nu_1 & \ldots & \ldots & b_1 \\
\end{array}
\]

WS: \text{dep}(v, y)

\[
\begin{array}{cccc}
\nu & x & z & y \\
\nu_1 & a_1 & \ldots & b_1 \\
\nu_1 & a_1 & \ldots & b_1 \\
\nu_1 & a_2 & \ldots & b_2 \\
\nu_1 & a_2 & \ldots & b_2 \\
\end{array}
\]

IS: \text{dep}(vx, y)

\[
\begin{array}{cccc}
\nu & x & z & y \\
\nu_1 & a_1 & c_1 & b_1 \\
\nu_1 & a_2 & c_2 & b_2 \\
\nu_1 & a_3 & c_3 & b_3 \\
\nu_1 & a_4 & c_4 & b_4 \\
\end{array}
\]

NS: \text{dep}(vxz, y)
Application I: Exceptional Scope

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

a. WS $[\exists y/\forall x/\forall z]: \forall x\forall z \exists s_y (\phi \land \text{dep}(v, y))$

b. IS $[\forall x/\exists y/\forall z]: \forall x\forall z \exists s_y (\phi \land \text{dep}(vx, y))$

c. NS $[\forall x/\forall z/\exists y]: \forall x\forall z \exists s_y (\phi \land \text{dep}(vxz, y))$

But how to account for the known vs unknown contrast?
### Application II: Specific Known, Specific Unknown, Non-specific

<table>
<thead>
<tr>
<th></th>
<th>Constancy</th>
<th>Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependence</strong></td>
<td>$\text{dep}(\emptyset, x)$</td>
<td>$\text{var}(\emptyset, x)$</td>
</tr>
<tr>
<td><strong>Constancy</strong></td>
<td>$\nu \quad x$</td>
<td>$\nu \quad x$</td>
</tr>
<tr>
<td><strong>Dependence</strong></td>
<td>$\ldots \quad d_1$</td>
<td>$\ldots \quad d_1$</td>
</tr>
<tr>
<td><strong>Variation</strong></td>
<td>$\nu \quad x$</td>
<td>$\nu \quad x$</td>
</tr>
<tr>
<td><strong>Dependence</strong></td>
<td>$\nu_1 \quad d_1$</td>
<td>$\nu_1 \quad d_1$</td>
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<tr>
<td><strong>Variation</strong></td>
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<td>$\nu_1 \quad d_2$</td>
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<tr>
<td><strong>Constancy</strong></td>
<td>$\nu \quad x$</td>
<td>$\nu \quad x$</td>
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<tr>
<td><strong>Dependence</strong></td>
<td>$\nu_1 \quad d_1$</td>
<td>$\nu_1 \quad d_1$</td>
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<tr>
<td><strong>Variation</strong></td>
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Application II: Specific Known, Specific Unknown, Non-specific

<table>
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<tr>
<th></th>
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<th>$\text{variation}$</th>
<th>$\text{v-constancy}$</th>
<th>$\text{v-variation}$</th>
</tr>
</thead>
</table>
| $\text{dep}(\emptyset, x)$ | $\begin{array}{c|c}
  v & x \\
  \cdots & d_1 \\
  \cdots & d_1 \\
\end{array}$ | $\begin{array}{c|c}
  v & x \\
  \cdots & d_1 \\
  \cdots & d_2 \\
\end{array}$ | $\begin{array}{c|c|c}
  v & x & \\
  v_1 & d_1 & \\
  v_2 & d_2 & \\
\end{array}$ | $\begin{array}{c|c|c}
  v & x & \\
  v_1 & d_1 & \\
  v_1 & d_2 & \\
\end{array}$ |
| $\text{var}(\emptyset, x)$ | $\begin{array}{c|c}
  v & x \\
  \cdots & d_1 \\
  \cdots & d_2 \\
\end{array}$ | $\begin{array}{c|c}
  v & x \\
  \cdots & d_1 \\
  \cdots & d_2 \\
\end{array}$ | $\begin{array}{c|c|c}
  v & x & \\
  v_1 & d_1 & \\
  v_1 & d_2 & \\
\end{array}$ | $\begin{array}{c|c|c}
  v & x & \\
  v_1 & d_1 & \\
  v_1 & d_2 & \\
\end{array}$ |

**Specific Known:**
constancy $\text{dep}(\emptyset, x)$

$\begin{array}{c|c|c}
  v & \cdots & x \\
  v_1 & \cdots & d_1 \\
  v_2 & \cdots & d_1 \\
\end{array}$
### Application II: Specific Known, Specific Unknown, Non-specific

<table>
<thead>
<tr>
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<th>$\text{dep}(\emptyset, x)$</th>
<th>$\text{var}(\emptyset, x)$</th>
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<td>$\nu$ $\ldots$ $d_1$</td>
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<tr>
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<td>$\nu$ $\ldots$ $d_2$</td>
</tr>
<tr>
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<td>$\nu_2$ $d_2$</td>
</tr>
<tr>
<td></td>
<td>$\nu_1$ $d_1$</td>
<td>$\nu_1$ $d_1$</td>
</tr>
<tr>
<td>$\nu$-<strong>variation</strong></td>
<td>$\nu_1$ $d_1$</td>
<td>$\nu_1$ $d_2$</td>
</tr>
</tbody>
</table>

**Specific Unknown:**

$\nu$-constancy $\text{dep}(\nu, x) +$

$\nu$-variation $\text{var}(\emptyset, x)$
Application II: Specific Known, Specific Unknown, Non-specific

| constancy | $\text{dep}(\emptyset, x)$ | $\nu \quad x$
|------------|-----------------|---------|
| $\ldots \quad d_1$
| $\ldots \quad d_1$
| $\nu \quad x$
| $\ldots \quad d_1$
| $\ldots \quad d_2$

| variation | $\text{var}(\emptyset, x)$ | $\nu \quad x$
|------------|-----------------|---------|
| $\nu \quad x$
| $\ldots \quad d_1$
| $\ldots \quad d_2$
| $\nu \quad x$
| $\nu_1 \quad d_1$
| $\nu_2 \quad d_2$

| $\nu$-constancy | $\text{dep}(\nu, x)$ | $\nu \quad x$
| $\nu_1 \quad d_1$
| $\nu_2 \quad d_2$
| $\nu \quad x$
| $\nu_1 \quad d_1$
| $\nu_1 \quad d_2$

| $\nu$-variation | $\text{var}(\nu, x)$ | $\nu \quad x$
| $\nu_1 \quad d_1$
| $\nu_1 \quad d_2$

Non-specific: $\nu$-variation $\text{var}(\nu, x)$

| $\nu \quad \ldots \quad x$
| $\nu_1 \quad \ldots \quad d_1$
| $\nu_1 \quad \ldots \quad d_2$
## Application III: Variety of Indefinites

<table>
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<tr>
<th>type</th>
<th>functions</th>
<th>requirement</th>
<th>example</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) unmarked</td>
<td>✓ ✓ ✓</td>
<td>none</td>
<td>Italian <em>qualcuno</em></td>
</tr>
<tr>
<td>(ii) specific</td>
<td>✓ ✓ ✗</td>
<td><em>dep</em>(ν, x)</td>
<td>Georgian <em>-ghats</em></td>
</tr>
<tr>
<td>(iii) non-specific</td>
<td>✗ ✗ ✓</td>
<td><em>var</em>(ν, x)</td>
<td>Russian <em>-nibud</em></td>
</tr>
<tr>
<td>(iv) epistemic</td>
<td>✗ ✓ ✓</td>
<td><em>var</em>(∅, x)</td>
<td>German <em>-irgend</em></td>
</tr>
<tr>
<td>(v) specific known</td>
<td>✓ ✗ ✗</td>
<td><em>dep</em>(∅, x)</td>
<td>Russian <em>-koe</em></td>
</tr>
<tr>
<td>(vi) SK + NS</td>
<td>✓ ✗ ✓</td>
<td><em>dep</em>(∅, x) ∨ <em>var</em>(ν, x)</td>
<td>unattested</td>
</tr>
<tr>
<td>(vii) specific unknown</td>
<td>✗ ✓ ✓</td>
<td><em>dep</em>(ν, x) ∧ <em>var</em>(∅, x)</td>
<td>Kannada <em>-oo</em></td>
</tr>
</tbody>
</table>

\[
\begin{align*}
& \text{var}(∅, x) \\
& \text{dep}(∅, x) \lor \text{var}(ν, x) \\
& \text{dep}(ν, x) \\
\end{align*}
\]
# Application III: Variety of Indefinites

<table>
<thead>
<tr>
<th>type</th>
<th>functions</th>
<th>requirement</th>
<th>example</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) unmarked</td>
<td>✓ ✓ ✓</td>
<td>none</td>
<td>Italian <em>qualcuno</em></td>
</tr>
<tr>
<td>(ii) specific</td>
<td>✓ ✓ ✗</td>
<td><em>dep</em>(v, x)</td>
<td>Georgian <em>-ghats</em></td>
</tr>
<tr>
<td>(iii) non-specific</td>
<td>✗ ✗ ✓</td>
<td><em>var</em>(v, x)</td>
<td>Russian <em>-nibud</em></td>
</tr>
<tr>
<td>(iv) epistemic</td>
<td>✗ ✓ ✓</td>
<td><em>var</em>(∅, x)</td>
<td>German <em>-irgend</em></td>
</tr>
<tr>
<td>(v) specific known</td>
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<tr>
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<td>(vii) specific unknown</td>
<td>✗ ✓ ✓</td>
<td><em>dep</em>(v, x) ∧ <em>var</em>(∅, x)</td>
<td>Kannada <em>-oo</em></td>
</tr>
</tbody>
</table>

\[
\text{var(∅, x)}
\]

\[
\begin{align*}
\text{dep}(∅, x) & \quad \text{var}(v, x) \\
\end{align*}
\]

\[
\text{dep}(v, x)
\]

**(vii) specific unknown:** increased complexity
### Application III: Variety of Indefinites

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<td>✗ ✗ ✓</td>
<td><em>var</em> (ν, x)</td>
<td>Russian <em>-nibud</em></td>
</tr>
<tr>
<td>(iv) epistemic</td>
<td>✗ ✓ ✓</td>
<td><em>var</em> (Ø, x)</td>
<td>German <em>-irgend</em></td>
</tr>
<tr>
<td>(v) specific known</td>
<td>✓ ✗ ✗</td>
<td><em>dep</em> (Ø, x)</td>
<td>Russian <em>-koe</em></td>
</tr>
<tr>
<td>(vi) SK + NS</td>
<td>✓ ✗ ✓</td>
<td><em>dep</em> (Ø, x) ∨ <em>var</em> (ν, x)</td>
<td>unattested</td>
</tr>
<tr>
<td>(vii) specific unknown</td>
<td>✗ ✓ ✗</td>
<td><em>dep</em> (ν, x) ∧ <em>var</em> (Ø, x)</td>
<td>Kannada <em>-oo</em></td>
</tr>
</tbody>
</table>

**Diagram**

\[
\begin{align*}
& \text{var}(Ø, x) \\
\{ & \text{dep}(Ø, x) & \text{var}(ν, x) \}
\end{align*}
\]

\[
\text{dep}(ν, x)
\]

**Note**

**(vii) specific unknown:** increased complexity

**(vi) SK + NS:** violation of connectedness (Gardenfors 2014; Enguehard and Chemla 2021)
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 or a modal) which licenses them:

(3)*Ivan včera kupil kakuju-nibud’ knigu.
Ivan yesterday bought which-indef. book.

‘Ivan bought some book [non-specific] yesterday.’

(4) 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 trigger \( \nu \)-variation: 
\[ \text{var}(\nu, x). \]
Application IV: Licensing of non-specific indefinites

Recall that non-specific indefinites trigger $\nu$-variation: $\var(\nu, x)$.

$$\exists_s x \ (\phi \land \var(\nu, x))$$

$$\begin{array}{c|c}
\nu & \nu_1 \\
\hline
\nu & \nu_1 \\
\hline
\end{array}$$

$$\begin{array}{c|c}
\nu & \chi \\
\hline
\nu_1 & a_1 \\
\hline
\end{array}$$
Application IV: Licensing of non-specific indefinites

Recall that non-specific indefinites trigger $\nu$-variation: $\text{var}(\nu, x)$.

\[
\forall y \phi
\]

$$\frac{\nu}{\nu_1} \quad \frac{\nu \ y}{\nu_1 \ b_1} \quad \frac{\nu_1 \ b_1}{\nu_1 \ b_2}$$
Application IV: Licensing of non-specific indefinites

Recall that non-specific indefinites trigger $\nu$-variation: $\text{var}(\nu, x)$.

$$\forall y \exists s x (\phi \land \text{var}(\nu, x))$$

$$
\begin{array}{c}
\nu \\
\nu_1 \\
\end{array}
\begin{array}{c}
\nu \\
\nu_1 \\
\end{array}
\begin{array}{c}
\nu \\
\nu_1 \\
\end{array}
\begin{array}{c}
\nu \\
\nu_1 \\
\end{array}
$$

$$
\begin{array}{c}
\nu y \\
\nu_1 b_1 \\
\nu y \\
\nu_1 b_1 \\
\nu y x \\
\nu_1 b_1 a_1 \\
\nu y x \\
\nu_1 b_1 a_2 \\
\end{array}
\begin{array}{c}
\nu y \\
\nu_1 b_2 \\
\nu y \\
\nu_1 b_2 \\
\nu y x \\
\nu_1 b_2 a_1 \\
\nu y x \\
\nu_1 b_2 a_2 \\
\end{array}
$$
Application IV: Licensing of non-specific indefinites

Recall that non-specific indefinites trigger $\nu$-variation: $\text{var}(\nu, x)$.

$$\forall y \exists x (\phi \land \text{var}(\nu, x))$$

But indefinites can also be licensed by modals.
Modality

We can analyze modals as *(lax) quantifiers* $(\Diamond_w \sim \exists_{l(a\alpha)} w; \Box_w \sim \forall w)$ modulo an accessibility relation.

(5) You must/can take nibud-book (non-specific).

a. $\forall w \exists_s x(\phi \land \text{var}(v, x))$
a
b. $\exists_l w \exists_s x(\phi \land \text{var}(v, x))$

<table>
<thead>
<tr>
<th>$v$</th>
<th>$w$</th>
<th>$x$</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>$v_1$</td>
<td>$w_2$</td>
<td>$a_2$</td>
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Supporting

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<th>$x$</th>
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<tbody>
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<td>$a_1$</td>
</tr>
<tr>
<td>$v_1$</td>
<td>$w_2$</td>
<td>$a_1$</td>
</tr>
</tbody>
</table>

Non-supporting
Application V: Epistemic Indefinites and ignorance inference

Epistemic indefinites (e.g. Italian *un qualche*, German *irgend-* , ...) signal speaker’s **lack of knowledge**.

(6) *Irgendjemand hat angerufen.*

irgend-someone has called.

‘Someone called. **The speaker does not know who.**’
Application V: Epistemic Indefinites and ignorance inference

Epistemic indefinites (e.g. Italian *un qualche*, German *irgend-* . . . ) signal speaker’s **lack of knowledge**.

(6) *Irgendjemand hat angerufen.*

irgend-someone has called.

‘Someone called. **The speaker does not know who.**’

Ignorance inferences are typically undefeasible:

(7) *Irgendjemand hat angerufen. #Rat mal wer*

irgend-someone has called.    guess who?

‘Someone called. #Guess who?'

(Kratzer and Shimoyama 2002; Alonso-Ovalle and Menéndez-Benito 2010; Alonso-Ovalle and Menéndez-Benito 2017; Jayez and Tovena 2006; Aloni and Port 2015; Chierchia 2013)
Application V: Epistemic Indefinites and ignorance inference

(8) *Irgendjemand hat angerufen.*

irgend-someone has called.

‘Someone called. The speaker does not know who.’

Recall that epistemic indefinites trigger $\text{var}(\emptyset, x)$:

$$\exists_s x(\phi(v, x) \land \text{var}(\emptyset, x))$$

<table>
<thead>
<tr>
<th>$v$</th>
<th>$x$</th>
<th>$v$</th>
<th>$x$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$v_1$</td>
<td>$a_1$</td>
<td>$v_1$</td>
<td>$a_1$</td>
</tr>
<tr>
<td>$v_2$</td>
<td>$a_2$</td>
<td>$v_2$</td>
<td>$a_1$</td>
</tr>
</tbody>
</table>

Supporting  Non-supporting
Final Proposal

We propose that:

(i) Indefinites are **strict existentials**;
Final Proposal

We propose that:

(i) Indefinites are strict existentials;

(ii) They are interpreted in-situ;
Final Proposal

We propose that:

(i) Indefinites are **strict existentials**;

(ii) They are interpreted **in-situ**;

(iii) An unmarked/plain indefinite \( \exists_s x \) in **syntactic scope** of \( O_z \) allows all \( \text{dep}(\tilde{y}, x) \), with \( \tilde{y} \) included in \( \nu\tilde{z} \):

\[
O_{z_1} \ldots O_{z_n} \exists_s x (\phi \land \text{dep}(\tilde{y}, x))
\]
Final Proposal

We propose that:

(i) Indefinites are strict existentials;

(ii) They are interpreted in-situ;

(iii) An unmarked/plain indefinite \( \exists_s x \) in syntactic scope of \( O_{\vec{z}} \) allows all \( \text{dep}(\vec{y}, x) \), with \( \vec{y} \) included in \( \nu\vec{z} \):

\[
O_{z_1} \ldots O_{z_n} \exists_s x (\phi \land \text{dep}(\vec{y}, x))
\]

(iv) Marked indefinites trigger the obligatory activation of particular dependence or variation atoms.
Final Proposal

\[ O_{z_1} \ldots O_{z_n} \exists x (\phi \land \ldots ) \]

**Plain:** \( \text{dep}(\vec{y}, x) \), where \( \vec{y} \subseteq \nu \vec{z} \)

**SK:** \( \text{dep}(\vec{y}, x) \) with \( \vec{y} = \emptyset \)

**Specific:** \( \text{dep}(\vec{y}, x) \) with \( \vec{y} \subseteq \{ \nu \} \)

**Epistemic:** \( \text{dep}(\vec{y}, x) \land \text{var}(\vec{z}, x) \) with \( \vec{z} \subseteq \{ \nu \} \)

**Non-specific:** \( \text{dep}(\vec{y}, x) \land \text{var}(\vec{z}, x) \) with \( \vec{z} = \nu \)

**SU:** \( \text{dep}(\vec{y}, x) \land \text{var}(\vec{z}, x) \) with \( \vec{y} = \nu \) and \( \vec{z} = \emptyset \)
### Application VI: Interaction with Scope

\[ \forall z \forall y \exists s x \phi \]

<table>
<thead>
<tr>
<th></th>
<th>WS-K (dep(\emptyset, x))</th>
<th>WS-U (dep(\nu, x))</th>
<th>IS (dep(\nu y, x))</th>
<th>NS (dep(\nu y z, x))</th>
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</thead>
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<td>unmarked</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>specific</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>(dep(\subseteq \nu, x))</td>
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<td></td>
</tr>
<tr>
<td>non-specific</td>
<td>x</td>
<td>x</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>(var(\nu, x))</td>
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<td>✓</td>
<td>✓</td>
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<tr>
<td>epistemic</td>
<td>x</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>(var(\emptyset, x))</td>
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<td></td>
</tr>
<tr>
<td>specific known</td>
<td>✓</td>
<td>x</td>
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<tr>
<td>(dep(\emptyset, x))</td>
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<tr>
<td>specific unknown</td>
<td>x</td>
<td>✓</td>
<td>x</td>
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<tr>
<td>(dep(\nu, x) \land var(\emptyset, x))</td>
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</tbody>
</table>

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

(9)

Možet byť, MašaMaša xočet kupit'kakuju-nibud'knigu.
### Application VI: Interaction with Scope

\[ \forall z \forall y \exists x \phi \]

<table>
<thead>
<tr>
<th></th>
<th>WS-K ( \text{dep}(\emptyset, x) )</th>
<th>WS-U ( \text{dep}(v, x) )</th>
<th>IS ( \text{dep}(vy, x) )</th>
<th>NS ( \text{dep}(vyz, x) )</th>
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</thead>
<tbody>
<tr>
<td>unmarked</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>specific ( \text{dep}(\subseteq v, x) )</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>non-specific ( \text{var}(v, x) )</td>
<td>✗</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>epistemic ( \text{var}(\emptyset, x) )</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>specific known ( \text{dep}(\emptyset, x) )</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>specific unknown ( \text{dep}(v, x) \wedge \text{var}(\emptyset, x) )</td>
<td>✗</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
</tr>
</tbody>
</table>

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

(9) \[ \text{Možet byt’, Maša xočet kupit’ kakuju-nibud’ knigu.} \]
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.
Application VII: From non-specific to epistemic

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

![Diagram showing the transition from non-specific to epistemic](image)
Application VII: From non-specific to epistemic

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

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

(10) **Weakening of functions (a) > (b) > (c)**
(a) non-specific
(b) non-specific + specific unknown = epistemic
(c) epistemic + specific known = unmarked
Application VII: From non-specific to epistemic

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

(10) **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 VII: From non-specific to epistemic

(11) **Weakening of functions (a) > (b) > (c)**

(a) non-specific: $\var(n, x)$

(b) non-specific + specific unknown = epistemic: $\var(\emptyset, x)$

(c) epistemic + specific known ($\text{dep} (\emptyset, x) = \text{unmarked}$)
(11) **Weakening of functions (a) > (b) > (c)**

(a) non-specific: \( \text{var}(v, x) \)

(b) non-specific + specific unknown = epistemic: \( \text{var}(\emptyset, x) \)

(c) epistemic + specific known (\( \text{dep}(\emptyset, x) = \text{unmarked} \))

This framework makes the notion of weakening precise in terms of **logical entailment** between atoms.
Application VII: From non-specific to epistemic

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<tr>
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This framework makes the notion of weakening precise in terms of **logical entailment** between atoms.

We have ‘atomic weakening’ from non-specific to epistemic: \( \text{var}(v, x) \) entails \( \text{var}(\emptyset, x) \).
Application VII: From non-specific to epistemic

(11) **Weakening of functions (a) > (b) > (c)**

(a) non-specific: \( \text{var}(v, x) \)
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(c) epistemic + specific known (\( \text{dep}(\emptyset, x) = \text{unmarked} \))

This framework makes the notion of weakening precise in terms of **logical entailment** between atoms.

We have ‘atomic weakening’ from non-specific to epistemic: \( \text{var}(v, x) \) entails \( \text{var}(\emptyset, x) \).

But no further ‘atomic weakening’ triggering the acquisition of SK. (Note also that \( \text{var}(\emptyset, x) \land \text{dep}(\emptyset, x) \models \bot \)).

To get unmarked from epistemic, we would need \( \text{var}(\emptyset, x) \lor \text{dep}(\emptyset, x) \), which trivializes the dependence conditions (arguably a complex operation).
We have developed a **two-sorted team semantics** framework accounting for indefinites.

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.
Outline

1. Introduction
2. Desiderata
3. The Framework
4. Applications
5. Epistemic Indefinites
6. Conclusion
Basic Data

(12) **Undefeasible Ignorance Inference**

Maria ha sposato un qualche dottore (#cioè Ugo).

‘Maria married some doctor, namely Ugo.’

(13) **Co-Variation**

Todos los profesores están bailando con algún estudiante.

‘Every professor is dancing with some student.’

(14) **NPI** (only for some EIs, e.g. German irgend-)

Niemand hat irgendeine Frage beantwortet.

‘Nobody answered any question.’

(15) **Free Choice** (only for some EIs, e.g. German irgend-)

Mary muss irgendeinen Arzt heiraten.

‘Mary must marry a doctor, any doctor is a permissible option.’
Basic Strategy

We have proposed that epistemic indefinites trigger $\text{var}(\subseteq \{v\}, x)$. This already gives us ignorance inferences and co-variation (non-specific) readings.
Basic Strategy

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Basic Strategy

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Our strategy for the remaining desiderata:

(i) To account for NPI uses, we adopt an intensional notion of negation.

(ii) To account for free choice, we generalize the variation atom to express the cardinality of the variation and to allow for splitting.
Generalized Variation

\[ M, T \models var_n(\vec{y}, x) \text{ iff } \forall d \in D^* \subseteq D \text{ with } |D^*| \geq n, \text{ for all } i \in T, \text{ there is a } j \in T_{i, \vec{y}} \text{ s.t. } j(x) = d, \text{ where } T_{i, \vec{y}} = \{ j \in T : i(\vec{y}) = j(\vec{y}) \} \]
Generalized Variation

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Example: with \( D = \{ d_1, d_2, d_3 \}, \text{ var}_{|D|}(y, x) \):

\[
\begin{array}{ccc}
\cdots & y & x \\
& d_1 & \rightarrow d_1 \\
\vdots & \rightarrow & d_2 \\
& d_1 & \rightarrow d_3 \\
\vdots & d_1 & \rightarrow d_1 \\
& d_2 & \rightarrow d_2 \\
& & \rightarrow d_3 \\
\end{array}
\]
Generalized Variation

\[ M, T \models \text{var}_n(\tilde{y}, x) \text{ iff } \]
\[ \forall d \in D^* \subseteq D \text{ with } |D^*| \geq n, \text{ for all } i \in T, \text{ there is a } j \in T_{i, \tilde{y}} \text{ s.t. } j(x) = d, \text{ where } T_{i, \tilde{y}} = \{ j \in T : i(\tilde{y}) = j(\tilde{y}) \} \]

Example: with \( D = \{ d_1, d_2, d_3 \} \), \( \text{var}_{|D|}(y, x) \):

\[
\begin{array}{cccc}
\vdots & y & \to & x \\
\vdots & d_1 & \to & d_1 \\
\vdots & d_2 & \to & d_2 \\
& d_1 & \to & d_2 \\
& d_2 & \to & d_3 \\
\end{array}
\]

Note: \( \text{var}(\emptyset, x) \) is equivalent to \( \text{var}_2(\emptyset, x) \).
**German *Irgend*-**

*Irgend*-indefinites associate with $\varphi_2(\subseteq \nu, \chi)$.

(16) $Jeder_\nu$ hat irgendein$_\chi$ Buch gelesen.

- **specific unknown:**
  $$\forall \nu \exists_\nu \chi (\phi \land \text{dep}(\nu, \chi) \land \varphi_2(\emptyset, \chi))$$

- **co-variation:**
  $$\forall \nu \exists_\nu \chi (\phi \land \text{dep}(\nu, \chi) \land \varphi_2(\nu, \chi))$$

<table>
<thead>
<tr>
<th>$\nu$</th>
<th>$\nu_1$</th>
<th>$\nu_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$</td>
<td>$d_1$</td>
<td>$d_2$</td>
</tr>
<tr>
<td>$x$</td>
<td>$b_1$</td>
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<td>$d_3$</td>
</tr>
<tr>
<td>$x$</td>
<td>$b_1$</td>
<td>$b_2$</td>
</tr>
</tbody>
</table>

(49a) (49b)
German *Irgend-*

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

a. specific unknown:
$\forall w \exists x (\phi \land \text{dep}(v, x) \land \text{var}_2(\emptyset, x))$

b. non-specific:
$\forall w \exists x (\phi \land \text{dep}(vy, x) \land \text{var}_2(v, x))$

c. free choice:
$\forall w \exists x (\phi \land \text{dep}(vw, x) \land \text{var}_{|D|}(v, x))$

$\text{var}_{|D|}(v, x)$ models **free choice** (full non-specificity), possibly triggered by prosodic prominence. For $D = \{a, b, c\}$:

<table>
<thead>
<tr>
<th>$v$</th>
<th>$w$</th>
<th>$x$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$v_1$</td>
<td>$w_1$</td>
<td>$a$</td>
</tr>
<tr>
<td>$v_1$</td>
<td>$w_2$</td>
<td>$b$</td>
</tr>
<tr>
<td>$v_1$</td>
<td>$w_3$</td>
<td>$c$</td>
</tr>
<tr>
<td>$v_2$</td>
<td>$w_1$</td>
<td>$a$</td>
</tr>
<tr>
<td>$v_2$</td>
<td>$w_2$</td>
<td>$b$</td>
</tr>
<tr>
<td>$v_2$</td>
<td>$w_3$</td>
<td>$c$</td>
</tr>
</tbody>
</table>
German *Irgend-*

(17) *Mary musste*<sub>W</sub> *irgendeinen*<sub>x</sub> *Mann heiraten.*
Mary had-to irgend-one man marry.

a. specific unknown:
\[ \forall w \exists s_x (\phi \land \text{dep}(v, x) \land \text{var}_2(\emptyset, x)) \]
b. non-specific:
\[ \forall w \exists s_x (\phi \land \text{dep}(vy, x) \land \text{var}_2(v, x)) \]
c. free choice:
\[ \forall w \exists s_x (\phi \land \text{dep}(vw, x) \land \text{var}_{|D|}(v, x)) \]

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<table>
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<th>x</th>
</tr>
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<tbody>
<tr>
<td>( v_1 )</td>
<td>( w_1 )</td>
<td>a</td>
</tr>
<tr>
<td>( v_1 )</td>
<td>( w_2 )</td>
<td>b</td>
</tr>
<tr>
<td>( v_1 )</td>
<td>( w_3 )</td>
<td>c</td>
</tr>
<tr>
<td>( v_2 )</td>
<td>( w_1 )</td>
<td>a</td>
</tr>
<tr>
<td>( v_2 )</td>
<td>( w_2 )</td>
<td>b</td>
</tr>
<tr>
<td>( v_2 )</td>
<td>( w_3 )</td>
<td>c</td>
</tr>
</tbody>
</table>

In general, we can show that:
\[ \Box_w / \Diamond_w \exists_s x (\phi \land \text{var}_{|D|}(v, x)) \rightarrow \forall x (\Diamond_w \phi) \]
Negation and Implication

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

(18) Intensional Negation

\[ \neg \phi(v) \iff \forall w (\phi(w) \rightarrow v \neq w) \]
Negation and Implication

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(18) **Intensional Negation**

\[ \neg \phi(v) \leftrightarrow \forall w(\phi(w) \rightarrow v \neq w) \]

(19) **Semantic Clause for Implication**

\[ M, X \models \phi \rightarrow \psi \iff \text{for some } X' \subseteq X \text{ s.t. } M, X' \models \phi \text{ and } X' \text{ is maximal (i.e. for all } X'' \text{ s.t. } X' \subset X'' \subseteq X, \text{ it holds } M, X'' \not\models \phi), \text{ we have } M, X' \models \psi \]

[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.]
Negation and Epistemic Indefinites

EIs under negation behave like NPI (e.g., *any*).

In our framework, EIs under negation as in (20) are supported only if the initial team is \( \{ \emptyset \} \). (In \( \emptyset \), John read no book, in \( \emptyset_a \), John read only book \( a \), and so on.)

(20) John does not have *irgend*-book (epistemic).
    a. \( \forall w (\exists x (\phi(x, w) \land \text{var}(\emptyset, x)) \rightarrow v \neq w) \)


\[
\begin{array}{ccc}
    v & w & x \\
    \emptyset & \emptyset & a \\
    \emptyset & \emptyset_a & a \\
    \emptyset & \emptyset_b & b \\
    \emptyset & \emptyset_{ab} & b \\
\end{array}
\]

(a) Supporting Team

\[
\begin{array}{ccc}
    v & w & x \\
    \emptyset_a & \emptyset & b \\
    \emptyset_a & \emptyset_a & a \\
    \emptyset_a & \emptyset_b & b \\
    \emptyset_a & \emptyset_{ab} & a \\
\end{array}
\]

(b) Non-Supporting Team

[maximal teams of antecedent in blue]
Negation and Specific Indefinites

For (21), specific indefinites under negation are supported by \{w_{\emptyset}\} (John read no book), but also by \{w_a\} (John read book a and not b) or \{w_b\}.

We predict that (21) is false only for the case of \{w_{ab}\}.

[The antecedent of (21a) is supported by more than one maximal team, due to different constant values of \(x\) induced by \text{dep}(\emptyset, x), but for the second reading only one is supporting.]

(21) John does not have some-SK book.

\[ \forall w (\exists_s x (\phi(x, w) \land \text{dep}(\emptyset, x)) \rightarrow v \neq w) \]

\[
\begin{array}{ccc}
\nu & w & x \\
\hline
w_{\emptyset} & w_{\emptyset} & a \\
w_{\emptyset} & w_a & a \\
w_{\emptyset} & w_b & a \\
w_{\emptyset} & w_{ab} & a \\
\end{array}
\hspace{1cm}
\begin{array}{ccc}
\nu & w & x \\
\hline
w_a & w_{\emptyset} & b \\
w_a & w_a & b \\
w_a & w_b & b \\
w_a & w_{ab} & b \\
\end{array}
\hspace{1cm}
\begin{array}{ccc}
\nu & w & x \\
\hline
w_{ab} & w_{\emptyset} & a \\
w_{ab} & w_a & a \\
w_{ab} & w_b & a \\
w_{ab} & w_{ab} & a \\
\end{array}
\]

(a) Supporting Team  (b) Supporting Team  (c) Non-Supporting Team

[In (c), if \(x \mapsto b\), 3rd and 4th row are the max team of the antecedent]
Outline

1. Introduction
2. Desiderata
3. The Framework
4. Applications
5. Epistemic Indefinites
6. Conclusion
Conclusion

Some directions of future research:

(a) Explore language-specific distinctions in the domain of specificity;

(b) Expand our team-based analysis to other areas of the map (e.g. NPI);

(c) Integrate our framework with conceptual covers;

(d) Model epistemic modals vs root modals in a team-based system;

(e) Develop a dynamic version of our logic (including dependence atoms).

(f) . . .
Conclusion

THANK YOU!
THANK YOU!

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3.6 Semantic Clauses
3.7 Dependence Atoms
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4.3 Application II: Specific Known, Specific Unknown, Non-specific
4.4 Application III: Variety of Indefinites
4.5 Application IV: Licensing of non-specific indefinites
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4.8 Application VI: Interaction with Scope
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5.3 Generalized Variation
5.4 German *Irgend*- modification
5.5 Negation and Implication
5.6 Negation and Epistemic Indefinites
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6. Conclusion


Port, Angelika and Maria Aloni (2015). The diachronic development of German Irgend-indefinites. Ms, University of Amsterdam.


Yang, Fan (2014). *On extensions and variants of dependence logic*. 