

Functional multiple wh relatives

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ZAS, Berlin

NELS 51 @ UQAM, November 6-8 2020

The data of interest

Internal composition of MWRs

Composing functional MWRs with the matrix predicate

Conclusion and open issues

Data of interest: a multiple non-interrogative *wh*-clause which is common in Bulgarian, Macedonian, Serbian, Czech, Russian and Romanian.

(Rudin, 1986, 2007, 2008, Dimova, 2014)

- (1) A mâncat [**cine ce** a adus].
has eaten who what has brought.
'Everyone ate what they brought.'
- (2) Maria puneă [**ce unde** vroia să pună].
Maria put what where wanted to put
'Maria was putting everything where she wanted to put it.'

These constructions are also possible with an argument+adjuncts combination.

- (3) Fac [**ce când** am chef].
do what when have mood
'I do what I want when I feel like it.'

Each *wh*-phrase satisfies an argument/adjunct of the matrix predicate as well as an argument/adjunct of the embedded predicate; it is always the corresponding argument/adjunct.

- (4) A mâncat [**cine ce** a adus].
has eaten who what has brought.
'Everyone ate what they brought.'

For (4), there cannot be an overt subject or object in such constructions, reinforcing the observation above that each *wh*-phrase is somehow related to an argument of the matrix predicate.

- (5) a. ***Student**~~ii~~ mănâncă **cine ce** a adus.
students.def eat who what has brought
b. *Mănâncă **carne** cine **ce** a adus.
eat meat who what has brought

MWRs are not embedded multiple *wh*-questions

The form of these MWRs is identical to that of multiple *wh*-questions.

- Romanian is a multiple fronting *wh*-language, as are all the Slavic languages which have this construction.
- The two *wh*-phrases need to be in the same order in both the interrogative and the non-interrogative constructions.

- (6) a. Cine când a plecat?
who when has left
'Who left when?' matrix MWQ
- b. Am observat [cine când a plecat].
have observed who when has left
'I noticed who left when.' embedded MWQ
- c. A plâns [cine când a plecat].
has cried who when has left
'Everyone cried when they left.' MWR

MWRs are distinct from embedded multiple *wh*-questions. They are completely natural with non-question embedding matrix predicates, e.g. *eat, carry, do, put, cry*.

MWRs are not multiple correlatives

Rudin makes a point that these MWRs are distinct from MCRs like (7)
(Dayal, 1996, Lipták, 2009):

- | | | |
|-----|---|-----|
| (7) | <p>Cine ce a adus, acela aia a mâncat.
Who what has brought that-one that has eaten
'Everyone eat what they brought.'</p> | MCR |
| (8) | <p>A mâncat [cine ce a adus].
has eaten who what has brought.
'Everyone ate what they brought.'</p> | MWR |

The differences between the two constructions:

- correlatives occur at the periphery of their matrix clause, unlike MWRs which occur in argument or adjunct positions within their matrix clauses.
- in correlatives, *wh*-phrases have a corresponding anaphoric marker (e.g. a demonstrative) in the matrix clause, unlike with MWRs.
- Not all languages have both MCRs and MWRs (Polish has MCRs but not MWRs).

This construction is also crucially different from the multiple FR construction discussed by Caponigro and Fălăuș (2018, 2020).

- (9) Maria a împachetat [ce cui dă de Crăciun].
Maria has wrapped what who gives for Christmas
Roughly: Maria wrapped the things she'll give to the appropriate people.

Only the topmost *wh*-phrase acts as an argument of the matrix predicate; the second *wh*-phrase is in no way related to the matrix predicate.

- C&F's construction can be replaced by a complex DP, unlike Rudin's MWRs, since MWRs do not satisfy any one particular argument.

- (10) Maria a împachetat **lucrurile** pe care le va da de Crăciun.
Maria has wrapped things.def ACC which them will give for Christmas
'Maria has wrapped the things she'll give for Christmas.'

- (11) A mâncat [cine ce a adus].
has eaten who what has brought.
'Everyone ate what they brought.'
- Romanian

We need to understand what the meaning of the MWR is.

- it is not immediately obvious what it can be replaced with, unlike a simple FR or C&F's MFRs.

We need to understand how the MWR composes with the matrix predicate.

- since the MWR itself cannot be said to fulfill either of the matrix predicate's arguments, how can it compose with it?

The goal: provide the first formal semantic account of MWRs.

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Parallel with multiple *wh*-questions

Recall that MWRs are identical in form with multiple *wh*-questions.

In multiple *wh*-questions, replacing the higher *wh*-phrase with a universal quantifier allows for the same answers: pair-list and functional answers.

- (12) a. Who brought what?
b. What did everyone bring?
c. Everyone brought their favorite dish.
d. Anna brought the cake and Victor brought the lasagna.

This parallel also holds of MWRs (as discussed by Caponigro and Fălăuș 2020).

- (13) a. A mâncat **cine ce** a adus.
has eaten who what has brought.
'Everyone ate what they brought.'
b. A mâncat **fiecare ce** a adus.
has eaten everyone what has brought
'Everyone ate what they brought.'

This parallel can help us understand what the MWR object refers to.

The common core of *wh*-constructions

A FR is equivalent to the nominal meaning of the complete true short answer of the corresponding *wh*-question.

- (14) a. What did Maria bring?
b. Victor ate what Maria brought.
c. The cake.

We assume FRs denote the abstract of the corresponding question.

(e.g. Chierchia and Caponigro 2013, Xiang 2020)

- a single *wh*-question denotes a set of propositions, each one based on an element in the domain of the *wh*-phrase.
- the corresponding abstract denotes the set of individuals satisfying the relevant property.

$$\left\{ \begin{array}{l} \text{Anna brought cake} \\ \text{Anna brought lasagna} \end{array} \right\}$$
$$\left\{ \begin{array}{l} \text{cake} \\ \text{lasagna} \end{array} \right\}$$

A type-shifting operator akin to *the* applies picking out the maximally informative individual, which then combines with the matrix predicate via functional application.

Returning to multiple *wh*-questions, such questions allow for pair-list answers

- these answers result from functional interpretations of one of the *wh*-phrases.
(Engdahl, 1980, Chierchia, 1993, Dayal, 1996, 2016, Abels and Dayal, 2017, Xiang, 2020)

(15) Who brought what?

Anna brought cake and Victor brought lasagna	<i>graph of f_1</i>
Anna brought lasagna and Victor brought cake	<i>graph of f_2</i>
Anna brought cake and Victor brought cake	<i>graph of f_3</i>
Anna brought lasagna and Victor brought lasagna	<i>graph of f_4</i>

Each answer corresponds to a function from individuals to the things they brought.

(16) $\lambda p. \exists f [\text{Range}(f)=\text{inanimate} \wedge p = \cap \{\lambda w. \text{brought}_w(x, f(x)) \mid \text{human}(x)\}]$

The corresponding MWR will denote the abstract of (16), the set of functions in (17):

(17) $\lambda f. \text{Range}(f)=\text{in} \wedge \forall x [\text{hum}(x) \rightarrow x \text{ brought } f(x)]$

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Back to multiple wh-questions

Note that in using an FR you identify the thing(s) eaten by Maria with the thing(s) brought by her.

- (18) Maria a mâncat [ce a adus].
Maria has eaten what has brought.
'Maria ate what she brought.'

Applying the same reasoning to our MWRs, we can now think about identity between two functions:

- (i) the function from individuals to the things they brought, and
- (ii) the function from individuals to the things they ate.

- (19) A **mâncat** [cine ce a **adus**].
has eaten who what has brought.
'Everyone ate what they brought.'

How do we create this identity between functions since the matrix verb is not a function?

Composing the MWR with the matrix predicate

The problem: the matrix predicate is of type $\langle e, \langle e, t \rangle \rangle$, which is of the wrong type to combine with the type-shifted MWR.

The solution: a type $\langle e, \langle e, t \rangle \rangle$ predicate can be type-shifted into a type $\langle \langle e, e \rangle, t \rangle$ predicate so as to allow for direct composition with the MWR.

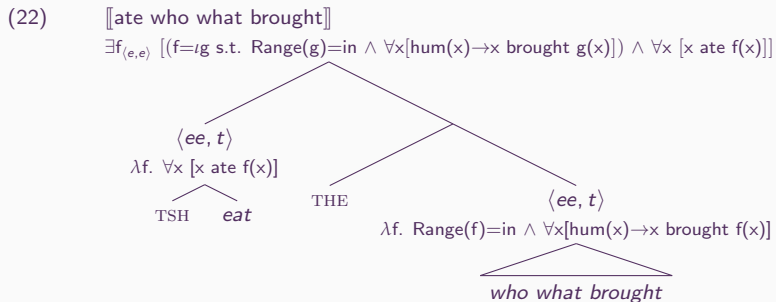
$$(20) \quad \llbracket \text{eat}_{\langle e, et \rangle} \rrbracket = \lambda y. \lambda x. [x \text{ ate } y] \xrightarrow{\text{TSH}} \llbracket \text{eat}_{\langle ee, t \rangle} \rrbracket = \lambda f. \forall x [x \text{ ate } f(x)]$$

On this denotation, a transitive verb like *eat* can be thought of as denoting a set of functions mapping individuals to things they ate.

Putting all the pieces together, we derive the intuitively correct final interpretation:

- there's a unique function from individuals to the things they brought and everyone ate the thing they brought.

$$(21) \quad \llbracket \text{ate who what brought} \rrbracket = \\ \exists f_{\langle e, e \rangle} [(f = \iota g \text{ s.t. Range}(g) = \text{in} \wedge \forall x [\text{hum}(x) \rightarrow x \text{ brought } g(x)]) \wedge \forall x [x \text{ ate } f(x)]]$$



where

(23) $\llbracket \text{THE} \rrbracket = \lambda F_{\langle ee, t \rangle} . \lambda G_{\langle ee, t \rangle} . \exists f_{\langle e, e \rangle} [(f = \text{lg s.t. } F(g)) \wedge G(f)]$

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I offered a formal semantics for MWRs:

- the interpretation of the MWR I argued is derived from the interpretation of functional multiple *wh*-questions.
- the internal composition of MWRs builds on current theories of functional multiple *wh*-questions – *skipped in this presentation but see appendix*.
- the denotation of the matrix predicate must be type-shifted in order to directly compose with the MWR.

A simple addendum can also explain the argument+adjunct MWRs.

- we can assume that even implicit non-argumental XPs are syntactically represented (Barros 2014).

What is the syntax of these constructions?

Thank you!

Selected references

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There are 2 points of variation when it comes to *wh*-phrases: whether they are interrogative or relative, and whether they range over individual or functional entities.

(24) Individual *wh*-phrases

- a. $\llbracket \text{what}_{\text{rel-ind}} \rrbracket = \lambda P_{\langle e, t \rangle} \lambda x_e [\text{in}(x) \wedge P(x)] \quad \langle et, et \rangle$
- b. $\llbracket \text{what}_{\text{int-ind}} \rrbracket = \lambda P_{\langle e, t \rangle} \exists x_e [\text{in}(x) \wedge P(x)] \quad \langle et, t \rangle$

(25) Functional *wh*-phrases

- a. $\llbracket \text{what}_{\text{rel-fn}} \rrbracket = \lambda F_{\langle ee, t \rangle} \lambda f_{\langle e, e \rangle} [\text{Range}(f) = \text{in} \wedge F(f)] \quad \langle eet, eet \rangle$
- b. $\llbracket \text{what}_{\text{int-fn}} \rrbracket = \lambda F_{\langle ee, t \rangle} \exists f_{\langle e, e \rangle} [\text{Range}(f) = \text{in} \wedge F(f)] \quad \langle eet, t \rangle$

Appendix: the internal composition of a MWR

$$(26) \quad \llbracket \text{who brought what}_{\text{MWR}} \rrbracket = \\ \lambda f. [\text{Range}(f)=\text{in} \wedge \forall x [\text{hum}(x) \rightarrow x \text{ brought } f(x)]]$$

