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Unveiling Multiple *wh*- Free Relative Clauses and their functional *wh*-words*

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<abstract>

We provide the first description and compositional semantic analysis of a construction that we label a “multiple *wh*- free relative clause”—an embedded non-interrogative *wh*- clause with more than one *wh*-word. We show that multiple *wh*- free relative clauses are closely related to the more familiar free relative clauses with one *wh*- word—single *wh*- free relative clauses. We argue that an appropriate semantic analysis for multiple *wh*- free relative clauses can be grounded in the semantic analyses that have been proposed for single *wh*- free relative clauses, but crucially requires non-trivial broadening of the meaning of *wh*-words. Focusing on Romanian, we propose a compositional account of multiple *wh*- FRs building on two main components: (i) the assumption that *wh*-words can license complex traces/variables with a functional component—an option that has been independently suggested for several other *wh*- constructions, and (ii) a new functional meaning for *wh*-words—a close variant of the functional meaning of *wh*-words that has been independently proposed to account for functional *wh*-interrogative clauses.

</abstract>

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1 Introducing multiple *wh*- free relative clauses

Wh- clauses are full clauses characterized by the necessary presence of at least one *wh*-phrase.¹ They are well-attested across languages and manifest themselves in different syntactic and semantic shapes, with various levels of productivity, both within a given language and across

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¹ We use the term *wh*-phrase to refer to both a simple phrase that is made of just a *wh*-word (e.g., *who*, *where*) and a more complex phrase containing a *wh*-word together with other lexical material (e.g., *by means of which device*).

languages: *wh*- interrogative clauses, headed relative clauses, correlative clauses, and free relative clauses—just to mention a few. *Wh*- clauses with more than one *wh*-phrase raise at least a couple of broad issues. Which kinds of *wh*- clauses allow for more than one *wh*-phrase and which don't? Can the semantic analyses that have been proposed for **single *wh*- clauses** (i.e., *wh*- clauses with one *wh*-phrase) be straightforwardly extended to **multiple *wh*- clauses** (i.e., *wh*- clauses with more than one *wh*-phrase) and, in particular, can the meaning that has been assumed for *wh*-words in single *wh*- clauses be retained and applied to *wh*-words in multiple *wh*- clauses as well? To the best of our knowledge, these two broad issues have not yet been systematically investigated within languages, let alone across languages. They are relevant issues not just for a more complete description of *wh*- clauses but also, and crucially, for a better understanding of the semantic behavior of *wh*-words—one of the most powerful and least understood building blocks of the logic behind human language. In this paper, we focus on a construction that exemplifies both issues: (i) it is a multiple *wh*- clause whose existence has not yet been recognized, unlike its single *wh*- variant, and (ii) its semantic analysis cannot be a simple extension of its single *wh*- variant but requires non-trivial broadening of the meaning of its *wh*-words. We label this construction a **multiple *wh*- free relative clause** or, in short, a **multiple *wh*- FR**. We focus our investigation on Romanian, a language that displays an articulated system of multiple *wh*- FRs.² Examples are given in brackets in (1)–(4).

- (1) Bunica a împachetat [**ce cui** dă de Crăciun].
 Grandma has wrapped what who.DAT gives for Christmas
 'Grandma wrapped the things she'll give to the appropriate people for Christmas.'
- (2) Muncitorii au montat [**ce cum** fusese instalat înainte de incendiu].
 workers-the have.3PL assembled what how had.been.3SG installed before of fire
 'The workers assembled the things that had been installed in the appropriate ways before the fire.'
- (3) Bunica a pregătit [**ce când** va lua în următoarele săptămâni].
 Grandma has prepared what when will.3SG take in next-the weeks
 'Grandma prepared the things that she'll take at their appropriate time in the next weeks.'
- (4) Proprietarul a aranjat [**ce unde** a trebuit instalat].
 owner-the has arranged what where has needed installed
 'The owner arranged the things that needed to be installed in the appropriate place.'

² Our ten consultants are all from Transylvania, a region from North-Western and Central Romania. Two anonymous conference-abstract reviewers reported that in their (unspecified) variety of Romanian multiple *wh*- FRs are not allowed. Subsequent feedback from colleagues who are native speakers of other varieties suggests a split between northern varieties (which allow multiple *wh*- FRs) and southern ones (which disallow them), but further investigation is necessary to determine the extent and nature of the observed variation. From now on, whenever we use the label *Romanian* in discussing multiple *wh*- FRs, we are specifically referring to the variety of Romanian spoken in Transylvania, unless mentioned otherwise.

The multiple *wh*- FRs in (1)–(4) are full clauses containing two *wh*-phrases, all in clause-initial position in a fixed order, as in multiple *wh*- interrogative clauses in Romanian. Still, the multiple *wh*- FRs in (1)–(4) occur as the complements of matrix predicates that usually select for a DP in their complement position, rather than a clause. The multiple *wh*- FRs in (1)–(4) are not interpreted as conveying a question, but as referring to a maximal (plural) individual, as (plural) definite DPs do. In all these multiple *wh*- FRs, the first *wh*-phrase affects the interpretation of the other one in a way that we tried to partially render with the adjective “appropriate” or “corresponding” in most translations. The precise nature of this “functional” connection is at the center of the paper and will be discussed at length.

In brief, we argue that multiple *wh*- FRs are free relative clauses, rather than any other new or already attested kind of *wh*- clause in Romanian. At the same time, we show that a satisfactory compositional account of the semantic behavior of multiple *wh*- FRs requires a revision of the semantic contribution of *wh*-words that is usually assumed for single *wh*- FRs. This revision will introduce a “functional” component in the lexical entry of *wh*-words and their traces that will be very close to what has been argued for in the case of the so-called functional interpretations of single *wh*- interrogative clauses and headed relative clauses with universally quantified subjects across languages (Engdahl 1980, 1986; Groenendijk & Stokhof 1984; Chierchia 1991, 1993; Jacobson 1994; Dayal 1996, 2016; Sharvit 1999a,b, a.o.). Therefore, our investigation of Romanian and its multiple *wh*- FRs broadens the meaning space of *wh*-words in free relative clauses and in general. In doing so, it also highlights how this meaning space is constrained and holds across different kinds of *wh*- clauses.

We also provide further evidence that free relative clauses in general cannot be reduced to headed relative clauses without an overt nominal head. If this were the case, then languages like Romanian would be expected to have multiple *wh*- headed relative clauses. Although Romanian does make use of a subset of *wh*-words to introduce headed relative clauses, they are not exactly the same subset that single *wh*- FRs make use of (see Grosu 2013; Caponigro & Fălăuș 2017). More crucially, it is not possible to have a headed relative clause with more than one *wh*-word. The bracketed string in (5) shows an attempt to build a headed relative clause with the *wh*-words for ‘what’ and ‘where’, which can introduce headed relative clauses separately (and a multiple *wh*- FR together, as in (4)). The result is completely unacceptable, regardless of the presence of either both the DP head (‘the furniture’) and PP head (‘in places’), or only the former.

- (5) *Proprietarul a aranjat mobila (în locurile) [**ce unde** a trebuit
owner-the has arranged furniture-the in places-the what where has needed
instalată].
installed
(‘The owner arranged the furniture that needed to be installed (in the places)
where it needed to be installed.’)

Lastly, we aim to promote the crosslinguistic investigation of multiple *wh*- FRs. There are strong reasons to believe that multiple *wh*- FRs are not confined to Romanian. Below we provide some preliminary crosslinguistic evidence from speakers of varieties of American English, Franconian German, Czech, and Serbian. We hope that the methodology and the series

of tests that we have developed will encourage further investigation within those languages and help unveil multiple *wh*-FRs across more languages.³

- EARLY ACCESS
- (6) I gave you [**what** you had to put **where**]. [American English]
 ‘I gave you the things you had to put in the appropriate places.’
- (7) Ich bereite vor, [**was** wir **wem** geben müssen]. [German]
 I prepare what we whom give must
 ‘I’ll prepare the things we should give to the appropriate people.’
- (8) Zabalili jsme [**co** **komu** dáme na Vánoce]. [Czech]
 packed be.AUX.1PL what.acc who.DAT give.1PL on Christmas
 ‘We wrapped the things we’ll give to the appropriate people on Christmas.’
- (9) Spakovali smo [**šta** ćemo **kome** pokloniti za Božić]. [Serbian]
 packed.MPL AUX.1PL what AUX.1PL who.DAT give for Christmas.
 ‘We wrapped the things we’ll give to the appropriate people for Christmas.’

We proceed as follows. In the next section, we describe multiple *wh*-FRs in Romanian in more detail and introduce their main properties. In Section 3, we show that they cannot be reduced to any other *wh*-clause that is attested in Romanian but free relative clauses. Section 4 offers a compositional account of multiple *wh*-FRs building on two main components: (i) the assumption that *wh*-phrases can license complex traces/variables with a functional component, an option that has been independently argued for several other *wh*-constructions, and (ii) a new functional meaning for *wh*-phrases, a variant of the functional meaning of *wh*-phrases that has been independently proposed to account for functional *wh*-interrogative clauses. Section 5 concludes and discusses some open issues for future research.

2. Main properties of multiple *wh*-FRs

In this section, we highlight four core properties that characterize multiple *wh*-FRs in Romanian. We start with two distributional properties: one having to do with where multiple *wh*-FRs occur within their matrix clause (Section 2.1) and the other dealing with which *wh*-phrases can or cannot introduce multiple *wh*-FRs (Section 2.2). We then turn to properties pertaining to the interpretation of multiple *wh*-FRs: their referentiality and maximality (Section 2.3) and the “functional” component that is associated with their interpretation (Section 2.4). Finally, we consider a potential fifth property, agentivity, which has been suggested by an anonymous Reviewer on the basis of data from Czech multiple *wh*-FRs, and conclude that our data do not support this property for Romanian (Section 2.5).

³ The judgments about American English come from one speaker from Maryland and one from Georgia. The Franconian German judgments come from a speaker from Baden-Württemberg. We are grateful to Daniel B. Kane, Harold Torrence, Eva Wittenberg, Radek Šimik, and Boban Arsenijevic for the data and the judgments.

Each of the attested four properties in Romanian multiple *wh*- FRs will give rise to one or more tests that we use in the next section (Section 3) to compare multiple *wh*- FRs with other kinds of *wh*- clauses, of which Romanian has several. A formal and compositional semantic account for the semantic properties of multiple *wh*- FRs in Romanian and their distribution is provided in Section 4.

2.1 Distribution

Multiple *wh*- FRs can occur as arguments of an embedding clause and can be replaced by a DP, despite being clausal and looking more like CPs. For instance, the multiple *wh*- FR we saw in (2), repeated in (10)a below, occurs as the object of the matrix clause and can be replaced (and roughly paraphrased) with the (complex) definite DP in brackets in (10)b.

- (10) a. Muncitorii au montat [ce cum fusese instalat înainte de incendiu].
 workers-the have.3PL assembled what how had.been installed before of fire
 ‘The workers assembled the things that had been installed in the appropriate ways before the fire.’
- b. Muncitorii au montat [DP **mobila** în felul în care fusese instalată înainte de incendiu].
 workers-the have.3PL assembled furniture-the in way-the in which had.been installed before of fire
 ‘The workers assembled the furniture in the way in which it had been installed before the fire.’

Multiple *wh*- FRs can also occur as complements of prepositions. The multiple *wh*- FR in brackets in (11)a acts as the complement of the preposition *la* ‘at’ and can be replaced by the DP in (11)b.

- (11) a. Azi m-am uitat la [ce cui dă bunica de Crăciun.]
 today REFL-have.1SG looked at what who.DAT gives Grandma for Christmas
 ‘Today I looked at the things that Grandma will give to the appropriate people for Christmas.’
- b. Azi m-am uitat la [DP **lucrurile** pe care le dă bunica nepoților de Crăciun.]
 today REFL-have.1SG looked at things-the ACC which CL.ACC gives Grandma grandchildren.DAT for Christmas
 ‘Today I looked at the things that Grandma gives to the grandchildren for Christmas.’

Finally, multiple *wh*- FRs can also occur as subjects of the clause embedding them, although not without restrictions. The multiple *wh*- FRs in brackets in (12)a behave as the subjects of their matrix clauses and can be replaced by the DPs in (12)b.

- EARLY ACCESS
- (12) a. {E ascuns în dulap}/{Mă sperie} [ce cui dă bunica de Crăciun].
 is hidden in closet me.ACC frightens what who.DAT gives Grandma for Christmas
 ‘The things that Grandma will give to the appropriate people for Christmas {are hidden in the closet}/{frighten me}.’
- b. {Sunt ascunse în dulap}/{Mă sperie} [DP lucrurile pe care le dă
 are hidden in closet me.ACC frighten things-the ACC which CL.ACC gives
 bunica nepoților de Crăciun].
 Grandma grandchildren.DAT for Christmas
 ‘The things that Grandma gives to the grandchildren for Christmas {are hidden in the closet}/{frighten me}.’

The matrix predicate taking a multiple *wh*- FR as its subject can be intransitive, as *e ascuns* ‘is hidden’ in (12)a, or transitive, as *sperie* ‘frightens’ in (12)a. These predicates allow for either a preverbal or postverbal subject when the subject is a DP, while they prefer a postverbal subject when the subject is a single or multiple *wh*- FR, as we discuss further in Section 3.1. Overall, what seems to emerge is some (poorly understood) restriction on free relative clauses in preverbal subject position in Romanian, regardless of whether they have one or more *wh*-phrases. Further research on this is needed.

What matters the most for our current investigation is to have established that multiple *wh*- FRs can unambiguously occur in argument positions (subject, object, complement of a preposition), since this distributional property will be used in Section 3 to distinguish multiple *wh*- FRs from other multiple *wh*- constructions.

2.2 Restrictions on *wh*-phrases

Multiple *wh*- FRs cannot be introduced by the complex *wh*-phrase [*care* NP] (‘which’ NP). The bracketed string in (13) is almost identical to the multiple *wh*- FR in (1), except that the simple *wh*-phrase *ce* ‘what’ in (1) has been replaced with the complex [*care cadou(ri)*] (‘which gift(s)’) or [*ce cadou(ri)*] (‘what gift(s)'). The resulting sentence is unacceptable with *care cadou(ri)*, while it is fully acceptable with *ce cadou(ri)*. This contrast shows that there is no independent incompatibility between multiple *wh*- FRs and complex *wh*-phrases.

- (13) Bunica a împachetat [ce/*care cadou(ri) cui dă de Crăciun].
 Grandma has wrapped what/which gift(s) who.DAT gives for Christmas

Another restriction concerns the use of *cine* ‘who’, which cannot head a multiple *wh*- FR, as suggested by the unacceptability of the sentences in (14):

- (14) a. * A venit [cine unde l-a cunoscut pe Ion].
 has come who where him-has met ACC Ion
 ('The people who met Ion at the corresponding place (where they met him) have come.')
- b. * Organizatorul a vorbit cu [cine ce aduce la petrecere.]
 organizer-the has talked with who what brings to party
 ('The organizer talked with those who bring the corresponding things to the party.')

2.3 Referentiality and maximality

In this section, we show that multiple *wh*-FRs are always interpreted as referential and maximal. These are the same properties that definite DPs exhibit, following Sharvy 1980, Link 1983, and subsequent work. Referentiality is the semantic property of referring to an individual (or a portion of matter, or a kind). A referential expression is, therefore, non-quantificational. Maximality is the property that some referential expressions have to refer to the maximal individual of a given set. For instance, the definite DP *the dogs* is referential and maximal because it refers to the maximal plural individual made of the sum of all the single dogs in the given context. The deictic DP *those dogs* is referential, but not maximal: it can refer to a plural individual resulting from the sum of some, but not necessarily all, the single dogs in the given context. Finally, quantificational DPs like *some dogs* and *every dog* are neither maximal nor referential.⁴

One piece of evidence that multiple *wh*-FRs are referential and maximal comes from the fact that speakers agree with paraphrasing them by means of referential and maximal expressions like definite DPs. For instance, the multiple *wh*-FR we started with in (1) can be roughly paraphrased using the complex definite DP in (15). Other examples of multiple *wh*-FRs with their DP paraphrases were provided in Section 2.1.

- (15) Bunica a împachetat [DP **lucrurile** pe care le va oferi oamenilor
 Grandma has wrapped things-the ACC REL CL will.3SG offer people-the.DAT
 de Crăciun].
 for Christmas
 'Grandma wrapped the things that she'll give to the people they are for at Christmas.'

There is also another way to test maximality: by building a scenario that would force a multiple *wh*-FR to violate it. For instance, imagine a situation in which Grandma started wrapping Christmas gifts, and managed to wrap 3 out of 10 before she got interrupted. In this scenario, it is not felicitous for the speaker to utter the sentence in (16)a with the bracketed multiple *wh*-FR, nor the sentence in (16)b with the bracketed definite DP instead of the multiple *wh*-FR. In both cases, the two-place relation of wrapping is claimed to hold between Grandma and the maximal plural individual made of those 10 gifts, which would be false, since 7 of them

⁴ See Heim 2011 for an overview of the semantic analyses on definite DPs, Coppock & Beaver 2015 for a recent proposal that does not treat definite DPs as referential, Wolter 2009 for an overview on the semantics of demonstrative DPs (including proposals that treat them as triggering maximality/uniqueness), and Szabolcsi 2010 for an overview on the semantic treatments of quantificational DPs.

are still unwrapped. Notice that in this scenario a DP can occur as the complement of the matrix predicate, as long as it is not definite, as shown by the bracketed indefinite DP in (16)c.

- EARLY ACCESS
- (16) a. # Bunica a împachetat [**ce cui** dă de Crăciun].
 Grandma has wrapped what who.DAT gives for Christmas
 ‘Grandma wrapped the things she’ll give to the appropriate people for Christmas.’
- b. # Bunica a împachetat [DP **lucrurile** pe care le va oferi de Crăciun].
 Grandma has wrapped things-the ACC REL CL will.3SG offer for Christmas
 ‘Grandma wrapped the things that she’ll give for Christmas.’
- c. Bunica a împachetat [DP **niște lucruri** pe carele va oferi de
 Grandma has wrapped some things ACC REL CL will.3SG offer for
 Crăciun].
 Christmas
 ‘Grandma wrapped some things that she’ll give for Christmas.’

The test above allows us to conclude that multiple *wh*- FRs do not behave like indefinites, i.e., existentially quantified DPs. The examples in (17)a-c below show that multiple *wh*- FRs do not behave like universally quantified DPs either. Multiple *wh*- FRs can occur as the complement of *mare parte* ‘a big part/most of’ in a partitive construction, as shown in (17)a. Definite DPs exhibit the same behavior, as shown in (17)b. On the other hand, universally quantified DPs cannot occur as the complement of a partitive, as shown by the degraded status of (17)c.

- (17) a. Bunica a fabricat mare parte din [**ce cui** dă de Crăciun].
 Grandma has made big part of what who.DAT gives for Christmas
 ‘Grandma made most of the things she gives to the people they were made for at Christmas.’
- b. Bunica a fabricat mare parte din [**lucrurile** ce vor fi dăruite
 Grandma has made big part of things-the REL will.3PL be offered
 oamenilor de Crăciun].
 people-the.DAT for Christmas
 ‘Grandma made most of the things that will be offered to people at Christmas.’
- c. ??Bunica a fabricat mare parte din [**tot** ce va dărui
 Grandma has made big part of everything REL will.3SG offer
 oamenilor de Crăciun].
 people-the.DAT for Christmas
 (‘Grandma made most of everything she will offer to people at Christmas.’)

In conclusion, multiple *wh*- FRs share the same semantic properties as definite DPs: they are referential and maximal.

2.4 *Wh*-phrases and functional dependencies

The next property of multiple *wh*-FRs that we discuss is semantic as well. Unlike maximally, it does not have to do with the overall meaning of a multiple *wh*-FR, but rather the way the *wh*-phrases are interpreted. In particular, in all multiple *wh*-FRs, the interpretation of the first/higher *wh*-phrase—the *wh*-phrase preceding and c-commanding the other—affects the interpretation of the other *wh*-phrase. In other words, the interpretation of the lower *wh*-phrase depends on the interpretation of the higher. To see this, let us consider the example in (18), a slight variant of the example in (3).

- (18) Azi mama a pregătit [ce când va lua bunica în următoarele
today Mom has prepared what when will.3SG take Grandma in next-the
săptămâni].
weeks
'Today Mom prepared what Grandma will take at its appropriate time in the next weeks.'

This sentence would be used in a context like the following. Imagine Grandma is getting worried about having a lot of medication to take, at different times of the day, and having it all mixed up. To put her mind at ease, Mom prepared Grandma's morning and evening medication for the next few weeks, putting it in separate boxes so that Grandma doesn't get confused. In this context, it is clear that for each medicine Mom prepared, there is an *appropriate/unique* time for it to be taken. Crucially, (18) cannot mean that today Mom prepared what Grandma will take at some *random/non-unique* time in the next weeks, with the *wh*-phrase *când* 'when' acting as an existentially quantified expression. Nor can it mean that today Mom prepared what Grandma will take at *that one specific* time in the next weeks, with *când* acting as a free pronoun over instances whose reference is contextually determined. Both these meanings are logically possible and natural. In fact, they can be conveyed by a single *wh*-FR with an indefinite ('sometime next week') or a referential ('on Sunday') temporal expression in place of 'when', as shown in (19).

- (19) Azi mama a pregătit [ce va lua bunica { cândva săptămâna
today Mom has prepared what will.3SG take Grandma sometimes week-the
viitoare} / {duminică}].
next Sunday
'Today Mom prepared what Grandma will take {sometime next week} / {on Sunday}.'

It is a specific property of the multiple *wh*-FR in (18) that the time at which each medication has to be taken is functionally dependent on the specific medication: each medication is associated with a unique specific time.

Speakers share this "functional" intuition across all multiple *wh*-FRs we have discussed: their interpretation of the lower *wh*-phrase (or, more precisely, of the argument that the *wh*-phrase plays the role of) depends on the interpretation of the higher *wh*-phrase (or, more precisely, of the argument that the *wh*-phrase plays the role of). This kind of functional

dependency is from one individual to another—a Skolem function, as we discuss in detail in Section 4.

2. An agentivity constraint?

An anonymous Reviewer confirmed our preliminary findings about the existence of multiple *wh*-FRs in Czech (see our example in (8)), but pointed out that a further semantic constraint may hold, together with referentiality, maximality, and functionality—the core properties of multiple *wh*-FRs that we have argued for so far. This further constraint requires a multiple *wh*-FR to occur as the non-agent argument of an agentive predicate, as shown in (20) and (21) (data and judgements from the Reviewer). (20)a is the Czech equivalent of our example in (1). The multiple *wh*-FR (20)a occurs as the object of the agentive matrix predicate ‘pack’ with Grandma as the agent. The sentence is judged fully acceptable. If the very same multiple *wh*-FR occurs as the subject of an intransitive locative predicate like ‘to lie’ as in (20)b, the resulting sentence is unacceptable. If a closely related single *wh*-FR replaces the multiple *wh*-FR in (20)b, the resulting sentence is fully acceptable, as in (20)c.

- (20) a. Babička zabalila, [**co** **komu** dá k Vánocům].
 Grandma.NOM packed what.ACC who.DAT give.3SG for Christmas
 ‘Grandma packed the things that she will give to the appropriate people for Christmas.’
- b. ***[Co** **komu** dá **babička** k Vánocům] leží na stole.
 what.ACC who.DAT give.3SG Grandma.NOM for Christmas lies on table
 (‘The things that Grandma will give to the appropriate people for Christmas are lying on the table.’)
- c. **[Co** dá **babička** dětem k Vánocům] leží na stole.
 what.ACC give.3SG Grandma.NOM children.DAT for Christmas lies on table
 ‘The things that Grandma will give to the children for Christmas are lying on the table.’

The Czech examples in (21) provide a similar contrast, but with all the FRs in object position this time.

- (21) a. Matka připravila dceři, [**co** **si** **kdy** dá na sebe].
 Mom prepared daughter.DAT what.ACC REFL when put on self
 ‘Mom prepared for her daughter the clothes that she will wear at the appropriate times.’
- b. *Dcera zahlédla, [**co** **si** **kdy** dá na sebe].
 daughter spotted what.ACC REFL when put on self
 (‘The daughter spotted/saw the clothes that she will wear at the appropriate times.’)
- c. Dcera zahlédla, [**co** **si** příští týden dá na sebe].
 daughter spotted what.ACC REFL next week put on self
 ‘The daughter spotted/saw the clothes that she will wear next week.’

The Reviewer suggests that these contrasts show that the “functionality” of multiple *wh*-FRs has to be relativized to a syntactically expressed agent. In other words, multiple *wh*-FRs are licensed only if the functional mapping triggered by the interaction between the two *wh*-phrases is determined by the agent of the matrix predicate. Whenever no overt agent is present, as in (20)b and (21)b, a sentence is predicted to be unacceptable.

Our findings do not support an agentivity constraint in multiple *wh*-FRs in Romanian. First, the examples in (12)a already showed that Romanian allows multiple *wh*-FRs as subjects of non-agentive predicates. Second, even with agentive predicates, there is no need for an overt agent in sentences with multiple *wh*-FRs nor does the overt matrix agent need to be the one determining the functional mapping, as shown in (22). Both matrix options in (22) make the sentence acceptable, although they both violate the agentivity constraint. The option with the matrix predicate at the impersonal form doesn't have an overt agent anywhere in the sentence. The option with an overt matrix agent (Grandma) is acceptable even when the agent is not the one determining the functional mapping between gifts and people who receive them. The continuations in (22)a-c are fully compatible with the sentence(s) with the multiple *wh*-FR in (22), despite depicting scenarios in which neither Grandma nor the speaker are familiar with the functional mapping, let alone being responsible for it. The scenarios in (22)d-e are incompatible, instead. The scenario (22)d in which nobody knows about the relevant functional mapping doesn't ensure the existence of at least one relevant mapping, while the scenario in (22)e explicitly asserts that such a mapping doesn't exist.

- (22) {S-a}/ {Bunica a} împachetat [ce cui va fi donat de Crăciun].
 {SE-has}/{Grandma has} wrapped what who.DAT will be donated for Christmas
 ‘The things that will be donated for Christmas to the appropriate people have been wrapped.’/‘Grandma has wrapped the things that will be donated for Christmas to the appropriate people.’
- but only Grandma knows who gets what.*
 - but Grandma doesn't know who gets what.*
 - but I have no idea who gets what.*
 - # but nobody knows who gets what.*
 - # The gifts will be given out to random people on Grandma's gift list.*

So if the functional construal of the multiple *wh*-FR is not relativized with respect to an agent, why is an example like (23)a (the Romanian version of (21)b in Czech) degraded with respect to its single *wh*-FR counterpart in (23)b?

- (23) a. ??Fata a dat peste / zărit [ce când va purta].
 girl-the has given across / spotted what when will.3SG wear
 ‘The girl came across/spotted the things she will wear at the appropriate time.’
- b. Fata a dat peste / zărit [ce va purta].
 girl-the has given across / spotted what will.3SG wear
 ‘The girl came across/spotted what she will wear.’

We do not have a conclusive answer, but we would like to at least offer some observations that may help future investigation on multiple *wh*-FRs in Romanian, Czech, and across languages in general. Drawing on our consultants' comments, the action of seeing clothes doesn't seem to justify the relevance of the functional mapping in (23)a from clothes to the time at which those clothes will be worn. On the other hand, organizing medicines that will have to be taken at the appropriate moments, as in (3), may be affected by those chosen moments (e.g., medicines would be put in different places according to when they have to be taken). Overall, this could be the manifestation of a pragmatic restriction penalizing semantic complexity (e.g., Skolem functions) unless it is informationally relevant.

If this observation is on the right track, why are the sentences in (12)a acceptable then? How does the status of being hidden or frightening gifts relate to the people who will receive those gifts? Unlike (23)a, the multiple *wh*-FR in (12)a is a subject, which is notoriously a much better topic than the object—in Romanian and across languages (on the complex relation between subjects and topics in Romanian, see Giurgea 2019 and references therein). It could be that being a topic (at least with certain intransitive predicates) facilitates the licensing of a multiple *wh*-FR by assuming that it has already been introduced in the discourse, or, equivalently, it was part of the question under discussion.

To sum up, the data from Romanian do not support a ban on multiple *wh*-FRs lacking an overt (or covert) matrix agent. There are however a variety of factors affecting the acceptability of multiple *wh*-FRs, some of which we discussed in the previous sections. One extra factor that has emerged in this section is the need for a justification for the introduction of a functional mapping via a multiple *wh*-FR—a justification that could be pragmatic in nature. Agentive predicates like 'arrange/organize' or 'wrap' seem to facilitate the satisfaction of this requirement in a way that non-agentive predicates like 'spot' do not. Being in a topic vs. non-topic position could be another way to satisfy that pragmatic requirement. A related open issue is whether Czech and other languages with multiple *wh*-FRs may not all be sensitive to exactly the same factors in the same way.

In the rest of the paper, we set these issues aside and focus on examples of fully acceptable multiple *wh*-FRs in object position with mainly agentive predicates. We hope that future crosslinguistic work will shed light on this and other potential constraints on the distribution and interpretation of multiple *wh*-FRs. At the same time, we think the analysis of multiple *wh*-FRs we propose in Section 4 is not incompatible with possible further restrictions and could be modified to incorporate those as well.

2.6 Interim summary

The discussion in this section has revealed the properties summarized in (24) as the ones characterizing multiple *wh*-FRs in Romanian:

(24) Main properties of multiple *wh*-FRs in Romanian:

- (i) they are embedded *wh*-clauses that can occur as arguments of their embedding predicates;
- (ii) they cannot be introduced by the *wh*-phrases *care NP* 'which NP' nor *cine* 'who';

- (iii) they are referential and maximal, like definite DPs;
- (iv) they are associated to a functional mapping that is triggered by the lower *wh*-phrase and its interaction with the higher *wh*-phrase.

3. Multiple *wh*- FRs are free relative clauses rather than any other *wh*- clauses

In this section, we compare multiple *wh*- FRs with other *wh*- clauses in Romanian using the properties of multiple *wh*- FRs we presented in Section 2 and summarized in (24). We conclude that multiple *wh*- FRs are free relative clauses, while they exhibit crucial differences with all the other *wh*- clauses that are found in Romanian, in particular Rudin's multiple *wh*- clauses, *wh*- interrogative clauses, correlative clauses, and modal existential constructions.

3.1. Multiple *wh*- FRs are free relative clauses

Single *wh*- FRs are clauses with one *wh*-phrase, like the bracketed string in (25).⁵

- (25) Muncitorii au montat [ce fusese instalat înainte de incendiu].
 workers-the have.3PL assembled what had.been installed before of fire
 'The workers assembled the things that had been installed before the fire.'

They share the first three properties in (24) with multiple *wh*- FRs (they cannot share the last property since they only have one *wh*-phrase by definition). First, single *wh*- FRs can occur as arguments, as shown by the bracketed single *wh*- FR acting as the object of the matrix predicate in (25). Second, they can be introduced by all *wh*-phrases but *care NP* 'which NP' (26) and *cine* 'who' (27).⁶

- (26) * Bunica a împachetat [care cadou(ri) dă de Crăciun].
 Grandma has wrapped which gift(s) gives for Christmas
 ('Grandma wrapped the gifts she'll give for Christmas.')
- (27) ?? Bunica a îmbrățișat [pe cine a văzut la petrecerea de Crăciun].
 Grandma has hugged ACC who has seen at party-the for Christmas
 ('Grandma hugged the people she saw at the Christmas party.')

⁵ On single *wh*- FRs in Romanian, see Grosu 2003, 2013; Caponigro & Fălăuș 2017, among others.

⁶ In his detailed overview of relative clauses in Romanian, Grosu 2013 does not mention any restriction on the use of *cine* 'who' in FRs. However, the examples he gives, such as (i), allow a free choice reading of *cine*, which can be paraphrased as 'whoever.'

- (i) [Cine îl cunoaște pe Ion] nu poate decât să-l admire. (Grosu 2013: 654)
 who him knows ACC Ion not can but SUBJ-him admire.3
 'Whoever knows Ion can't help admiring him.'

In fact, *cine* could easily be replaced with the morphologically related free choice item *oricine* 'anyone'/'whoever' without any change in meaning. When *cine* FRs are episodic (27), our consultants find them degraded (although one of our Reviewers, speaker of a southern Romanian dialect, seems to accept them). See Patterson & Caponigro 2016 for a detailed discussion of what looks like a similar degraded status of *who* FRs in English and the factors at play.

Third, they are referential and maximal. The bracketed single *wh*- FR in (25) can be replaced and paraphrased by the definite DP in (28)—a prototypical referential expression.

- EARLY ACCENT
- (28) Muncitorii au montat [DP **lucrurile** care fuseseră instalate înainte de incendiu].
workers-the have.3PL assembled things-the REL had.been installed before of fire
'The workers assembled the things that had been installed before the fire.'

(29) with a bracketed single *wh*- FR is infelicitous in the given context in which Grandma hasn't wrapped all Christmas gifts: the single *wh*- FR has to refer to the maximal gift, the plural gift resulting from the sum of all the individual gifts that Grandma will give for Christmas. But Grandma hasn't yet wrapped the maximal gift, i.e., all the individual gifts the maximal gift is the sum of.

(29) CONTEXT: Grandma started wrapping her Christmas gifts, but got interrupted.

- #Bunica a împachetat [**ce** va oferi de Crăciun].
Grandma has wrapped what will.3SG offer for Christmas
'Grandma wrapped the things she'll give for Christmas.'

Single and multiple *wh*- FRs also share the poorly understood ban on being used as subjects in preverbal position (although the ban seems weaker for single *wh*- FRs). In Section 2.1, we showed that multiple *wh*- FRs (12)a and complex definite DPs (12)b can act as the subjects of their matrix clauses and follow their matrix predicates. (30) shows that single *wh*- FRs can do the same.

- (30) { E ascuns în dulap } / { Mă sperie } [**ce** dă bunica nepoților de Crăciun].
is hidden in closet me.ACC frightens what gives Grandma grandchildren.DAT for Christmas
'The things that Grandma will give to the grandchildren for Christmas {are hidden in the closet} / {frighten me}.'

On the other hand, neither single nor multiple *wh*- FRs can (easily) occur preverbally, as shown in (31)a–b, while complex DPs can, as shown in (31)c.

- (31) a. * [**Ce cui** dă bunica de Crăciun] { e ascuns în dulap } / { mă sperie }
what who.DAT gives Grandma for Christmas is hidden in closet me.ACC frightens
('The things that Grandma will give to the appropriate people for Christmas {are hidden in the closet} / {frighten me}.')

- b.?? [Ce dă bunica nepoților de Crăciun] { e ascuns în dulap }/
 what gives Grandma grandchildren.DAT for Christmas is hidden in closet
 {mă sperie}.
 me.ACC frightens
 (‘The things that Grandma will give for Christmas {are hidden in the closet}/
 {frighten me}.’)
- c. [DP **Lucrurile** pe care le dă bunica nepoților de Crăciun]
 things-the ACC REL CL gives Grandma grandchildren.DAT for Christmas
 {sunt ascunse în dulap}/{mă sperie}.
 are hidden in closet me.ACC frighten
 ‘The things that Grandma gives to her grandchildren for Christmas {are hidden in
 the closet}/{frighten me}.’

In view of all these similarities, we conclude that multiple *wh*-FRs are free relative clauses. To further support this conclusion, we now provide evidence that they differ in significant ways from other multiple *wh*- constructions that are attested in Romanian.

3.2 Multiple *wh*-FRs are not Rudin’s multiple *wh*-relative clauses

To our knowledge, the literature has so far only mentioned multiple *wh*-relative constructions in a few languages, mostly spoken in the Balkans (Bulgarian, Macedonian, Romanian). Rudin 1986, 2007, 2008 has been the first to discuss them, providing examples from Romanian like (32)–(33) (given with Rudin’s original translation).⁷

- (32) Trăncănește [**cine ce** vrea]. [Rudin 2007: 302]
 blabs who what wants
 ‘Everyone’s blabbing whatever they want.’
- (33) Mănâncă [**cine ce** vrea]. [Rudin 2008: 260]
 eats who what wants
 ‘Let everyone eat whatever they want.’

Rudin analyzes each of the bracketed multiple *wh*-clauses in (32)–(33) as a “headless relative clause in a non-left-peripheral, argument position”, i.e., a free relative clause with more than one *wh*-word (Rudin 2008). However, despite the common label of ‘multiple *wh*-free relative clause’, we think that these examples are different from the multiple *wh*-FRs we investigate in this paper and, more generally, the two kinds of multiple *wh*-clauses exhibit several properties that set them apart.

The first property is the relation between the *wh*-phrases and the predicates in the matrix and relative clause. In the examples in (32)–(33) above, each *wh*-phrase is related to an

⁷ To our knowledge, in addition to Rudin’s work, the only other two papers that mention multiple *wh*-clauses such as those in (32)–(33) are Citko & Gračanin-Yuksek 2016, which discusses Croatian, and Dimova & Tellier 2018, which discusses Bulgarian. Both papers argue that these constructions are not FRs.

argument of *both* the matrix and the embedded predicate: the people blabbing/eating are the ones that want to blab/eat and the things they blab/eat are the things they want to blab/eat. An even clearer example is the one in (34), where the agent(s) and the patient(s) of the attacking and the finding are the same. (35) shows that it is also possible to have adjunct *wh*-phrases in these constructions, once again modifying both the matrix and the embedded predicate.

(34) A atacat [**cine pe cine** a găsit].
 has attacked who ACC who has found
 ‘Everyone attacked whoever they found.’

(35) Fac [**ce când** am chef].
 do.1SG what when have.1SG urge
 ‘I do whatever I feel like doing whenever I feel like doing it.’

In contrast, our multiple *wh*- FRs satisfy only one argument of the matrix predicate (typically the object) and the lower *wh*-phrase is in no way related to the matrix predicate. In (36)a, for instance, repeated from (1), the *wh*- clause refers to a set of objects wrapped by Grandma; the receiver of the gifts is an argument of the embedded predicate ‘give’ and not an argument of the predicate ‘wrap’. Similarly for the example in (18), repeated in (36)b, where there is no temporal overlap between the time the medication is prepared and the time it is taken.

(36) a. Bunica a împachetat [**ce cui** dă de Crăciun].
 Grandma has wrapped what who.DAT gives for Christmas
 ‘Grandma wrapped the things she’ll give to the appropriate people for Christmas.’
 b. Azi mama a pregătit [**ce când** va lua bunica în următoarele
 today Mom has prepared what when will.3SG take Grandma in next-the
 săptămâni].
 weeks
 ‘Today Mom prepared what Grandma will take at its appropriate time in the next weeks.’

Second, the interpretation of the *wh*-phrases in (32)–(35) is akin to a universal quantifier or a free choice item, like ‘anyone’ or ‘whoever’. These elements can also replace the *wh*-phrases without any detectable change in meaning, as shown in (37), where the higher *wh*-phrase is replaced by the universal quantifier *fiecare* ‘every’ and (38), where both *wh*-phrases have been replaced by free choice elements, which in Romanian are realized by prefixing the *wh*-words with *ori*- (see e.g., Farkas 2002, 2013; Caponigro & Fălăuș 2017):

(37) Trăncănește **fiecare ce** vrea.
 blabs everyone what wants
 ‘Everyone’s blabbing anything/whatever they want.’

- (38) Trăncănește **oricine orice** vrea.
 blabs FC-who FC-what wants
 ‘Anyone’s blabbing anything/whatever they want.’

These substitutions are not possible in multiple *wh*-FRs. (39)a shows a variant of the multiple *wh*-FR in (36)a in which the higher *wh*-phrase has been replaced by a universal quantifier. In (39)b, instead, both *wh*-phrases in (36) have been replaced by free choice items. Both resulting sentences are ungrammatical.

- (39) a.*Bunica a împachetat [**fiecare cadou cui** dă de Crăciun].
 Grandma has wrapped every gift who.DAT gives for Christmas
 (‘Grandma wrapped every gift she’ll give to the appropriate people for Christmas.’)
 b.*Bunica a împachetat [**orice oricui** dă de Crăciun].
 Grandma has wrapped FC-what FC-who.DAT gives for Christmas
 (‘Grandma wrapped anything she’ll give to anyone for Christmas.’)

A further difference between the two kinds of multiple *wh*-clauses concerns the use of *cine* ‘who’. It is extremely productive in the multiple *wh*-constructions discussed by Rudin (32)–(35). In contrast to this, as already pointed out in Section 2.2, all the examples of our multiple *wh*-FR introduced by *cine* ‘who’ are judged degraded, as illustrated in (40) (see also (14)):

- (40) a.*A sosit [**cine ce** dă copiilor de Crăciun].
 has arrived who what gives children.DAT for Christmas
 (‘The people who give children appropriate things for Christmas have arrived.’)
 b.*Am îmbrățișat [pe **cine cui** a oferit cadouri de Crăciun].
 have.1SG hugged ACC who who.DAT has offered gifts for Christmas
 (‘I hugged the people who offered gifts to the appropriate people for Christmas.’)

Finally, it should be mentioned that the acceptability of the construction in (32)–(35) is not subject to any kind of speaker or dialectal variation—examples such as these are extremely productive and systematically accepted by all native speakers we have consulted, independently from the varieties of Romanian they speak. In contrast, our multiple *wh*-FRs are more restricted and are only accepted by a subset of native speakers (see footnote 2). This, we think, provides further support for the claim that we are dealing with two different multiple *wh*-constructions. In this paper, whenever we use the label *multiple wh-FRs*, we are referring to examples such as (1)–(4), and not to the kind of construction analyzed by Rudin, which deserves an independent investigation.

3.3 Multiple *wh*- FRs are not interrogative clauses

Multiple *wh*- interrogative clauses are widespread across languages.⁸ They are very productive in Romanian as well (Comorovski 1996, Rațiu 2011), both as matrix and embedded clauses, as shown in (41) and (42).

- (41) (Mă întreb / spune-mi) [**Cine ce** a făcut azi ?]
 me wonder.1SG/ tell.2SG-me who what has done today
 ‘(I wonder/tell me) who has done what today?’
- (42) (Mă întreb / spune-mi) [**Ce unde** trebuie pus ?]
 me wonder.1SG/ tell.2SG-me what where must put
 ‘(I wonder/tell me) what to put where?’

There are at least three properties indicating that multiple *wh*- FRs are not interrogative clauses. First, like single *wh*- FRs, multiple *wh*- FRs can occur as arguments of non-interrogative predicates like ‘assemble’, ‘prepare’, or ‘wrap’, as shown above in (1)–(4). None of these predicates can take a polar or *wh*- interrogative clause as its complement.

Second, recall from Section 2.2 above that multiple *wh*- FRs disallow the use of the *wh*-phrase [*care* NP] ‘which NP’ as the first *wh*-phrase, as in (43)a, as well as that of *cine* ‘who’, as in (43)b. In contrast, [*care* NP] and *cine* can perfectly well introduce embedded multiple *wh*- interrogative clauses, as shown in (44)a–b, respectively.

- (43) a. *Bunica a împachetat [**care cadouri cui** dă de Crăciun].
 Grandma has wrapped which gifts who.DAT gives for Christmas
 ‘(Grandma wrapped the gifts she’ll give to the appropriate people for Christmas.)’
- b. *A venit [**cine unde** l-a cunoscut pe Ion].
 has come who where him-has met ACC Ion
 ‘(The people who met Jon at the appropriate places arrived.)’
- (44) a. Bunica se întreabă [**care cadouri cui** le dă de Crăciun].
 Grandma REFL wonders which gifts who.DAT CL.3PL gives for Christmas
 ‘Grandma wonders which gifts she gives to whom for Christmas.’
- b. Bunica se întreabă [**cine unde** l-a cunoscut pe Ion].
 Grandma REFL wonders who where him-has met ACC Ion
 ‘Grandma wonders who met Ion where.’

Third, the interpretation of multiple *wh*- FRs does not resemble the interpretation of (single or multiple) *wh*- interrogative clauses. We discuss the semantic contribution of multiple *wh*- FRs in more detail in Section 4. Here it suffices to observe that multiple *wh*- FRs denote (singular or plural) individuals, as highlighted by the definite descriptions paraphrasing them and the

⁸ See Dayal 2016 for a recent overview.

semantic properties discussed in Section 2. *Wh*-interrogative clauses, instead, denote a question, i.e., a set of propositions or some other semantic object different from individuals.

Lastly, a few words of caution. Examples like (45) provide evidence that the matrix predicate ‘show’ allows for an analysis of the bracketed multiple *wh*- clause that is ambiguous between an embedded interrogative reading, where the children showed both where and when the puzzle pieces must be put, and a multiple *wh*- FR reading, where the second *wh*-phrase has a functional interpretation, i.e., the children showed the places where the pieces had to be put and for each piece there is an appropriate time to put that piece in its place.

- (45) Copiii ne-au arătat [unde când trebuie puse piesele din puzzle].
 children us-have.3PL showed where when must put.3PL pieces-the from puzzle

Reading 1 (interrogative): ‘The children showed us where the pieces of the puzzle had to be put and when.’

Reading 2 (FR): ‘The children showed us the places where the pieces of the puzzle had to be put at the time that it was appropriate for each piece.’

In the remainder of the paper, we will refrain from using predicates that can select for both multiple *wh*- FRs and interrogative clauses, or for more than one multiple *wh*- construction in general.

3.4 Multiple *wh*- FRs are not correlative clauses

In addition to multiple *wh*- interrogative clauses, some languages—including Romanian—also allow for multiple *wh*- correlative clauses like the bracketed strings in (46)a–b (see Dayal 1996; Braşoveanu 2008, 2012; Gajewski 2008; Citko 2009; Lipták 2009 a.o.).

- (46) a. [**Cine ce** şi-a luat], *acela aia* să mănânce.
 who what CL.3SG-has taken that-one that SUBJ eat.3SG
 ‘Everyone should eat whatever (food) they picked.’
- b. [**Ce unde** era], *aia acolo* să găsească.
 what where was that there SUBJ find.1SG
 ‘I want to find everything where it was.’

Correlative clauses can be clearly distinguished from multiple *wh*- FRs. A well-known feature of correlative clauses—also illustrated in (46)a–b above—is that they occur at the periphery of their matrix clause (e.g., Dayal 1996; Lipták 2009). In contrast, as discussed in Section 2, multiple *wh*- FRs occur in argument positions within their matrix clauses (similarly to single *wh*- FRs), rather than dislocated. Furthermore, the *wh*-phrases used in a correlative clause have corresponding anaphoric (pronominal/demonstrative) markers in the matrix clause—typically one for each *wh*-phrase. FRs on the other hand (be they single or multiple *wh*- ones) do not have this property—their matrix clause does not contain anaphoric elements linked to their *wh*-phrase(s).

Finally, correlative clauses in Romanian can be introduced by the *wh*-phrases [*care* NP] ‘which NP’ and *cine* ‘who’—unlike multiple *wh*- FRs (see Section 2.2 above). This is illustrated in the sentences in (47) (taken from Braşoveanu 2008: 48) and (48):

- EARLY ACCESS
- (47) [**Care fată** şi-a uitat ieri haina], pe *aceea* o caută
 which girl her.DAT-has forgotten yesterday coat-the ACC DEM.3FSG her look_for
 tatăl ei.
 father-the her.GEN
 ‘The father of the girl that forgot her coat yesterday is looking for her.’
- (48) [**Pe cine** ți-a fost alături la greu], pe *acela* să-l ții aproape și la bine.
 ACC who you-has been close at hard ACC DEM.3MSG SUBJ-him keep close at good
 ‘Who(ever) has been there for you in hard times, you should keep them close in good times.’

Given that neither defining property of correlative clauses (peripheral position, anaphoric marker) holds in multiple *wh*- FRs and taking into consideration the different distributions of [*care* NP] and *cine* in multiple *wh*-clauses, we conclude that multiple *wh*- FRs and correlative clauses are different constructions.

3.5 Multiple *wh*- FRs are not modal existential constructions

Multiple *wh*-“Modal Existential Constructions” (MECs) like the bracketed strings (49)a–b constitute another—possibly less common—type of multiple *wh*- construction attested crosslinguistically.

- (49) a. Nu are [**cine ce** să facă].
 not has who what SUBJ do.3SG
 ‘There’s nothing anyone could do.’
- b. Bunica nu are [**ce cui** {da} /{să dea} de Crăciun].
 Grandma not has what who.DAT give.INF SUBJ give.3SG for Christmas
 ‘Grandma doesn’t have anything to give to anybody for Christmas.’

Grosu 2004, 2013 and Šimík 2011 provide crosslinguistic evidence that multiple *wh*- MECs are introduced by a limited class of matrix predicates, i.e., existential ‘be’ and ‘have’, as illustrated in (49) with the Romanian existential predicate *a avea* ‘to have’. In contrast, predicates like ‘wrap’, ‘prepare’, ‘assemble’, and ‘arrange’ are not existential and do not embed MECs.⁹ Since these are exactly the matrix predicates introducing the multiple *wh*- clauses in (1)-(4), we take it that the embedded multiple *wh*- clauses cannot be MECs.

Another, possibly stronger argument against a MEC analysis for the multiple *wh*- clauses we are investigating comes from mood. Grosu 2004, 2013 and Šimík 2011 extensively argue

⁹ There are other predicates that can introduce single *wh*- MECs crosslinguistically, like ‘give’, ‘send’, ‘find’, ‘choose’, ‘get’. However, to our knowledge no *multiple wh*- MECs have been discussed in the literature with predicates other than ‘be’ and ‘have’ (see Šimík 2011 for more details); see (51) for a possible example.

that MECs require the subjunctive or the infinitive, as also exemplified in the Romanian sentences in (49). In contrast, multiple *wh*- FRs do not impose any mood restrictions: all our examples of multiple *wh*- FRs allow the indicative, behaving like single *wh*- FRs in this respect as well.¹⁰

Lastly, MECs and multiple *wh*- FRs differ in their interpretation. MECs have been argued to have the meaning of existentially quantified expressions. As already suggested by the paraphrases above and discussed in the previous sections, this is unlike the semantic behavior of multiple *wh*- FRs, which semantically behave like definite descriptions. To see this more clearly, compare the sentences in (50)a–b below with those we already saw in (1) and (16)b.

- (50) a. Bunica are [**ce cui** da de Crăciun].
 Grandma has what who.DAT give.INF for Christmas
 ‘Grandma has things to give to people for Christmas.’
- b. Bunica are [**lucruri/ niște lucruri** de dat **unor copii** de Crăciun].
 Grandma has things some things to given some.DAT children for Christmas
 ‘Grandma has (some) things to give to (some) people for Christmas.’

(50)a, with a MEC in brackets, asserts the existence of an unspecified non-empty set of things that Grandma will offer to some unspecified non-empty set of children for Christmas without any (functional) relation between the members of those two sets. When we try to replace and paraphrase the MEC with a DP, we need to use an indefinite DP or a bare plural, as in (50)b. In contrast, the bracketed multiple *wh*- FR in (1) refers to the maximal individual of the set of things that Grandma wrapped in order to give them to the appropriate people. As we saw in (16)b, a definite DP needs to be used to replace and roughly paraphrase the multiple *wh*- FRs in (1) (see discussion in Sections 2.3 and 2.4).

The properties mentioned above therefore provide both syntactic and semantic arguments against an analysis of multiple *wh*- FRs as MECs.

Together with the clear cases we just discussed, there are cases of multiple *wh*- constructions that are truly ambiguous and could be analyzed as multiple *wh*- FRs or MECs, depending on the interpretation. For instance, the sentence in (51)—which contains a bracketed multiple *wh*- clause in the subjunctive in the complement position of the MEC-embedding predicate *da* ‘give’ (Šimík 2011)—is ambiguous, as highlighted by the two different readings.

¹⁰ This does not mean that FRs disallow the use of subjunctive. As (i) shows, subjunctive mood is also possible in FRs, both single and multiple *wh*- ones (on subjunctive mood in Romanian, see Farkas 1985, 1992):

- (i) Am împachetat [**ce (când)** să iei cu tine.]
 have.1SG wrapped what when SUBJ take.2SG with you
 ‘I wrapped/packed what you should take with you (at the corresponding times).’

(51) Ți-am dat [ce unde să instalezi].¹¹

CL2-have.1SG given what where SUBJ install.2SG

Reading 1 (MEC): ‘I gave you things to install somewhere.’

Reading 2 (FR): ‘I gave you the things to install at their appropriate places.’

Reading 1 results from parsing the multiple *wh*- clause as a MEC: the *wh*-word ‘what’ introduces a set of things, while the *wh*-word ‘where’ introduces a set of places and both sets are asserted to be non-empty, i.e., they are existentially quantified over. Crucially, this reading does not require the existence of a specific connection between things and places. On the other hand, the sentence in (51) can also be interpreted along the lines of Reading 2, resulting from analyzing the multiple *wh*- clause as a multiple *wh*- FR: the whole embedded clause now refers to the maximal individual of the set of things that had to be installed, each at its own specific place, according to a mapping that the speaker and the hearer share. The predicates ‘find’ or ‘choose’ exhibit similar ambiguous selectional properties (see Šimík 2011). Speakers rely on the context to determine the appropriate interpretation.

3.6 Interim summary

The discussion above has highlighted the many commonalities between multiple *wh*- FRs and single *wh*- FRs and the substantial differences between multiple *wh*- FRs and other constructions involving multiple *wh*-phrases. We summarize the main ones in (52):

(52) Single and multiple *wh*- FRs vs. other multiple *wh*- constructions:

- (i) FRs are referential and maximal, like definite DPs;
- (ii) FRs can occur as arguments of the same (non-interrogative, non-existential) predicates;
- (iii) FRs realize one argument of their predicates at a time;
- (iv) FRs cannot be introduced by the *wh*-phrases *cine* (‘who’) nor [*care* NP] (‘which NP’);
- (v) FRs do not carry any mood restrictions.

There is convincing syntactic and semantic evidence to distinguish the construction that we are investigating—multiple *wh*- FRs—from other kinds of multiple *wh*- clauses attested crosslinguistically, be they correlatives, interrogatives, MECs or the kind of multiple *wh*- clauses discussed by Rudin. The next section will provide a compositional account of the semantic properties of multiple *wh*- FRs and most of their features above (we won’t have much to say about the restriction on *wh*-phrases). Before concluding, though, we would like to add some further remarks.

In this section, we have provided a series of tests and contexts that could help set apart various multiple *wh*- constructions. The attentive reader may have noticed that we used a fairly limited number of predicates (e.g., ‘wrap’, ‘assemble’, ‘prepare’, ‘arrange’) and most of our

¹¹ It is also possible to have a more abstract meaning where the speaker gave a list of things (and places where the things were to be installed). Since nothing in our argumentation hinges on this, we set this interpretation aside.

multiple *wh*-FRs examples have *ce* ‘what’ as their first *wh*-phrase. In the remainder of the paper, we will continue with this restrictive strategy and focus exclusively on multiple *wh*-FRs that occur as arguments of non-interrogative and non-existential predicates, are only in the indicative mood, and are headed by *ce* ‘what’. This is motivated by the desire to avoid any possible ambiguity in order to facilitate our consultants’ judgments and make the data we report in the paper as clear and solid as possible. However, it is important to keep in mind that multiple *wh*-FRs are not necessarily restricted to these predicates and these *wh*-phrase combinations.

Taking stock, we have seen that multiple *wh*-FRs behave in all relevant respects like single *wh*-FRs: they have a very similar distribution and, as we will discuss in detail in the following section, they have the same overall meaning. The question then becomes what the interpretation of multiple *wh*-FRs is and how it is derived by a compositional procedure resembling the one used by single *wh*-FRs.

4 Semantic analysis of multiple *wh*-FRs

In this section, we develop a compositional semantic analysis for multiple *wh*-FRs by building on a well-established semantic analysis of single *wh*-FRs. First, we show the limits this analysis faces when it is extended to multiple *wh*-FRs. Then, we propose an analysis that overcomes those limits by broadening the semantic contribution of *wh*-phrases in FRs.

Before going into the formal details and its supporting arguments, let’s sketch the main ideas behind our proposal. Let’s return to the multiple *wh*-FR we started with in (1), which is repeated in (53) below for convenience.

- (53) Bunica a împachetat [**ce** **cui** dă de Crăciun].
 Grandma has wrapped what who.DAT gives for Christmas
 ‘Grandma wrapped what she will give to the appropriate people for Christmas.’

Our proposal treats the bracketed multiple *wh*-FR in (53) as a construction that semantically behaves like a referential expression and denotes an object of the gift kind, similarly to the plural definite DP *the gifts*. Like *the gifts*, the multiple *wh*-FR in (53) denotes the largest (‘maximal’) object out of a certain set of gifts—the plural gift resulting from the sum of all the individual gifts inside the given set of gifts.

What is peculiar about multiple *wh*-FRs and makes them different from simple definite DPs like *the gifts* is the way the set of gifts is construed. It is not associated to a lexical item like the noun *gift* with or without further restrictions (*cheap gifts*, *gifts from Italy*, etc.). The gifts in the set that is associated to the multiple *wh*-FR in (53) are all and only those gifts that Grandma will give to the people those gifts are mapped onto according to a certain mapping.

There are many ways to map gifts to people. A multiple *wh*-FR imposes one specific kind of mapping—a function—rather than a relation of any kind, and a specific kind of function—a Skolem function—rather than any function. It also imposes that this Skolem function must exist and must be unique in the given context.

This “functional” construction of the relevant set is triggered by the semantic properties of the lower *wh*-phrase and its interplay with the higher *wh*-phrase, as we’ll discuss in detail soon. None of the other multiple *wh*- constructions we have discussed so far exhibit the same semantic properties as multiple *wh*- FRs. Simple definite DPs and single *wh*- FRs are similar to multiple *wh*- FRs in both being referential. This explains why they can all occur as arguments. On the other hand, only multiple *wh*- FRs exhibit the “functional” dimension we sketched above.

It’s now time to formulate our proposal more precisely. We will start by summarizing a well-established semantic analysis for single *wh*- FRs (Section 4.1) to then show that it cannot be extended to multiple *wh*- FRs straightforwardly (Section 4.2). We present our analysis of multiple *wh*- FRs in detail (Section 4.3) and then discuss various aspects of it and provide various argument in its support (Section 4.4).

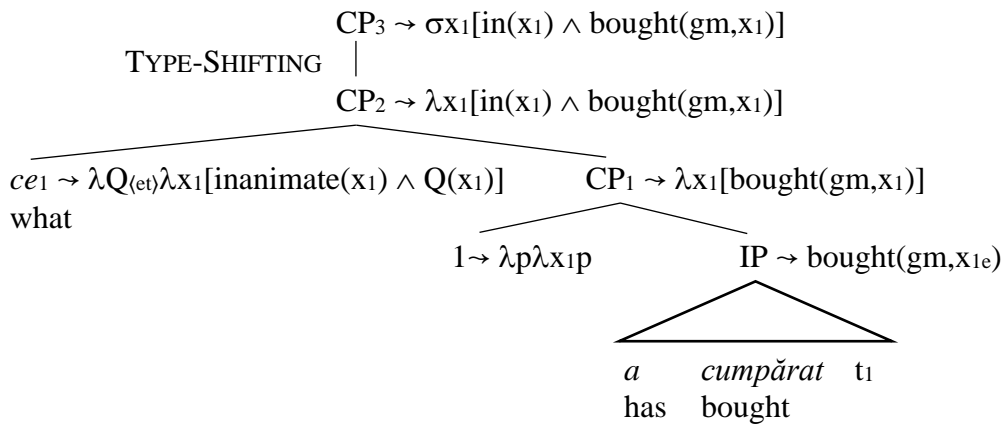
4.1 Semantics of single *wh*- FRs

The main idea behind a well-established semantic analysis of single *wh*- FRs—details aside—is that their *wh*-phrase licenses a trace/variable over individuals over which lambda-abstraction applies, producing a set of individuals. A silent maximality operator or a type-shifting operation applies to this set returning the unique maximal member of the set (Jacobson 1995; Dayal 1996; Caponigro 2003, 2004). This analysis for FRs is based on what has been argued for definite descriptions (e.g., Link 1983). Let us look at the details of this approach by considering a specific example.

The sentence in (54) contains a bracketed single *wh*- FR, while (55) gives the crucial steps of the semantic derivation of the FR according to the approach just mentioned. Comments follow.

- (54) Bunica a împachetat [ce a cumpărat azi].
 Grandma has wrapped what has bought today
 ‘Grandma wrapped what she bought today.’

- (55) *Semantic derivation of the single wh- FR in (54)*



In (55), the *wh*-phrase leaves a trace t_1 in its base-generated position, which translates into a variable over individuals x_1 (type e). CP_1 ends up denoting a set of individuals (type $\langle et \rangle$) by lambda-abstraction over x_1 : the set of all the singular and plural individuals that Grandma bought up to its unique maximal individual (i.e., the individual resulting from the sum of all the atomic individuals in the set). The *wh*-phrase syntactically combines with CP_1 , while semantically acts as a set restrictor (type $\langle et, et \rangle$): it applies to the set that CP_1 denotes and returns the subset of all the inanimate (*in*) singular or plural individuals that Grandma bought as the denotation of CP_2 (type $\langle et \rangle$). Finally, a default type-shifting operation applies, where the set that CP_2 denotes is converted into its maximal individual (type e) via the maximality operator σ , which has been argued to be the semantic contribution of the definite determiner *the* in English and similar languages (Link 1983). Notice that such an operation from a set to its maximal individual is information-preserving: it is always possible to construct the unique maximal individual of a finite set of atomic individuals (and all the plural individuals that can be formed out of the atomic ones) and it is always possible to reconstruct a set of atomic individuals (and all the plural individuals that can be formed out of the atomic ones) from its maximal individual.

Summarizing, this analysis of single *wh*- FRs accounts for their behavior as definite descriptions by assuming that a silent version of the definite operator applies by default—an assumption that crucially relies on a set of individuals resulting from abstracting over a variable over individuals. This is the same variable that *wh*-phrases in *wh*- interrogative clauses license. The meaning that is assumed for *wh*-phrases in single *wh*- FRs (56) is close, but not identical, to the meaning that is assigned to *wh*-phrases in common analyses of *wh*- interrogative clauses (57) (e.g., Karttunen 1977).

$$(56) \text{ WH}_{\text{FR}} \sim \lambda Q \lambda x [\text{wh}(x) \wedge Q(x)]$$

$$(57) \text{ WH}_{\text{INT}} \sim \lambda Q \exists x [\text{wh}(x) \wedge Q(x)]$$

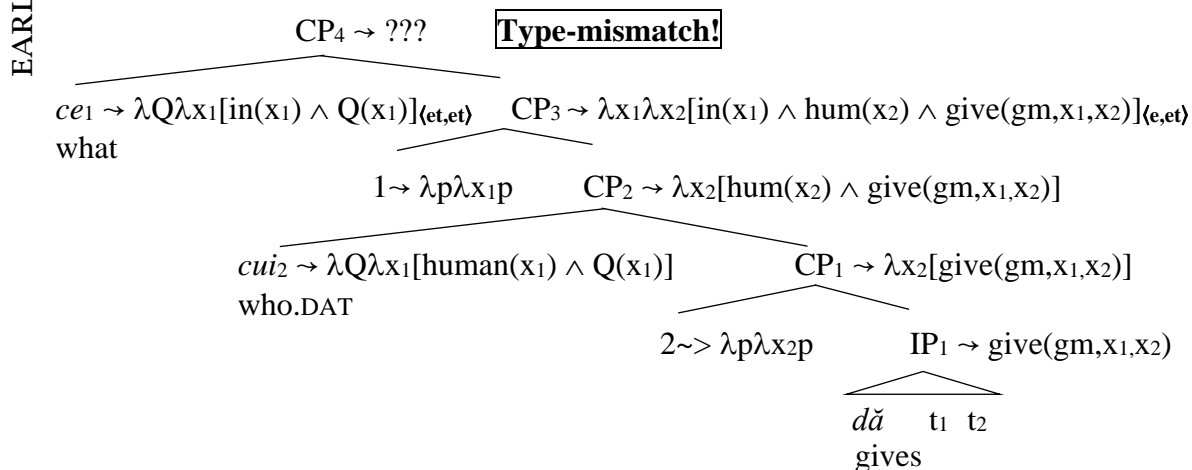
According to (57), a *wh*-phrase in an interrogative clause (WH_{INT}) behaves exactly like an existential generalized quantifier: for instance, *who* means exactly the same thing as *someone*. As we just saw, the existential quantification over the variable licensed by the *wh*-phrase in a *wh*- interrogative clause is replaced by lambda-abstraction over the variable translating the *wh*-trace in a FR (56). The one-place predicate *wh* in (56) and (57) stands for whatever semantic restriction the *wh*-phrase carries (human for ‘who’, inanimate for ‘what’, location for ‘where’, etc.).

4.2 Problems with extending the semantics of single *wh*- FRs to multiple *wh*- FRs

The approach in Section 4.1 cannot be straightforwardly extended to multiple *wh*- FRs. Let us briefly see why with an example, such as (58), which contains a multiple *wh*- FR in brackets. (59) attempts to provide a semantic derivation for the bracketed FR in (58) by assuming that all *wh*-phrases license traces translating into variables over individuals.

(58) Bunica a împachetat [**ce** **cui** **dă** **de** Crăciun].
 Grandma has wrapped what who.DAT gives for Christmas
 ‘Grandma wrapped what she will give to the appropriate people for Christmas.’

(59) Failed semantic derivation of the multiple *wh*- FR in (58)



The translation of CP_2 in (59), i.e., the CP containing only the lowest *wh*-phrase and the remainder of the FR, is the usual set of individuals, in particular, the set of individuals Grandma gives a certain object x_1 to.¹² Problems arise with the next step. As usual, before a *wh*-phrase can combine with the remainder of its clause, lambda-abstraction over the variable that is coindexed with the *wh*-word must apply. Abstracting over x_1 produces the denotation of CP_3 : a function from an inanimate individual x_1 to a set of human individuals x_2 such that Grandma gives x_1 to x_2 —a semantic object of type $\langle e, et \rangle$. On the other hand, the sister of CP_3 is a *wh*-word that semantically behaves like a set restrictor (type $\langle et, et \rangle$). No function application can apply, nor any other independently motivated semantic rule. Therefore, CP_4 ends up without a denotation and the semantic derivation crashes. Even if we assumed an *ad hoc* semantic rule to combine the two meanings, it would not return the correct meaning for CP_3 and the whole FR. The semantic analysis we just tried to pursue treats each *wh*-phrase as semantically independent from any other *wh*-phrase in the same clause. This clashes with speakers’ intuitions, according to which the meaning of the lowest *wh*-phrase “depends” on the meaning of the highest *wh*-phrase, as we showed in Section 2.4. In conclusion, a simple extension of existing analyses of single *wh*- FRs to multiple *wh*- FRs is both formally and empirically problematic.¹³

¹² Here and in the remainder of the paper, we follow a non-uncommon convention of sacrificing precision to simplicity and use in our prose the same labels (x_1 , x_2 , f , F , etc.) for variables and the values that are assigned to those variables.

¹³ A similar discussion is also present in Šimík 2011: 4.4.1, where it is argued that Caponigro’s (2003) semantics for *wh*-phrases in single *wh*- FRs cannot be easily (if at all) extended to multiple *wh*- MECs.

4.3 Proposal: the semantics of multiple *wh*- FRs by means of complex traces and functional *wh*-phrases

To overcome the problems in the analysis we just discussed, we propose two changes that broaden the available meaning inventory for *wh*-phrases in FRs. First, we assume that the first/higher *wh*-phrase in a FR, i.e., the *wh*-phrase that c-commands the other in a multiple *wh*- FR, licenses a standard *wh*-trace, which translates into a familiar variable over individuals. This is the same translation for *wh*-phrases we assumed in a single *wh*- FR. It is repeated in (60)a. The other *wh*-phrase, instead, licenses a complex trace translating into the complex functional variable in (60)b, which is made of a variable over Skolem functions (f_2 , type $\langle e, e \rangle$) taking a variable over individuals (x_1 , type e) as its argument and returning an individual (type e) as its value.

- (60) a. Simple *wh*-trace: $t_1 \rightarrow x_1$
 b. Complex *wh*-trace: $t_2^1 \rightarrow f_2(x_1)$

In the end, both traces/variables in (60) denote individuals, but, while the simple *wh*-trace does so through a direct assignment of an individual by the assignment function, the complex *wh*-trace denotes an individual through the interplay of a variable over Skolem functions and a variable over individuals acting as the argument of the function. The individual variable that occurs as the argument of the Skolem function is coindexed with the higher *wh*-phrase—a feature that plays a crucial role in the semantic composition, as we discuss below.

Our second change is strictly related to the first one and has to do with the denotation of *wh*-phrases. We summarize it in (61)a–b.¹⁴ Comments follow.

- (61) a. Individual $\text{WH}_{\text{FR}} \rightarrow \lambda Q \lambda x [\text{wh}(x) \wedge Q(x)]$
 b. Functional $\text{WH}_{\text{FR}} \rightarrow \lambda F \exists f \in C [\mathbf{WH}(f) \wedge \mathbf{F}(f) \wedge \mathbf{U}(f)]$ ¹⁵

$$\text{Abbreviations: } \mathbf{WH}(f): \forall x [\text{wh}(f(x))]^{16}$$

$$\mathbf{U}(f): \forall f^* \in C [[\mathbf{WH}(f) \wedge \mathbf{F}(f^*)] \rightarrow f^*=f]$$

The denotation in (61)a is the one that has been proposed for *wh*-phrases in single *wh*- FRs like those we discussed in Section 4.1. A *wh*-phrase licensing the trace over individuals in (60)a semantically behaves like a set restrictor: it applies to a set of individuals to return a subset.

¹⁴ Technically, (61)a–b provides the translations of WH_{FR} into expressions of a formal language, as marked by “ \rightarrow ”. These two expressions are then univocally interpreted as denoting two different objects—two functions of different kinds, in this specific case—via the model that is provided to interpret the formal language. We will use translation or denotation interchangeably, in order to keep the presentation simpler, unless the terminological choice makes a non-trivial difference.

¹⁵ We use uppercase and boldface letters for (variables over) properties of Skolem functions (type $\langle ee, t \rangle$).

¹⁶ We assume f to be a total function over the domain of individuals D , following Engdahl 1986 and subsequent work on Skolem functions. Heim 2012: Section 2 argues that this is an “unrealistic idealization” and proposes a way to turn f into a partial function by relying on presupposition projection. Since this is not crucial for us, we’ll maintain Engdahl’s idealization.

This is why we labeled it *Individual WH_{FR}*. The denotation in (61)b, instead, is new and we are proposing it for a *Functional WH_{FR}*—a *wh*-phrase licensing the complex *wh*-trace in (60)b. The denotation in (61)b can be unpacked in prose as in (62):

(62) *Denotation of the Functional WH_{FR} in (61)b in prose*

A Functional WH_{FR} denotes a function that takes a set *F* of Skolem functions as its argument (type of *F*: $\langle ee, t \rangle$) and returns the value true iff there is a Skolem function *f* (type of *f*: $\langle ee \rangle$) in the context *C* satisfying the following restrictions:

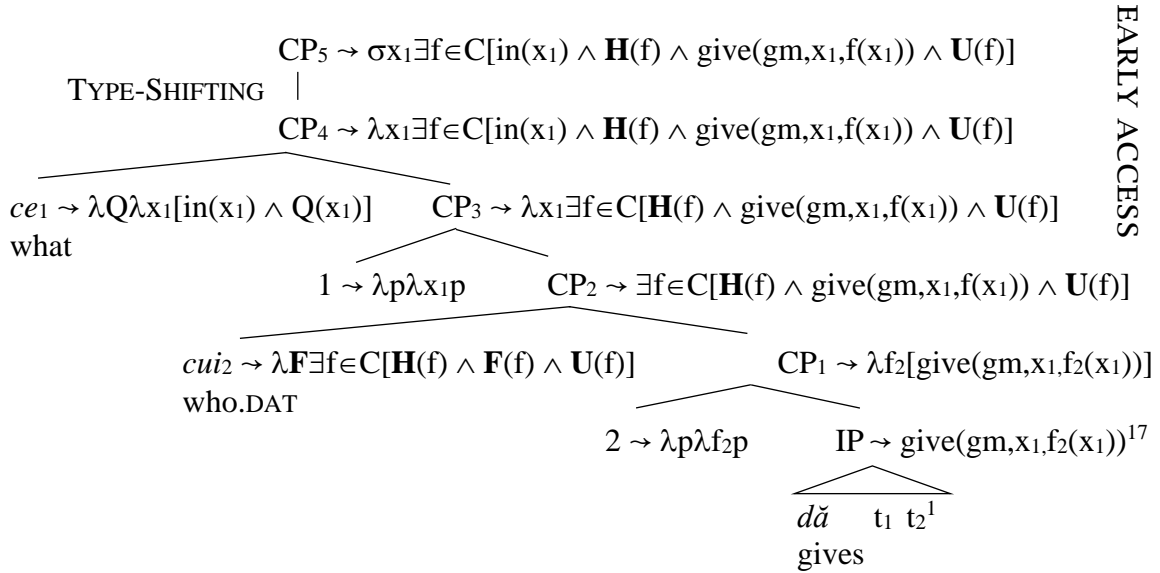
- I. *Wh-restriction: WH(f)*
f outputs individuals that satisfies the semantic restriction that is carried by the Functional WH_{FR} (human, inanimate, place, etc.).
- II. *FR restriction: F(f)*
f is a Skolem function satisfying the restriction provided by the remainder of the FR, i.e., *f* is a member of the set *F*. *F* is the argument fed to the Functional WH_{FR} and results from lambda-abstracting over the Skolem function variable introduced by the trace of the Functional WH_{FR} (see semantic derivation in (64) below).
- III. *Uniqueness restriction: U(f)*
f is the only Skolem function in *C* satisfying Restrictions I and II above—literally, every Skolem function *f** in *C* satisfying Restrictions I and II above must be identical to *f*.

The uniqueness restriction in (62)III is not a logical/mathematical one, like the uniqueness of a maximal individual for a set of individuals (Section 4.1). It is rather a context-dependent kind of uniqueness, as we highlighted with the restriction to the given context *C* (“∈*C*”) in the denotation in (61)b. Logically, there will always be more than one Skolem function satisfying the WH and F restrictions, as long as the domain of individuals is not a singleton. This restriction may be seen as another instantiation of the more general phenomenon of quantifier domain restrictions in natural language (see von Stechow 1994, Stanley & Szabó 2000, and references therein).

Before we further discuss and motivate our assumptions about complex traces and Functional WH_{FR} (Section 4.4), we first show how, with these two assumptions in hand, we can overcome the issues that led to the failed derivation in (59). Going back to the example with a multiple *wh*-FR in (58), repeated and simplified in (63) below, let us examine the new semantic derivation in (64), based on our new proposals about complex traces and Functional WH_{FR}. Comments follow.

- (63) Bunica a împachetat [**ce** **cui** **dă**].
 Grandma has wrapped what who.DAT gives
 ‘Grandma wrapped what she will give to the appropriate people.’

(64) *Semantic derivation of the Multiple wh- FR in (63)*



Starting from the bottom in (64), IP contains the two *wh*-traces: a simple one from the higher *wh*-word (t_1), which translates into x_1 , and a complex one (t_2^1), from the lower *wh*-word, which translates into $f_2(x_1)$. CP₁ denotes the function resulting from lambda-abstracting over the variable f_2 , or, equivalently, the set of all Skolem functions such that Grandma gives the individual x_1 to the individual that f_2 associates to x_1 .

The lower *wh*-word *cui*₂ no longer denotes a set restrictor, as in (59), but an existential quantifier that applies to a set F of Skolem functions and returns true if there is a unique function in F that outputs people, i.e., human individuals. Therefore, the combination of *cui*₂ and its sister CP₁ results in CP₂ denoting true iff there is one and only Skolem function f that outputs people such that Grandma gives an individual x_1 to the person that f associates to x_1 .

The next step is the lambda-abstraction that is necessary before the higher *wh*-word *ce*₁ can combine. The abstraction applies to all the instances of x_1 —the variable that is coindexed with *ce*₁ in CP₂. The result is that CP₃ denotes a set of individuals x_1 that Grandma gives to the people that are associated to the individuals x_1 according to a unique Skolem function f . This is the set the higher *wh*-phrase *ce*₁ applies to and restricts to the subset of objects (inanimate individuals), returning the denotation of CP₄. Finally, the familiar type-shifting operation from single *wh*-FRs (see (55) and related discussion) can apply here as well, returning the maximal individual the multiple *wh*-FR refers to.

In this way, the multiple *wh*-FR in (64) ends up denoting the unique maximal individual of the set of objects x_1 that Grandma gives to the people associated with x_1 according to the

¹⁷ We are crucially assuming that x_1 ranges over singular and plural individuals (see σ_{x_1} and the final denotation in (64) and the discussion in Section 4.4.5). Therefore, we also assume the shortcut in (i) below, in order to ensure the relevant distribution with distributive predicates like *give* when they take plural individuals as their arguments and, at the same time, to keep the length of the expressions in our semantic derivation manageable.

(i) $\text{give}(\text{gm}, x_1, f_2(x_1)) = \forall z [(z \leq x_1) \rightarrow \text{give}(\text{gm}, z, f_2(z))]$

unique Skolem function f . This final denotation captures the speakers' intuitions and the semantic properties we discussed in Section 2.

A welcome prediction of our proposal is the one schematized in (65): wh_2 , the wh -phrase that is c-commanded by the other (wh_1), must receive a functional interpretation and, therefore, has to license a complex wh -trace. Any other meaning combination of wh -phrases would make the semantic derivation crash (essentially for the same reasons discussed in Section 4.2).

(65) [FR WH_{FR-1} Functional/*Individual WH_{FR-2} ... t₁ ... t₂¹ ...]

This prediction matches speakers' intuitions according to which the interpretation of the highest wh -phrase “functionally” affects the interpretation of the other wh -phrase (see Section 2.4).

4.4 Further support for the two core assumptions and related remarks

The analysis of multiple wh -FRs we just presented crucially relies on two core assumptions about the semantic nature of wh -traces/variables and wh -phrases, at least in FRs in Romanian. We elaborated on and made use of those assumptions in the previous section. In this section, we provide further support for both and discuss possible objections.

4.4.1. Further support for complex wh -traces

We assumed that a wh -phrase can license a familiar simple mono-indexed trace translating into a variable over individuals, as shown in (60)a, or, crucially, a complex trace carrying two indices that are associated to two different antecedents—one of which is the wh -phrase itself—and translating into a variable over Skolem functions taking a variable over individuals, as shown in (60)b. The latter kind of trace/variable has been argued to be licensed in other constructions as well. Complex traces/variables were initially suggested to account for functional readings of single wh -interrogative clauses with universal quantifiers (Engdahl 1980, 1986; Chierchia 1991, 1993; Dayal 1996). For instance, the single wh -interrogative clause in (66)a allows for an answer like *His mother* (66)b, which doesn't refer to any individual in particular but rather to the function mapping every Italian male to a specific and unique female.

- (66) a. QUESTION: [Which woman]₂ does [every Italian man]₁ love **t₂¹** the most?
 b. ANSWER: His mother.

This approach was subsequently extended to account for headed relative clauses with a universal quantifier like (67) by assuming that their possibly null wh -operator (Op_2) licenses a functional trace (Sharvit 1999a).¹⁸

¹⁸ To the best of our knowledge, Jacobson 1994 is the first to recognize the functional nature of these headed relative clauses. She discusses examples like (i) below and proposes a functional analysis within her variable-free framework, which is grounded within Categorical Grammar and does not make use of wh -movement (or any syntactic movement) or traces/variables.

(i) The woman who every Englishman_i admires (the most) is his_i mother. (Jacobson 1991: ex. 2a)

(67) [The picture of herself]₂ [Op₂ that [every famous actress]₁ hated **t₂¹**] sold for a lot.¹⁹

Furthermore, Sharvit (1999b) argues that single *wh*- FRs with universal quantifiers in the subject position of predicational copular sentences like (68) also contain a functional trace licensed by the *wh*-phrase introducing the FR.

(68) [What₂ [every student]₁ got **t₂¹**] was a nuisance to him.²⁰

To this, we can add the fact that multiple *wh*- clauses, such as correlative clauses (Dayal 1996: 200–202; Braşoveanu 2012: 41) and multiple *wh*- interrogative clauses have also been argued to license functional traces (e.g., Comorovski 1996; Dayal 1996: 117–118, 2016: 112–115). For instance, a multiple *wh*- interrogative clause like the one in (69)a receiving a functional answer like (69)b (both adapted from Comorovski 1996: 51, ex. 95) would license a functional trace at LF, as shown in (69)c.

- (69) a. QUESTION: Which student got back which paper?
 b. ANSWER: Every student got back their syntax paper.
 c. LF of a.: [[which paper]₂ [[which student]₁ [t₁ got back **t₂¹**]]]

In conclusion, our core assumption that *wh*-phrases can license complex traces/variables is independently supported by proposals that have been made for several different constructions in different languages.

4.4.2. Functional *wh*-phrases in free relative clauses and interrogative clauses

The second assumption at the center of our proposal is that a *wh*-phrase in a FR in Romanian exhibits a dual semantic behavior: as Individual WH_{FR} , they denote a set restrictor over sets of individuals (61)a, while, as Functional WH_{FR} , they denote an existential quantifier over a set of Skolem functions (61)b. In (70), we repeat the denotation of Functional WH_{FR} in order to more easily compare them with the denotation in (71), which has been proposed for Functional WH_{INT} —*wh*-phrases in interrogative clauses that receive a functional interpretation, like the one we discussed in (66) (Engdahl 1986; Chierchia 1991; Dayal 1996).

(70) Functional $\text{WH}_{\text{FR}} \rightarrow \lambda F \exists f [\mathbf{WH}(f) \wedge \mathbf{F}(f) \wedge \mathbf{U}(f)]$

(71) Functional $\text{WH}_{\text{INT}} \rightarrow \lambda F \exists f [\mathbf{WH}(f) \wedge \mathbf{F}(f)]$

Abbreviations: $\mathbf{WH}(f): \forall x [\text{wh}(f(x))]$
 $\mathbf{U}(f): \forall f^* [\mathbf{WH}(f) \wedge \mathbf{F}(f^*)] \rightarrow f^*=f]$

¹⁹ Adapted from Sharvit 1999a: ex. 8a.

²⁰ Adapted from Sharvit 1999b: ex. 92.

The only difference between the two denotations is that the denotation for the Functional WH_{FR} includes an extra restriction: the uniqueness of the relevant Skolem function. In Section 2.4, we already showed why our consultants' semantic intuitions justify a functional component associated to the interpretation of the lower *wh*-phrase. In the next sections, we further discuss and support the need for the Skolem function *f* in multiple *wh*-FRs to be existentially quantified and unique.

4.3. Further evidence for the existential requirement in the denotation of Functional WH_{FR}

Let us return to the example in (63) we have discussed so far, which is repeated in (72) for convenience.

- (72) Bunica a împachetat [**ce cui** dă de Crăciun].
 Grandma has wrapped what who.DAT gives for Christmas
 'Grandma wrapped the things she'll give to the appropriate people for Christmas.'

According to our semantic analysis in (64), the bracketed multiple *wh*-FR in (72) denotes the maximal plural entity of a set of things, each of which is associated with a corresponding person, who will be given one of those things for Christmas. This closely matches speakers' intuitions, as we discussed in Section 2.4. The denotation for the Functional WH_{FR} in (70) requires the existence of at least one appropriate Skolem function. In fact, when the context makes it hard or impossible to find one, the sentence containing the multiple *wh*-FR sounds infelicitous, as shown in (73).

- (73) # Bunica a împachetat [**ce cui** dă de ziua lui Andrei].
 Grandma has wrapped what who.DAT gives for birthday of Andrei
 'Grandma wrapped the things she'll give to the appropriate people on Andrei's birthday.'

The example in (73) is minimally but crucially different from the fully felicitous example in (72). What makes (73) odd is the fact that typically for a given birthday, there aren't multiple gift-receivers. So, there's no appropriate Skolem function mapping gifts to gift-receivers. Notice that we are excluding the extreme case of a Skolem function whose domain contains just one individual (i.e., Andrei) and whose range is a singleton as well (i.e., Andrei's gift). The ban on such Skolem functions may receive a pragmatic explanation: why would the speaker use a functional dependency in (73) when she could just utter the bracketed single *wh*-FR in (74) or the even simpler bracketed DP in (75)?

- (74) Bunica a împachetat [**ce îi** dă lui Andrei de ziua lui.]
 Grandma has wrapped what CL.DAT gives to Andrei for birthday his
 'Grandma wrapped the thing she will give Andrei for his birthday.'

- (75) Bunica a împachetat [**cadoul** de ziua lui Andrei.]
 Grandma has wrapped present-the for birthday of Andrei
 ‘Grandma wrapped Andrei’s birthday gift.’

(73) would be acceptable only in a context where, for some reason, Grandma decided to give things to people on a particular day, which happens to be Andrei’s birthday, and had some way to establish which gift goes to which person.

Multiple *wh*-FRs with negation illustrate a similar point, as shown in (76).

- (76) # Bunica a împachetat [**ce cui** nu dă de Crăciun.]
 Grandma has wrapped what who.DAT not gives for Christmas
 ‘Grandma wrapped the things she will not give to the appropriate people for Christmas.’

The reason why (76) is infelicitous is that there is no natural Skolem function that associates wrapped objects to people to whom the objects are *not* given. The presence of negation makes a natural mapping from objects to individuals unavailable. Note, however, that it is perfectly natural to refer to the set of things Grandma will not give for Christmas, which is why the single *wh*-FR in (77) is felicitous and can be used, for example, in a context where Grandma wrapped things she bought for Christmas but decided not to give them as gifts anymore. It is therefore the presence of the second *wh*-phrase (and the need for an appropriate functional dependency) that makes (76) infelicitous.

- (77) Bunica a împachetat [**ce** nu dă de Crăciun].
 Grandma has wrapped what not gives for Christmas
 ‘Grandma wrapped the things she will not give for Christmas.’

The evidence we just presented argues in favor of existential quantification over Skolem functions as part of the denotation for *wh*-phrases. We now turn to the evidence supporting the uniqueness requirement.

4.4.4. Further evidence for the uniqueness requirement in the denotation of Functional WH_{FR}

The denotation for a Functional WH_{FR} in (61)b not only requires that there is a Skolem function in the context C satisfying WH and F restrictions, but it must be unique in C (see also (62)III). Let us imagine a context C that makes it clear that there may be more than one Skolem function satisfying the WH and F restrictions in it, due, for instance, to the agent’s epistemic uncertainty. Grandma bought Christmas presents for the family. She knows her two children and their wishes well, so she bought a book for Donka and a coffee machine for Adrian. She also has a couple of toys (a board game and a science set) for her two grandchildren, but she wants to check with the parents before deciding who receives which toy. This means that Grandma has two different mappings or Skolem functions from gifts to gift-receivers in mind—those represented in (78): f_a and f_b . The shading highlights what is identical/permanent between the two functions, while the clear areas cover the variation/uncertainty.

(78) Uncertainty context C: the two Skolem functions that Grandma has in mind

EARLY ACCESS	f_a		f_b	
	book	→ Donka	book	→ Donka
	coffee machine	→ Adrian	coffee machine	→ Adrian
	board game	→ Ana	board game	→ Lia
	science set	→ Lia	science set	→ Ana

In the context C described in (78), there is no maximal individual that can act as the denotation of the multiple *wh*- FR in (63)/(72), which was given in (64) and is now repeated in (79) below for convenience.

(79) Multiple *wh*- FR in (63)/(72) → $\sigma x_1 \exists f \in C [in(x_1) \wedge \mathbf{H}(f) \wedge give(gm, x_1, f(x_1)) \wedge \mathbf{U}(f)]$

According to (79), the multiple *wh*- FR refers to the maximal individual σx_1 of the set of objects x_1 that Grandma gave to those individuals $f(x_1)$ that are associated to the objects x_1 in a unique way, i.e., by a unique Skolem function f in C. But, in the given context C, there are two different Skolem functions that satisfy the relevant restrictions. It follows that no object x_1 satisfies the relevant requirements, the resulting set of objects is empty, and, as a consequence, the set has no maximal individual σx_1 . Since the multiple *wh*- FR ends up with no denotation, the semantic derivation for the whole sentence crashes and the sentence receives no semantic interpretation in the scenario in (78). We take this output as a welcome formal correlate to our consultants' rejection of the sentence in the scenario in (78).

Notice that it wouldn't be justified to restrict the set of objects to just the book and coffee machine, i.e., the objects that are always assigned to the same people in the mappings in (78) in the shaded areas. Although this restriction would assign a denotation to the maximal *wh*- FR, it wouldn't correctly represent the scenario we are in. This restriction would be equivalent to claiming that Grandma has in mind only the Skolem function f_c in (80). (80) implies that Grandma has no idea about who she will give the remaining two objects to—in other words, those two objects don't even count as gifts in Grandma's mind, which is not the case.

(80)

f_c	
book	→ Donka
coffee machine	→ Adrian

To sum up, multiple *wh*- FRs are infelicitous in scenarios that make more than one relevant Skolem function available. The uniqueness constraint on the Skolem function in our proposal captures this fact.

4.4.5. Further remarks on the denotation of Functional WH_{FR}

In this last section before concluding, we touch on a few other issues concerning the denotation of Functional WH_{FR} : the nature of the Skolem function, the projective behavior of the uniqueness requirement, and plural individuals as arguments or values of the Skolem function.

In Caponigro & Fălăuş 2018, we proposed a slightly different denotation for a Functional WH_{FR} —the one in (81).

$$(81) \text{ Functional } WH_{FR} \rightarrow \lambda F[\mathbf{WH}(f) \wedge \mathbf{F}(f)]$$

Like our current proposal, it is a function from sets of Skolem functions to true values and imposes the WH and F restrictions on a Skolem function. The crucial difference is on how this Skolem function is introduced. In our current proposal, it is via existentially binding a variable f over contextually given Skolem functions together with a uniqueness requirement, while in (81) the Skolem function is introduced as contextually salient via a free variable f over Skolem functions. In other words, our current proposal only requires the speaker to know that there is such a function and is unique in the context. Our former proposal presupposed that the speaker had some knowledge of the Skolem function. Our consultants' intuitions show that speakers don't need to be familiar with the relevant Skolem function, at least not its extension. They can utter (63)/(72) felicitously even if they don't know what appropriate mapping Grandma has in mind, as long as they know she has one, and only one (see the related discussion in Section 2.5 and the possible continuations in (22)).²¹ Our Editor observed that the speaker could be familiar with just the intension of the Skolem function—for instance, she would be familiar with the function mapping objects to people Grandma is giving those objects to, without knowing the actual mapping in the world of evaluation. Still our consultants can accept a sentence with a multiple *wh*-FR like (63) without knowing anything about Grandma and her plans ahead and become familiar with the intension of the relevant Skolem function only after hearing the sentence and the multiple *wh*-FR in particular. One possibility (suggested by our Editor) is that a parameterized version of the free variable over Skolem functions could allow some other cognitive agent to be the one familiar with the Skolem function, along the lines of the parameterized choice functions argued for by Kratzer 1998 in her treatment of indefinites and their scopal behavior. We leave the exploration of this intriguing option for future research.

Another concern that was raised by our Editor and one of our Reviewers is whether the existence and uniqueness restrictions that are introduced by a Functional WH_{FR} would be more appropriate as presuppositional content rather than asserted content. In particular, one may wonder whether clausal negation in the matrix clause wouldn't be predicted to interact with the existential quantifier over Skolem function or the universal quantifier in the uniqueness requirement within the multiple WH_{FR} . For instance, wouldn't our proposal predict that a sentence like (82) be acceptable in contexts in which either there is no mapping between gifts

²¹ The uniqueness requirement for definite description does not have to be paired up with familiarity either. *Grandma already bought the birthday gift for her only son* doesn't require the speaker to know what Grandma bought in order to be uttered felicitously.

and gift-receivers or there is more than one such mapping? Our consultants have no hesitation in judging (82) completely infelicitous in those contexts.

- (82) Bunica nu a împachetat [**ce** **cui** **dă**].
 Grandma not has wrapped what who.DAT gives
 ‘Grandma didn’t wrap what she will give to the appropriate people.’

Our semantic analysis does not make those incorrect predictions, though. The whole semantic contribution of the Functional WH_{FR} is within the scope of the maximality operator σ . This is the same operator that is lexically associated to the definite determiner—at least, according to the analyses of definite DPs and maximal free relative clauses that we are endorsing (e.g., Link 1983; Jacobson 1995). Therefore, we predict for sentences with multiple *wh*-FRs like (82) the same lack of scope interaction that is observed in a sentence like (83), with negation in the matrix clause and an existentially quantified nominal with the definite DP in object position. (83) is infelicitous if there is no grandchild at all.

- (83) Bunica nu a împachetat [cadoul pe care îl **dă** unui nepot].
 Grandma not has wrapped gift-the ACC REL CL.ACC gives a.DAT grandchild
 ‘Grandma didn’t wrap the gift she will give to a grandchild.’

Unsurprisingly, single *wh*-FRs exhibit the same lack of interaction, as shown in (84).

- (84) Bunica nu a împachetat [**ce** **dă** unui nepot].
 Grandma not has wrapped what gives a.DAT grandchild
 ‘Grandma didn’t wrap what she will give to a grandchild.’

Whatever explains the lack of interaction between scope sensitive elements in the matrix clauses and inside its definite DP object can be extended to single and multiple *wh*-FRs. It is likely to depend on the presuppositional component that is associated with definite descriptions, according to which the existence and uniqueness of a (maximal) individual satisfying the descriptive content of a definite description are presupposed.²² Since a Functional WH_{FR} always ends up being part of the descriptive content of what semantically behaves like a definite description—a multiple *wh*-FR, the semantic content of a Functional WH_{FR} always contributes to the presuppositional content of the whole multiple *wh*-FR.²³

²² See Elbourne 2013 for a detailed discussion of (singular) definite descriptions, their presuppositional content, and their presupposition projection properties.

²³ For instance, the full translation of the multiple *wh*-FR in (63) that was given in (64) would be like (i) below with the presuppositional content underlined.

(i) $\sigma_{x_1}: \exists x_1[\underline{\exists f[\text{in}(x_1) \wedge \mathbf{H}(f) \wedge \text{give}(\text{gm}, x_1, f(x_1)) \wedge \mathbf{U}(f)]}] \wedge \forall x_2[\underline{\exists f[\text{in}(x_1) \wedge \mathbf{H}(f) \wedge \text{give}(\text{gm}, x_1, f(x_1)) \wedge \mathbf{U}(f)]}] \rightarrow x_2 \leq x_1]. \sigma_{x_1} \exists f[\text{in}(x_1) \wedge \mathbf{H}(f) \wedge \text{give}(\text{gm}, x_1, f(x_1)) \wedge \mathbf{U}(f)]$

In prose, the maximal individual σ of a set of gifts that Grandma will give to the appropriate people iff the following presupposition is satisfied: there is at least one gift and σ is the maximal gift. The existential quantification over Skolem functions and the uniqueness requirement are both part of the (underlined) presuppositional content as well and, therefore, will project accordingly.

Lastly, we observe that a multiple *wh*-FR like (72) is fine in the scenario in which Grandma gives each grandchild a gift and, if a grandchild has a significant other, then the grandchild's gift is actually a gift to the couple as a whole. In other words, we are dealing with a mapping from atomic gifts to atomic or plural human individuals. Our proposal can handle this fact by allowing the range of the Skolem function to include plural individuals as well. It is also possible to utter (72) felicitously in a scenario in which more than one object is given as a gift to one or more individuals. For instance, if Grandma gives two gifts to each grandchild that has received all A's in school. Once again, we can accommodate this scenario by allowing the domain of the relevant Skolem function to include plural individuals as well.²⁴

The move to allow for plural individuals in the domain and range of Skolem functions is not unconstrained. It is only justified when the plural individuals form a natural unit in the given context. In the scenarios above, one of Grandma's children and their partner do form a natural unit, which is even lexicalized by nominals like *couple*. Similarly, it is easy to imagine a gift as made of more than one component. On the other hand, there are cases where a plural object is not granted and the sentence with a multiple *wh*-FR sounds infelicitous. For instance, let us consider a scenario in which a stage manager is in charge of carefully arranging, in boxes that are backstage, the objects that will be put by the actors in different places on the stage during the performance. Crucially, for several objects it will be the case that each of them will be put in different places at different times during the performance. For instance, suppose a special precious book will be put on the coffee table in Act 1 and then back in the bookcase in Act 2. Similarly, a plate will be on the main table in Act 2 and then on the floor in Act 3. The coffee table and the bookcase are two independent places, the same for the main table and the floor. So we are in a situation in which there are at least two objects, each of which is mapped to two independent and unrelated places. In this situation, (85) is infelicitous and speakers comment that this is the case because there is no singular or plural place each object can be mapped to, since at least two objects are associated with two places.

- (85) # În culise, directorul de scenă a aranjat [ce unde trebuia pus în timpul in backstage manager-the of stage has arranged what where needed put in time-the spectacolului].
 show-the.GEN
 'Backstage, the stage manager arranged the things that needed to be put in their appropriate places during the performance.'

The discussion in this section offered further support in favor of our proposal about the existence of a Functional WH_{FR} in (70). This new denotation for *wh*-phrases is what is crucially needed—we have argued—to both capture speakers' intuitions about how the meaning of the two *wh*-phrases interacts and to provide a fully compositional semantic analysis of multiple *wh*-FRs that is faithful to those intuitions.

²⁴ Thanks to Adrian Braşoveanu for making us think about these kinds of examples and contexts.

5 Conclusions

We have started unveiling a previously ignored multiple *wh*- construction: multiple *wh*- FRs. We have shown that they exist and are productive—at least in the variety of Romanian spoken in Transylvania. We have compared them to and distinguished them from the other kinds of multiple *wh*- clauses that are attested in the language—interrogative clauses, correlative clauses, Rudin’s sentences, and MECs. We have argued that multiple *wh*- FRs are FRs and their basic semantics is the same as that of single *wh*- FRs: both FRs are referential and maximal. We have proposed a compositional semantic analysis for multiple *wh*- FRs that builds on two main components: (i) the assumption that *wh*-phrases can license complex functional traces/variables, which has been independently argued for several other *wh*- constructions, and (ii) a new functional meaning for *wh*-phrases, which is essentially a variant of the functional meaning of *wh*-phrases that has been independently proposed to account for functional *wh*- interrogative clauses.

Finally, we have provided some preliminary evidence in (6)–(9) that multiple *wh*- FRs are attested in at least four more languages (or varieties thereof). These findings do not stem from a systematic crosslinguistic investigation, but simply from feedback we received by presenting our work to different audiences. We hope that our work will foster research on multiple *wh*- FRs by providing a clear case from Romanian, analytical tools and tests to identify them and distinguish them from other *wh*- constructions, as well as an analysis to account for their main properties. We are confident that other languages will turn out to have multiple *wh*- FRs. On the other hand, it is incontrovertible that multiple *wh*- FRs are less common across languages, which is probably a reason why they have been almost completely neglected so far. Even within our limited investigation, it is clear that languages that have both single *wh*- FRs and multiple *wh*- interrogative clauses do not necessarily have multiple *wh*- FRs. Most varieties of American and Canadian English we are aware of do not allow for multiple *wh*- FRs, nor do most varieties of German we have checked. Also, we have not found any variety of Spanish or French that allows for multiple *wh*- FRs. Although we do not have an explanation for this restriction, we would like to offer some speculations.

Functional WH_{FR} as defined in (70) require two major changes from their most likely lexical source—Functional WH_{INT} as defined in (71). First, the uniqueness requirement needs to be added to the denotation of Functional WH_{FR} . This is a semantic change that imposes further restrictions on the use of this kind of *wh*-word: the existence of one, and only one, relevant Skolem function in the given context. Second, Functional WH_{FR} have to be licensed in a non-interrogative clause—a syntactic change. Notice that the semantic change is different and independent from the semantic change from the denotation of Individual WH_{INT} as generalized quantifiers, as defined in (57), to the denotation of Individual WH_{FR} as set restrictors, as defined in (56). This semantic change does not impose further restrictions on the *wh*-words, but it actually “weakens” their meaning, by eliminating the assertion of existence. As a result of all this, we predict the existence of languages that allow for the semantic change from Individual WH_{INT} to Individual WH_{FR} without necessarily allowing the semantic change from Functional WH_{INT} to Functional WH_{FR} . In other words, we predict the existence of languages with single *wh*- FRs but no multiple *wh*- FRs. On the other hand, we do not predict the reverse pattern—languages with multiple *wh*- FRs but no single *wh*- FRs—since the first/highest

wh-phrase in a multiple *wh*- FR cannot be functional in multiple *wh*- FRs like the one in (58), as made it clear by its semantic derivation in (64). These predictions seem to be borne out, although our crosslinguistic evidence is still very limited and tentative. We hope that our work will help to fill in this gap by encouraging further investigation on multiple *wh*- FRs in Romanian and across languages.

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