A team semantics for FC indefinites and their grammaticalization

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Plan of the talk

1. Indefinites and FC
2. Grammaticalization
3. Team Semantics
4. Formal Diachronic Analysis
5. Conclusion

Outline

1. Indefinites and FC

2. Grammaticalization

3. Team Semantics

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Indefinite Pronouns

The English *some*-series, a canonical example of indefinite pronoun:

(1) John bought **something** yesterday.

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However, cross-linguistically indefinites display a **great variety in form and meaning**. For instance, the specific -ღაც (-*ghats*) vs the non-specific -მე (-*me*) in Georgian:

(2) ჯონმა გუშინ რაღაც/*რამე იყიდა
John-ERG yesterday raghats/*rame buy-PST.3SG
'John bought something yesterday.'

(3) ჯონს გუშინ რაღაც-ის/რამე-ის ყიდვა სურდა
John-DAT yesterday raghats/rame-GEN buy-INF want-PST.3SG
'John wanted to buy something yesterday.'

Indefinites and Free Choice

(4) a. You can take any book.
b. You can take a book and **every book is a possible option**.

[Aloni 2007; Chierchia 2013; Dayal 1998; Giannakidou 2001; Jayez and Tovena 2005; Menéndez-Benito 2005]

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    b. You can take a book and **every book is a possible option**.

They are quite frequent cross-linguistically:

English *anyone*
Spanish *cualquier(a)*
Japanese *daredemo*
...
Italian *qualunque*
Dutch *wie dan ook*
Hebrew *kol*

[Aloni 2007; Chierchia 2013; Dayal 1998; Giannakidou 2001; Jayez and Tovena 2005; Menéndez-Benito 2005]

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They normally cannot occur freely, but they display restricted distributions (e.g., they are licensed by modals):

(5) a. *Anyone fell.
    b. Anyone could fall.

[Aloni 2007; Chierchia 2013; Dayal 1998; Giannakidou 2001; Jayez and Tovena 2005; Menéndez-Benito 2005]

Outline

Grammaticalization Patterns

The grammaticalization of *wh*-based FC indefinites has been studied in several diachronic works:

A broad cross-linguistic generalization of the grammaticalization process:

1. Unconditional phase
2. Appositive phase
3. Indefinite phase

[Company Company and Loyo 2006; Degano 2022; Degano and Aloni 2021; Halm 2021; Haspelmath 1997; Pescarini 2010; de Vos 2010]

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2. Appositive phase
3. Indefinite phase

To illustrate this trend, we will use the Dutch indefinite *wie dan ook* as a representative item, while keeping the rest of the simplified examples in English.

[Company Company and Loyo 2006; Degano 2022; Degano and Aloni 2021; Halm 2021; Haspelmath 1997; Pescarini 2010; de Vos 2010]

Unconditional phase

First phase: Unconditional headed by a *wh*-element. Typically in combination with other elements (e.g., *dan ook* in the case of *wie dan ook*) will then be part of the grammaticalized indefinite.

(6) UNCONDITIONAL
Wie dan ook comes to the talk, I should present well.
Whoever comes to the talk, I should present well.

Appositive phase

Intermediate phase: the expression occurs as appositive often marked by two commas. Two typical anchors:

1. the anchor is a 'referential expression' (e.g., a proper name), as in (7);
2. the anchor is a non-referential expression (e.g., a plain indefinite), as in (8).

(7) John, *wie dan ook*, passed the exam.
Ignorance: John passed the exam and the speaker does not know who John is.

(8) A student, *wie dan ook*, can pass the exam.
Free Choice: Any student can pass the exam.

Indefinite phase

Final phase: full-fledged determiner or pronoun:

(9) *Wie dan ook* can pass the exam.
Free Choice: Anyone can pass the exam.

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Team Semantics

In team semantics, formulas are evaluated wrt a **set of evaluation points**, called **team**.

T	x	y
i_1	d_1	d_1
i_2	d_1	d_1
i_3	d_2	d_1
i_4	d_2	d_1

A team T: a set of assignments $i : V \to M$

[Hodges 1997; Väänänen 2007]

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A team T: a set of assignments $i : V \to M$

This allows us to express relationships of functional **dependence** between variables.

Dependence Atom:

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

[Hodges 1997; Väänänen 2007]

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$dep(x, y)$ ✓ $dep(\varnothing, y)$ ✓ $dep(y, x)$ ✗

[Hodges 1997; Väänänen 2007]

Teams as information states

Aloni and Degano (2022): two-sorted team semantics, with v as designated variable for the actual world.

Teams as information states of speakers. In initial teams only factual information is represented.The world variable v captures the speaker's epistemic state.

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

v
v_1
v_2
...
v_n

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v	x
v_1	a
v_2	a
$\dots$	a
v_n	a

Discourse information is added by operations of assignment extensions.

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v_2	a	w_2
...	a	...
v_n	a	w_n

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v_1	a	w_1	b_1
v_2	a	w_2	b_2
…	a	…	…
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v_1	a	w_1	b_1	...
v_2	a	w_2	b_2	...
...	a	...	...	...
v_n	a	w_n	b_n	...

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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	...

Discourse information is added by operations of assignment extensions.

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

Aloni & Degano (2022) - Basics

Indefinites are treated as **strict** existentials (i.e., extensions of the form $T \to D$):

(10) **Someone** called.
$\exists_{\mathbf{s}}\mathbf{x}\ \phi(x, v)$

v	x
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Universal quantifiers are captured via **universal extensions**:

(11) **Everyone** called.
$\forall\mathbf{x}\ \phi(x, v)$

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v_2	d_2

Existential modals are treated as **lax** existentials (i.e., extensions of the form $T \rightarrow \wp(W) \setminus \{\varnothing\}$)

(12) John **may** walk.
$\exists_{l}\mathbf{w}\ \phi(j, w)$

v	w
v_1	w_1
v_2	w_1
v_2	w_2

Aloni & Degano (2022) - Marked Indefinites

In Aloni & Degano (2022), marked indefinites trigger the obligatory activation of particular atoms, responsible for their enriched meaning and restricted distribution:

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

Marked (Non)-specific Indefinites

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Marked (Non)-specific Indefinites

Can we extend the account to free choice indefinites?

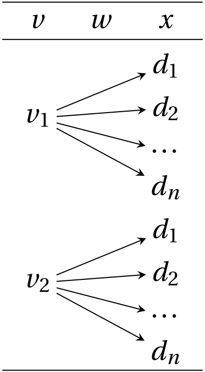
Generalized Variation

Generalized Variation Atom

$$M,T \models VAR_n(\vec{z},u) \Leftrightarrow \text{ for all } i \in T : |\{j(u) : j \in T \text{ and } i(\vec{z}) = j(\vec{z})\}| \geq n$$

$$M,T \models VAR_{|D|}(v,x) \Leftrightarrow \text{ for all } i \in T : |\{j(x) : j \in T \text{ and } i(v) = j(v)\}| = |D|$$

(13) You can take anything.
$\exists_l w \exists_s x(\phi(x,w) \wedge VAR_{|D|}(v,x))$



[Galliani 2012; Väänänen 2022]

Some facts

FC indefinites are ungrammatical in episodic contexts, since we analyze them as strict existentials with a total variation component:

(14) *John took anything
$\exists_s x(\varphi(x,v) \wedge VAR_{|D|}(v,x))$

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FC indefinites cannot be licensed by *bona-fide* quantifiers:
$VAR_{|D|}(v\vec{y},x)$

(15) *Everyone took anything
$\forall y \exists_s x(\varphi(x,v) \wedge VAR_{|D|}(vy,x))$

Outline

General Plan

Phases	Total Variation
1. Unconditional	Pragmatic inference $VAR_{\|D\|}(\varnothing, x)$
	↓ conventionalization
2. Appositive	Conventional NON-AT-ISSUE $VAR_{\|D\|}(\varnothing, x)$
	↓ strengthening
	Conventional NON-AT-ISSUE $VAR_{\|D\|}(v, x)$
	↓ integration
3. Indefinite	Conventional AT-ISSUE $VAR_{\|D\|}(v, x)$

Conjecture on **grammaticalization** processes:

Total variation as an **originally pragmatic** inference.

Appositive phase as a **conventionalization** bridge for **integrating** total variation into the semantic content of the indefinite.

Unconditionals

The antecedent of an unconditional denotes an **interrogative clause**, analyzed as a set of alternatives/teams.

(16) UNCONDITIONAL

a. Whoever comes to the talk, I should present well

b. $?x\phi(x,v) \Rightarrow \psi(v)$

[1] A similar analysis can be put forward for unconditionals of the form 'whether Mary or John will come to talk, ...', since inquisitive disjunction is definable with dependence atoms:

$$\phi \mathbin{\rotatebox[origin=c]{180}{$\mathbb{A}$}} \psi \equiv \exists x \exists y(dep(\varnothing,x) \wedge dep(\varnothing,y) \wedge (x = y \wedge \phi) \vee (x \neq y \wedge \psi))$$

[Ciardelli 2016; Rawlins 2008]

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Proposal: an unconditional requires for *all* alternatives T' of the antecedent, that their intersection with the initial team T supports the consequent.[1]

$$M, T \models \phi \Rightarrow \psi \Leftrightarrow \forall T' \in Alt(\phi) : M, T \cap T' \models \psi$$

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How to define $Alt(\phi)$?

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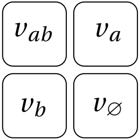
[Ciardelli 2016; Rawlins 2008]

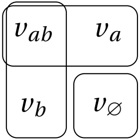
Questions and Team Semantics

A team-based system gives naturally rise to a treatment of questions by taking teams as set of alternatives.

The framework is expressive enough to take different theoretical choices (partition semantics, inquisitive semantics, ...).



Partion



Inq Sem (mention-some)

[Ciardelli 2022; Ciardelli, Groenendijk, and Roelofsen 2018]

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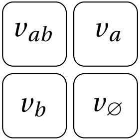

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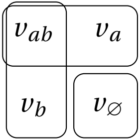


Inq Sem (mention-some)

Preliminary observation: *Wh*-questions are typically associated with **existential presuppositions**: ‘Who danced?’ presupposes that ‘Someone danced’.

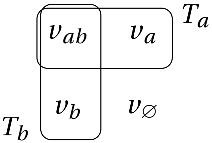
[Ciardelli 2022; Ciardelli, Groenendijk, and Roelofsen 2018]

Illustration

Whoever comes to the talk, I should present well.

$$M, T \models ?x\phi(x,v) \Rightarrow \psi(v) \Leftrightarrow \forall T' \in Alt(?x\phi(x,v)) : M, T \cap T' \models \psi(v)$$

Take an initial team $T^v = \{v_a, v_b\}$ with $D = \{a, b\}$.



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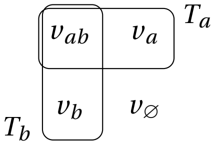


$Alt(?x\phi(x,v))$

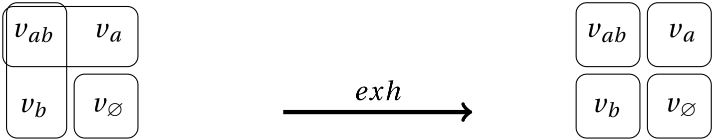
However, consider $T^v = \{v_{ab}\}$. Felicitous even in a context in which we *know* that both a and b come to talk.

Exhaustification

Two possible routes:

(i) We adopt a partion treatment of questions from the beginning;

(ii) We add an exhaustification operator.



Non-Empty Requirement

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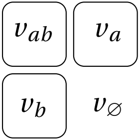

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[2]Conditional antecedents are typically taken to be consistent with the context set (Stalnaker 1976, Gillies 2004).

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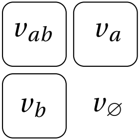

However, consider $T^v = \{v_b\}$. Note that $M, \varnothing \models \psi(v)$.

We thus require that all alternatives in the antecedent intersect with the inital team T: $T \cap T' \neq \varnothing$.[2]

$M, T \models ?x\phi(x,v) \Rightarrow \psi(v) \Leftrightarrow \forall T' \in Alt(?x\phi(x,v)) : M, T \cap T' \models \psi(v)$ and $T \cap T' \neq \varnothing$.

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Unconditionals and variation

(17) UNCONDITIONAL
Wie dan ook comes to the talk, I should present well.
Whoever comes to the talk, I should present well.

$M, T \models (?x\phi(x, v)) \Rightarrow \psi(v) \Leftrightarrow \forall T' \in Alt(?x\phi(x, v)) : M, T \cap T' \models \psi(v)$ and $T \cap T' \neq \varnothing$.

Unconditionals and variation

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This non-empty requirement gives us that the following must hold in the initial team T:

$$M, T \models \exists_s x(\phi(x,v) \wedge VAR_{|D|}(\varnothing, x))$$

In other words, an unconditional is felicitous if we are in a situation where any individual might satisfy the antecedent.

We classify the $VAR_{|D|}(\varnothing, x)$ condition as a form of **'pragmatic' inference**, as it follows from the non-empty requirement operative in the unconditional.

Appositives

Appositives contribute to **non-at-issue** dimension of semantic meaning:

(18) John, the postman, walks.

a. AT-ISSUE: $W(j)$

b. NON-AT-ISSUE:: $P(j)$

[Potts 2005; Schlenker 2010; Wang, Reese, and McCready 2005]

Appositives

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  a. AT-ISSUE: $W(j)$
  b. NON-AT-ISSUE:: $P(j)$

In the diachronic data, we find similar appositive constructions:

(19) 'Referential Appositive'
John, *wie dan ook*, passed the exam.
Ignorance: John passed the exam and the speaker does not know who John is.

(20) 'Non-Referential Appositive'
A student, *wie dan ook*, can pass the exam.
Free Choice: Any student can pass the exam.

[Potts 2005; Schlenker 2010; Wang, Reese, and McCready 2005]

Proper Names

Proper names refer to the same individual in a particular epistemic possibility of the speaker: $dep(v, j)$ holds for any name j.

But the value of proper names may **differ across epistemic possibilities**.

(21) a. John passed the exam.
b. $P(j, v)$

v	j
v_1	d_1
v_2	d_2
v_3	d_2
v_4	d_3

Appositives and Proper Names

Proposal: the variation condition $VAR_{|D|}(\varnothing, x)$ we discussed for the unconditional now represents the contribution of the appositive at a non-at-issue level:

(22) John, *wie dan ook*, passed the exam.
a. At issue: $P(j, v)$
b. Non at-issue: $VAR_{|D|}(\varnothing, j)$

v	j
v_1	d_1
v_2	d_2
...	...
v_n	d_n

Appositives and non-referential expressions

(23) A student, *wie dan ook*, can pass the exam.

a. At issue: $\exists_l w \exists_s x\ \phi(x, w)$

b. Non at-issue: $VAR_{|D|}(\varnothing, x)$

v	w	x
v_1	w_1	d_1
v_2	w_2	d_2
...	...	...
v_n	w_n	d_n

v	w	x
v_1	w_1	d_1
v_1	...	...
v_2	...	...
v_2	w_n	d_n

v	w	x
v_1	w_1	d_1
v_1	w_2	d_2
v_1	...	...
v_1	w_n	d_n

(a) corresponds to a specific use of total ignorance, while (c) is the non-specific narrow-scope reading conveying free choice.

Strengthening of $VAR_{|D|}(\varnothing, x)$ to $VAR_{|D|}(v, x)$:

1. Disambiguation: $VAR_{|D|}(v, x)$ only compatible with narrow-scope.
2. Conventionalization of the strongest possible meaning.

Appositives and non-referential expressions

(23) A student, *wie dan ook*, can pass the exam.

a. At issue: $\exists_l w \exists_s x\ \phi(x, w)$

b. Non at-issue: $VAR_{|D|}(\varnothing, x)$

v	w	x
v_1	w_1	d_1
v_2	w_2	d_2
...	...	...
v_n	w_n	d_n

v	w	x
v_1	w_1	d_1
v_1	...	...
v_2	...	...
v_2	w_n	d_n

v	w	x
v_1	w_1	d_1
v_1	w_2	d_2
v_1	...	...
v_1	w_n	d_n

(a) corresponds to a specific use of total ignorance, while (c) is the non-specific narrow-scope reading conveying free choice.

Strengthening of $VAR_{|D|}(\varnothing, x)$ to $VAR_{|D|}(v, x)$:

1. Disambiguation: $VAR_{|D|}(v, x)$ only compatible with narrow-scope.
2. Conventionalization of the strongest possible meaning.

Non-specific uses are only possible in (modal) embedded contexts.

Merging at-issue and non-at-issue

We merge AT-ISSUE and NON-AT-ISSUE semantic content to preserve the anaphoric relations between the two dimensions.[3]

$T \models merge(\phi_{\text{at-issue}} \mathbin{/\!\!\!\wedge} \phi_{\text{non-at-issue}})$ iff
T $\models \phi_{\text{at-issue}}$ and there is a T' s.t. $T[\phi_{\text{at-issue}}]T'$ and $T' \models \phi_{\text{non-at-issue}}$

(24) A student, *wie dan ook*, can pass the exam.
a. At issue: $\exists_l w \exists_s x(\phi(x,w))$
b. Non at-issue: $VAR_{|D|}(v,x)$

v
v_1
...
v_n

→

v	w	x
v_1	w_1	d_1
...	...	...
v_n	w_n	d_n

→

v	w	x
v_1	w_1	d_1
...	...	...
v_n	w_n	d_n

[3]See Appendix B for a Dynamic Team Semantics which behaves accordingly.

Free Choice

In the last phase, the strengthened $VAR_{|D|}(v, x)$ is integrated into the semantics of the indefinite.

(25) a. *Wie dan ook* can pass the exam.

b. $\exists_l w \exists_s x(\phi(x, v) \wedge VAR_{|D|}(v, x))$

v	w	x
	$\vdots$	d_1
v_1	$\vdots$	d_2
	$\vdots$	$\ldots$
	$\vdots$	d_n

Outline

Trajectory of Semantic Change

Our proposal suggests the following trajectory of semantic change

1. ‘Pragmatic’ inference $VAR_{|D|}(\varnothing, x)$
2. NON-AT-ISSUE meaning $VAR_{|D|}(\varnothing, x)$
3. Strengthening of NON-AT-ISSUE meaning to $VAR_{|D|}(v, x)$
4. AT-ISSUE meaning $VAR_{|D|}(v, x)$

NON-AT-ISSUE content in (2) and (3) as a **conventionalization** bridge for the integration of an originally pragmatic inference into at-issue semantic content.

Conclusion

THANK YOU!

Conclusion

THANK YOU!

Semantic Clauses

$M,T \models P(x_1,\ldots,x_n)$	$\Leftrightarrow$	$\forall j \in T : \langle j(x_1),\ldots,j(x_n)\rangle \in I(P^n)$
$M,T \models \phi \wedge \psi$	$\Leftrightarrow$	$M,T \models \phi$ and $M,T \models \psi$
$M,T \models \phi \vee \psi$	$\Leftrightarrow$	$T = T_1 \cup T_2$ for teams T_1 and T_2 s.t. $M,T_1 \models \phi$ and $M,T_2 \models \psi$
$M,T \models \forall z\phi$	$\Leftrightarrow$	$M,T[z] \models \phi$, where $T[z] = \{i[d/z] : i \in T$ and $d \in D\}$
$M,T \models \exists_{\text{strict}} z\phi$	$\Leftrightarrow$	there is a function $h : T \rightarrow D$ s.t. $M,T[h/z] \models \phi$, where $T[h/z] = \{i[h(i)/z] : i \in T\}$
$M,T \models \exists_{\text{lax}} z\phi$	$\Leftrightarrow$	there is a function $f : T \rightarrow \wp(D)\setminus\{\emptyset\}$ s.t. $M,T[f/z] \models \phi$, where $T[f/z] = \{i[d/z] : i \in T$ and $d \in f(i)\}$
$M,T \models dep(\vec{z},u)$	$\Leftrightarrow$	for all $i,j \in T : i(\vec{z}) = j(\vec{z}) \Rightarrow i(u) = j(u)$
$M,T \models var(\vec{z},u)$	$\Leftrightarrow$	there is $i,j \in T : i(\vec{z}) = j(\vec{z})\ \&\ i(u) \neq j(u)$
$M,T \models var(\vec{z},u)$	$\Leftrightarrow$	there is $i,j \in T : i(\vec{z}) = j(\vec{z})\ \&\ i(u) \neq j(u)$
$M,T \models VAR_n(\vec{z},u)$	$\Leftrightarrow$	for all $i \in T : \lvert\{j(u) : j \in T$ and $i(\vec{z}) = j(\vec{z})\}\rvert \geq$

A dynamic team semantics

$\langle T, T' \rangle \in [\![P(t_1 \dots t_n)]\!]_M$	iff	$T = T'$ and for all $i \in T, \langle i(t_1), \dots, i(t_n) \rangle \in I(P)$
$\langle T, T' \rangle \in [\![dep(\vec{z}, u)]\!]_M$	iff	$T = T'$ and for all $i, j \in T : i(\vec{z}) = j(\vec{z}) \Rightarrow i(u) = j(u)$
$\langle T, T' \rangle \in [\![\phi \wedge \psi]\!]_M$	iff	$\exists X : \langle T, X \rangle \in [\![\phi]\!]_M$ and $\langle X, T' \rangle \in [\![\psi]\!]_M$
$\langle T, T' \rangle \in [\![\phi \vee \psi]\!]_M$	iff	$\exists T_1, T_2, T_1', T_2'$ s.t. $T = T_1 \cup T_2, T' = T_1' \cup T_2', \langle T_1, T_1' \rangle \in [\![\phi]\!]_M$ and $\langle T_2, T_2' \rangle \in [\![\psi]\!]_M$
$\langle T, T' \rangle \in [\![\exists_s z\ \phi]\!]_M$	iff	$\exists X : T[z_s]T'$ and $\langle T, T' \rangle \in [\![\phi]\!]_M$
$\langle T, T' \rangle \in [\![\exists_l z\ \phi]\!]_M$	iff	$\exists X : T[z_l]T'$ and $\langle T, T' \rangle \in [\![\phi]\!]_M$
$\langle T, T' \rangle \in [\![\forall z\ \phi]\!]_M$	iff	$T = T'$ and $\exists X, X' : T[z_u]X$ and $\langle X, X' \rangle \in [\![\phi]\!]_M$

Negation can be defined as the dual negation.

(Alternative notation for $\langle T, T' \rangle \in [\![\phi]\!]$: $T[\phi]T'$)

A dynamic team semantics with post-suppositions

We can treat dependency atoms as post-suppositions (of existential sentences).

$$T[\phi_\psi]^+T' \quad \text{iff} \quad T[\phi]^+T' \text{ if } \exists X : T'[\psi]^+X\text{; undefined otherwise}$$

$$T[\phi_\psi]^-T' \quad \text{iff} \quad T[\phi]^-T' \text{ if } \exists X : T'[\psi]^+X\text{; undefined otherwise}$$

This also allows us to capture the merging of AT-ISSUE and NON-AT-ISSUE content and the projection behaviour of non-at-issue content under negation:

$$\langle \phi_{at-issue}, \psi_{non-at-issue} \rangle \text{ iff } \phi_{at-issue_{(\psi_{non-at-issue})}}$$

$$T[\phi(x,v)_{VAR(v,x)}]^+T' \quad \text{iff} \quad T[\phi(x,v)]^+T'\text{, if } \exists X : X = T' \text{ and for all } i \in X : |\{j(x) : j \in X \text{ and } i(v) = j(v)\}| = |D|$$

$$\text{iff} \quad T[\phi(x,v)]^+T'\text{, if for all } i \in T' : |\{j(x) : j \in T' \text{ and } i(v) = j(v)\}| = |D|$$

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