

Indirect scope marking again: a case for generalized question formation*

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Received: 6 June 2005 / Accepted: 28 March 2006 /
Published online: 15 February 2007
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Abstract In this paper we describe and analyse a particular scope marking construction that has not received attention in the generative literature so far: scope marking into relative and noun-associate clauses, which we will refer to as *adjunct scope marking*. In this type of scope marking system, a *wh*-element in an embedded adjunct clause takes matrix scope when it occurs in a clause that syntactically and semantically modifies a *wh*-phrase in the matrix. These facts provide unambiguous evidence for the indirect dependency approach to *wh*-scope marking advocated by Dayal (1994, 2000) where the embedded question provides a semantic restriction for the matrix *wh*-element. Dayal's theory will be extended to provide a compositional analysis of these constructions. The extended approach argues for a generalization of the question-formation procedure to different clause types, as first advocated in Sternefeld (2001).

Keywords Scope marking · Question formation · Relative clauses · Noun-associate clauses · Indirect dependency · Hungarian

*We would hereby like to thank Rajesh Bhatt and Thomas Ede Zimmermann for detailed discussion and valuable insights about the issues presented here, as well as Marcel den Dikken, István Kenesei and Kálmán Dudás for comments on the present manuscript and on earlier versions of the material (Lipták, 2004a, b). A special note of thanks is due to the four anonymous reviewers of this article, whose spot-on comments helped us to make this piece of work a better (and a more readable) one. All mistakes and shortcomings are our own. The research of Anikó Lipták is supported by *NWO* (Netherlands Organization for Scientific Research). The research of Malte Zimmermann is supported by *DFG* (German Science Foundation) as part of the SFB 632 'Information Structure'.

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1 Scope marking: an introduction

Since the early 1980s, scope marking (also referred to as *partial wh-movement*) has been on the generative research agenda for many languages, including German (van Riemsdijk, 1983), Romani (McDaniel, 1989), Hindi (Mahajan, 1990), Hungarian (Horvath, 1995; Marác, 1990), Russian and Polish (Stepanov, 2000), and Pasamaquoddy (Bruening, 2006), just to mention the most well-studied cases. As an illustration, consider a run-of-the-mill example from German together with its corresponding answer:

- (1) **Was**₁ denkt sie [*wen*₁ Fritz *t*₁ eingeladen hat]?
 what think-3SG she whom Fritz invited has
 ‘Who does she think Fritz invited?’

- (1A) Anna. (answer to (1))

As (1) illustrates, scope marking involves a bi-clausal structure, with one *wh*-item per clause. The *wh*-item in the superordinate clause is referred to as the *scope marker* (represented in bold), and the one in the embedded clause as the *contentful wh*-phrase (in italics).

A question like (1) is at first sight equivalent to a question with long *wh*-extraction (as the translation also indicates), which might suggest that in the particular example in (1), the matrix *wh*-item (*was*) is a placeholder element, while the embedded *wh*-item (*wen*) is what the question is about.¹ Looking at scope marking constructions cross-linguistically, the following appear to be characteristic properties:

- (2) *Characteristic properties of scope marking constructions*

- (i) There is a scope marker *wh*-item in the superordinate clause.
- (ii) Any *wh*-item can occur in the embedded *wh*-position (*who, why, which concept, how many unripe coconuts*, etc).
- (iii) The answer given to a scope marking question specifies the embedded *wh*-item (see (1A)).
- (iv) Scope marking can occur with multiply embedded clauses. In case of such transitive applications of scope marking, the scope markers are usually spelled out in every intermediate clause, as illustrated in (3):

- (3) **Was**₁ denkt sie [**was**₁ Hans gesagt hat [*wen*₁ Fritz *t*₁ eingeladen hat]]?
 what think-3SG she what Hans said has whom Fritz invited has
 ‘Who does she think Hans said Fritz invited?’

- (v) The embedded clause hosting the contentful *wh*-item cannot be a selected question (matrix predicates like *ask* are not allowed), as in (4):

- (4) ***Was**₁ fragt sie [_{<+wh>} *wen*₁ Fritz *t*₁ eingeladen hat]?
 what ask-3SG she whom Fritz invited has
 (lit.) ‘Who does she ask Fritz invited?’

¹ More detailed investigation shows that the parallel with long extraction is not absolute (Herburger, 2000; Lahiri, 2002; Pafel, 2000). We return to this point in Sect. 3.2.

Properties (i)–(v) will become relevant in the next section, where we will use them as diagnostics to identify scope marking that involves adjunct clauses.²

Scope marking phenomena present a number of theoretically interesting puzzles. The most important one of these concerns the syntactic and interpretive relation between the scope marker and the embedded question word. Under the general assumption that only *wh*-items with matrix scope get answered,³ the fact that the embedded *wh*-item in scope marking constructions is filled in by the answer suggests that the embedded *wh*-item has matrix scope. Yet syntactically, it is found in an embedded position. Various solutions have been proposed to resolve this issue. The three main lines of approach involve arguing for (i) a syntactic link between the embedded *wh*-item and the matrix (expletive) *wh*-item; (ii) a syntactic link between the whole embedded clause and the matrix (expletive) *wh*-item; (iii) an underlying semantic mechanism that ensures matrix scope as following from the fact that the embedded *wh*-item is found in the *restriction* of the matrix *wh*-item.

Our paper has two purposes. The first is to argue for the viability of the last approach to scope marking constructions, (iii), put forward by Dayal (1994, 2000). The argument is based on Hungarian constructions involving scope marking into embedded adjunct clauses, more specifically into relative and noun-associate clauses. These clauses license embedded *wh*-items with matrix interpretation, similarly to well-studied cases of embedded argument clauses in scope marking languages, and they will therefore be argued to instantiate scope marking constructions as well. When subjected to the available analyses of scope marking constructions in the syntactic-semantic literature so far, the facts surrounding scope marking into adjunct clauses are only compatible with Dayal's (1994, 2000) semantic account and thus provide prime evidence for the validity of this approach. The second purpose of the paper is to provide a detailed analysis of adjunct scope marking by adopting and at the same time generalizing Dayal's analysis in two directions.

The organization of the paper is as follows. Section 2 lays out the empirical scene, concerning both well-known cases of standard scope marking, and adjunct scope marking. Hungarian will be used for illustrative purposes for both, with a short cross-linguistic outlook on languages that also exhibit adjunct scope marking of the Hungarian type. Section 3 reviews previous accounts of standard scope marking facts, and spells out to what extent they can or cannot account for the new data of adjunct scope

² Some other properties of scope marking constructions are subject to variation across languages. In German or Hungarian, for example, the scope marker *wh*-item is overtly fronted, while in Hindi, it can also stay in situ. Similarly, yes/no questions are fine in the embedded clause in Hindi, but not in German or Hungarian. Factive verbs can be matrix predicates in Hindi and to some extent in Hungarian, but never in German. We are not concerned with these differences in this paper. For the properties of Hungarian scope marking in particular, see É.Kiss (1987), Marác (1990), Horvath (1995, 1997, 1998, 2000) and Dudás (2002).

³ The assumption that only *wh*-items with matrix scope get answered is quite widely accepted. It needs to be noted that it may be too strong in light of questions like (ia) and the answer it triggers (ib):

- (i) a. Which linguist will be offended if we invite which professor?
- b. Professor Smith will be offended if we invite Professor Brown.

As Dayal (2002) shows, the embedded *wh*-item 'which professor' in (ia) does not have matrix scope, yet it gets answered in (ib). See Dayal (2002) for further details.

marking. Section 4 contains the core of the present paper: a compositional semantic analysis of adjunct scope marking constructions. The analysis rests on a generalized question formation procedure in which the embedded ‘question’ clause denotes a set of properties and is thus of the right semantic type to restrict the matrix *wh*-expression, which asks for a property of some sort. It is shown that the proposed analysis correctly accounts for both scope marking into relative clauses and into noun-associate clauses, at the same time excluding ungrammatical instances of scope marking on principled semantic grounds. The paper closes with a syntactic section (Sect. 5), explaining answer patterns and the observed cross-linguistic variation in the availability of adjunct scope marking.

2 The facts

2.1 Standard scope marking in Hungarian

Hungarian scope marking constructions fall into two basic types: *sequential* and *subordinated* scope marking constructions, following terminology in Dayal (2000). Sequential scope marking is the most frequently occurring type of scope marking among native speakers. According to our small-scale survey carried out in 2001/2002,⁴ about 25% of Hungarian speakers prefer these constructions to subordinated ones. Sequential scope marking involves two juxtaposed, prosodically and syntactically autonomous clauses whose order is freely reversible. For illustration, see (5a) and (5b). The answer to both (5a) and (5b) is provided in (5A). The answer minimally specifies the embedded *wh*-item.

- (5)a. **Mit** gondolsz? *Ki* nyeri a versenyt?
 what-ACC think-2SG who win-3SG the competition-ACC
- b. *Ki* nyeri a versenyt? **Mit** gondolsz?
 who win-3SG the competition-ACC what-ACC think-2SG
 ‘What do you think? Who will win the competition?’
- (5A) Péter.
 Péter.

The most frequent “matrix” predicates occurring in sequential scope marking are *gondol* ‘think’, *tud* ‘know’, *hall* ‘hear’, *mond* ‘say’, *szeretne* ‘would like’, *akar* ‘want’, *számít* ‘count on’, *ajánl* ‘recommend’, *javasol* ‘advise’, *jósol* ‘predict’.

Subordinated scope marking differs from sequential scope marking in that it clearly involves syntactic subordination. Subordination in Hungarian argumental clauses is indicated by the presence of the finite complementizer *hogy* ‘that’, which is available both in indicative and interrogative clauses. The presence of this complementizer indicates that the question is syntactically subordinated to the matrix predicate ‘think’ in (6a), i.e. we are dealing with subordinated scope marking. (6b) shows that the clauses are not reversible in this case, unlike in sequential scope marking:

⁴ The survey consisted of data collection via a pen and paper questionnaire by 17 speakers, linguists and non-linguists alike. Individual variation between these speakers is present to some extent in all types of scope marking constructions.

- (6)a. **Mit** szeretnél, hogy *hova* utazzunk a nyáron?
 what-ACC like-COND-2SG that where travel-SUBJ-3PL the summer-ON
 (lit.) ‘What would you like, where should we go in the summer?’
- b. (*Hogy) *hova* utazzunk a nyáron, **mit** szeretnél?
 that where travel-SUBJ-3PL the summer-ON what-ACC like-COND-2SG
- (6A) Olaszországba.
 Italy-INTO
 ‘To Italy.’

(6A) shows that, just like in the German case in (1), (6a) can be answered by giving a specification for the embedded *wh*-item (see (2iii)). Subordinated scope marking can occur in many environments. Both response-stance and non-stance predicates can take part in subordinated scope marking: *elfelejt* ‘forget’, *emlékezik* ‘remember’, *észrevesz* ‘notice’, *rájön* ‘find out’, *megbán* ‘regret’, *említ* ‘mention’, *megakadályoz* ‘block’, *(meg)jósol* ‘predict’, *kihirdet* ‘make public’. Similarly, predicates taking subject clauses such as *zavar* ‘bother’ and *kiderül* ‘turn out’, can embed a scope marking question.

An interesting property of Hungarian subordinated scope marking is that the embedded clause can take on a wider range of grammatical functions than in other scope marking languages discussed to date. As noted by Horváth (1995, 1997, 1998, 2000), the grammatical function of the Hungarian embedded clause in scope marking is not restricted to that of an object argument clause alone, but it also occurs with subject clauses, oblique argument clauses or adjunct clauses. The characteristic property shared by all these clauses is that they have a pronominal associate. In declarative contexts this is a suitably case-marked *az* ‘that’ demonstrative pronominal in the matrix clause. In scope marking, this pronominal becomes the *wh*-equivalent of *az*, namely *mi* ‘what’. The latter functions as the scope marker *wh*-item in the matrix clause.

To illustrate all these patterns, consider the following examples in (7)–(9). (7a) exemplifies an embedded subject clause without scope marking, (7b) with scope marking. In the latter, we find the nominal scope marker *mi* ‘what’ in the matrix clause:

- (7)a. Az zavarta Marit [hogy Péternek telefonáltam].
 that-NOM bothered-3SG Mari-ACC that Péter-DAT phoned-1SG
 ‘It bothered Mari that I phoned Péter.’
- b. **Mi** zavarta Marit [hogy *kinek* telefonáltál]?
 what-NOM bothered-3SG Mari-ACC that who-DAT phoned-2SG
 (lit.) ‘What bothered Mari that you phoned whom?’

The answer pattern to the scope marking question in (7b) is given in (7bA). Notice the sentential pronominal *az* ‘that’, which introduces the elliptical embedded clause, just like it introduces the full clause in (7a):

- (7bA) Az, hogy Péternek.
 that that Péter-DAT
 ‘That I phoned Péter.’

The characteristic intonation pattern of (7b) is shown in (7b’):

- (7b’) |⁵**Mi** zavarta Marit | hogy □ ⁵*kinek* telefonáltál?|⁵

⁵ Symbols are taken from Varga (2002): | = edge of intonational phrase; □ = pause; ⁵ = full fall major stress; ¹ = half-fall major stress.

(8a) presents an oblique argument clause marked by the ablative case marker *-tól* ‘from’. This case marker also appears on the matrix *wh*-item in the scope marking construction in (8b). (8bA) provides the characteristic answer pattern and (8b’) the characteristic intonation pattern of these clauses:

(8)a. Attól fél Mari, [hogy Péter lesz az igazgató].
that-FROM fear-3SG Mari that Péter be-FUT.3SG the director
‘Mari fears that Péter will be the director.’

b. **Mitől** fél Mari, [hogy *ki* lesz az igazgató]?
what-FROM fear-3SG Mari that who be-FUT.3SG the director
(lit.) ‘What does Mari fear that who will be the director?’

(8bA) Attól, hogy Péter.
that-FROM that Péter
‘(Mari fears that it will be) Péter.’

(8b’) | ‘**Mitől** fél Mari |□ hogy ‘*ki* lesz az igazgató?’ |

In (9a), we illustrate an adverbial *because*-clause, which is also linked to a matrix pronominal, *azért* ‘that-FOR’. (9b) shows the same with scope marking. The matrix pronominal is now the scope marker *miért* what-FOR ‘why’:

(9)a. Azért vagy dühös [mert Péterrel talákoztál].
that-FOR be-2SG angry because Péter-WITH met-2SG
‘You are angry because you met Péter.’

b. **Miért** vagy dühös [mert *kivel* talákoztál]?
what-FOR be-2SG angry because who-WITH met-2SG
(lit.) ‘Why are you angry because you met whom?’

(9bA) Azért, mert Péterrel.
that-FOR because Péter-WITH
‘Because I met Péter.’

(9b’) | ‘**Miért** vagy dühös |□ mert ‘*kivel* talákoztál?’ |

As can be seen from examples (6)–(9), Hungarian subordinated scope marking constructions do not always allow for a short answer that specifies a value for the embedded *wh*-item alone, as in the German example in (1). A short answer is readily available for the question in (6), but in all other cases (7)–(9), a short answer is impossible for most speakers. When a short answer does not suffice, a longer answer containing at least the case-marked pronominal associate, the embedding complementizer, and a value for the embedded *wh*-item is required. We will refer to this answer pattern as the long answer. The long answer is also perfectly grammatical as a reply to questions that allow for the short answer in principle. We will return to the relevance of this generalization in Sect. 5.1. For the present purposes it suffices to note that the requirement for long answers in (7)–(9) indicates that property (iii) among the general properties of scope marking listed under (2) has to be relaxed to (2iii’), at least for Hungarian:

- (2) iii'. The answer given to a scope marking question either specifies the embedded *wh*-item alone (short answer, (6A)), or it *contains* a specification for the embedded *wh*-item (long answer, (7bA), (8bA), (9bA)).

2.2 New cases of scope marking: adjunct clauses embedded under NP/DPs in Hungarian

The previous section dealt with the various types of Hungarian scope marking constructions that have been discussed in the previous literature. The present section shows that subordinate scope marking is a much more widespread phenomenon than previously thought: it occurs with relative and noun-associate clauses as well, which feature NP/DP scope markers. These constructions occur frequently in oral language use, and are completely productive. Their two types will be introduced in Sect. 2.2.1. and 2.2.2. in turn.

2.2.1 Scope marking with relative clauses

Relative clauses in Hungarian can be headed relatives or free relatives. The type of relative clause that is important for purposes of illustrating scope marking data are restrictive relatives headed either by a pronominal *az* 'that' as in (10) or by a full NP/DP as in (11). Note that in both of the following examples the relative clauses are extraposed, as is indicated by the co-indexation between the nominal head and the relative clause (this notation is retained in all Hungarian examples in this section):

- (10) [Az]_i megy át a vizsgán [aki 20 pontot szerez]_i.
that go-3SG PV the exam-ON REL-who 20 point-ACC score-3SG
'The person who scores 20 points passes the exam.'
- (11) [Az a diák]_i megy át a vizsgán [aki 20 pontot szerez]_i.
that the student go-3SG PV the exam-ON REL-who 20 point-ACC score-3SG
'The student who scores 20 points passes the exam.'

Scope marking into relative clauses involves two *wh*-phrases. One is found inside the relative clause, and the other is, or is contained inside, the nominal head of the relative clause. Consider the scope marking examples corresponding to (10) and (11):

- (12) [**Ki**]_i megy át a vizsgán [aki *hány pontot* szerez]_i?
who go-3SG PV the exam-ON REL-who how.many point-ACC score-3SG
(lit.) 'Who_i, who_i scores how many points, passes the exam?'
(intended) 'How many points does one have to score to pass the exam?'
- (13) [**Melyik diák**]_i megy át a vizsgán [aki *hány pontot* szerez]_i?
which student go-3SG PV the exam-ON REL-who how.many point-ACC score-3SG
(lit.) 'Which student_i, who_i scores how many points, passes the exam?'
(intended) 'How many points does a student have to score to pass the exam?'

At first sight, these sentences might give the impression that they denote two questions: the matrix question appears to range over individuals (*ki* 'who' or *melyik diák* 'which student') and the embedded question ranges over the number of points (*hány pontot* 'how many points-ACC'). A look at characteristic answer patterns, however,

reveals that this not the case. The answers to (12) and (13) can only make reference to the embedded question, i.e. the number of points that need to be scored for passing the exam:

- (12A) [Az]_i [aki 20 pontot szerez]_i.
that REL-who 20 point-ACC score-3SG
'Who(ever) scores 20.'
- (13A) [Az a diák]_i [aki 20 pontot szerez]_i.
that the student REL-who 20 point-ACC score-3SG
'Students that score 20 points.'

An answer that specifies the matrix *wh*-phrase next to the embedded one (12A'/13A') is infelicitous:

- (12A'/13A') #[Az okos diákok]_i [akik 20 pontot szereznek]_i.
that clever student REL-who 20 point-ACC score-3PL
'The clever students who score 20 points.'

This shows that (12) and (13) do not involve instances of a complex DP containing two semantically independent *wh*-items that would trigger a multiple question interpretation and require a single-pair or pair list answer. Compare the multiple question '*WHOSE analysis of WHICH CONSTRUCTION convinced you most?*' from English, which can be answered by '*DAYAL'S analysis of THE SCOPE MARKING construction*'. That such an answer pattern is not available for (12/13) indicates that the Hungarian construction does not denote a multiple question.

Concerning the intonational properties of (12) and (13), one of the possible prosodic realisations of this complex construction is identical to that of other instances of subordinated scope marking, as illustrated in (7b'/8b'/9b') above:

- (12'/13') |**Melyik diák/ki** megy át a vizsgán, |□ aki
which student/who go-3SG PV the exam-ON REL-who
`hány pontot szerez?`
how.many point-ACC score-3SG

The constructions in (12)–(13) comply with all criteria that were identified in (2) as defining properties of scope marking. There is a scope marker (*ki*, *melyik diák*; property (2i)); the choice of the embedded *wh*-phrase is free (property (2ii)); the question is answered by providing a specification for the embedded *wh*-item (property (2iii')), as was the case with other instances of subordinated scope marking illustrated in (7)–(9), i.e. (12A),(13A)). The relation can be employed transitively (property (2iv)), i.e. it can involve multiple layers of embedding:

- (14) [**Melyik diák**]_i megy át a vizsgán, [aki [*milyen könyvből*]_j
which student go-3SG PV the exam-ON REL-who what book-FROM
tanul [amit *ki* írt]_j];?
study-3SG REL-what-ACC who wrote-3SG
(lit.) 'Which student_i, who_i studies from what kind of book_j, that_j who
wrote, passes the exam?'

The answer in this case, just as in the cases discussed above, needs to contain a specification of the value for the *wh*-phrase in the most embedded clause.

- (14A) [Az a diák]_i, [aki [abból]_j], [amit Chomsky írt]_j]_i.
 that the student REL-who that-FROM REL-what-ACC Chomsky wrote-3SG
 ‘The student that studies from the one that Chomsky wrote.’

The ban on selected interrogative subclauses (property (2v)) is satisfied vacuously, since relative clauses are never selected to be interrogative. In fact, they can never contain a *wh*-item in any construction except in the construction under investigation here. If the matrix clause was not a *wh*-interrogative clause, the relative clause would fail to license a question:

- (15) *[Az]_i megy át a vizsgán [aki hány pontot szerez]_i?
 that go-3SG PV the exam-ON REL-who how.many point-ACC score-3SG
 (intended) ‘Who(ever) scores how many points, passes the exam.’

Turning to the matrix interrogative clause now, it is subject to two restrictions. One is that the matrix *wh*-item in it has to correspond semantically to the relativized element in the relative clause. A mismatch between the two is not allowed, as shown in (16).

- (16) *[Hány diák]_i megy át a vizsgán [aki hány pontot szerez]_i?
 how.many student go-3SG PV the exam-ON REL-who how.many point-ACC get-3SG
 (intended) ‘How many students_i, who_i score how many points, pass the exam?’

(16) shows that although the matrix and the embedded *wh*-phrases are identical (*hány* ‘how many’), the sentence fails to be interpretable. This is because the matrix *wh*-item asks for a numerical specification of a group of students, but the relative clause ranges over properties of individuals due to the relative pronoun *aki* ‘who’. We will return to the ill-formedness of (16) in Sect. 4.1, where we show that it follows for semantic reasons: structures in which the matrix *wh*-item does not agree with the relativized element in terms of semantic type (individual, degree, ...) are uninterpretable because the embedded relative clause cannot be construed as a restricting modifier of the matrix *wh*-item.

The second restriction concerns the association of the relative clause with complex NPs that contain a *wh*-NP, e.g. the possessor *wh*-NP *kinek* ‘whose’. In these cases, the relative clause must associate with the *wh*-NP itself, and not with the larger NP containing it, as shown in (17):

- (17) **Kinek_i a diákja** megy át a vizsgán,
 who-DAT the student-POSS.3SG go-3SG PV the exam-ON
 [aki_i hány pontot szerez]_i?
 REL-who how.many point-ACC get-3SG
 (lit.) ‘Whose_i student_j, who_{i/*j} scores how many points, passes the exam?’
 (intended) ‘How many points does a teacher have to score such that his student passes the exam?’
 not: *‘How many points does a student of who have to score to pass the exam?’

In (17) the relative clause must associate with the *wh*-expression *kinek* ‘who-DAT’, and not with the head noun of the complex NP *diákja* ‘student-poss.3sg’, even though the resulting meaning is pragmatically unlikely. The generalization is that an individual-denoting relative clause in Hungarian scope marking has to be construed as

a modifier of the *smallest element with question interpretation* in the semantics.⁶ The question *Whose student passes the exam?* is a question about teachers and not about students, i.e. the question variable ranges over teachers (corresponding to *whose*) and not over students (corresponding to the whole DP phrase *whose student*). In other words, it is the possessor *wh*-element *whose* that triggers the question interpretation, and not the whole DP *whose student*. It is for this reason that the relative clause is construed as the modifier of the possessor and not the whole DP, giving us the pragmatically unlikely reading. In Sect. 4.1, we will show that this restriction follows for semantic reasons too: questions such as (17), where a possessive *wh*-item is contained in a larger NP, are nonetheless questions about the possessing individual, and not about the possessum denoted by the head of the complex NP, nor about the entire NP.

Concerning the syntactic properties of scope marking into relative clauses, it must be noted that the *wh*-item in the relative clause is realised *ex situ*: it appears in the preverbal focus position, which is the position *wh*-phrases occupy in Hungarian. This is indicated by the left-peripheral, preverbal placement of the *wh*-phrase as well as the position of the preverbal particle when the verb has one. In *wh*-constructions, the particle and the verb appear in an inverted order due to the movement of the verbal head accompanying *wh*-movement of the question word (É.Kiss, 1987). Consider the behavior of the particle verb *éler* ‘score’ in the embedded clause of a scope marking construction:

- (18) [**Ki**]_i megy át a vizsgán [aki *hány pontot* ér el]_i?
 who go-3SG PV the exam-ON REL-who how.many point-ACC reach-3SG PV
 (lit.) ‘Who_i, who_i scores how many points, passes the exam?’
 (intended) ‘How many points does one have to score to pass the exam?’

The fact that the preverb has to appear split off from its hosting verb is indicative of *hány pontot* ‘how.many point-ACC’ being in the *ex-situ* focus position.

The syntactic position of the relative clause within the matrix clause in the examples above is not difficult to determine, either. The relative clauses in scope marking constructions have the syntax of extraposed relatives.⁷ As can be seen in all the

⁶ A comparable phenomenon is found with the so-called quantifying particles *alles* and *so* in German (Reis, 1992). When combined with complex NPs containing a possessor *wh*-item, these quantifying particles directly apply to the denotation of the *wh*-element, not to the complex NP as a whole. As a result, the invariant quantifying particle (QP) *alles* ‘all’ in (ia) introduces exhaustive quantification over authors, not over books. Compare this to (ib) with the inflected floating quantifier (FQ) *alle* ‘all’, which takes the entire NP *wessen Bücher* ‘whose books’ as antecedent, and consequently quantifies exhaustively over books by one and the same author. The examples are from Reis (1992, p 472, (29), (29')).

- (i) a. [**Wessen**₁ Bücher] wurden *alles*₁ von Reich-Ranicki schlecht rezensiert?
 whose books were all (QP) by R-R negatively reviewed
 ‘What is the exhaustive list of authors x, such that x’s books were negatively reviewed by R-R?’
 (ii) b. [**Wessen** Bücher]₁ wurden *alle*₁ von Reich-Ranicki schlecht rezensiert?
 whose books were all(FQ) by R-R negatively reviewed
 ‘Whose books were all negatively reviewed by R-R?’

Data such as (ia) indicate that Hungarian is not the only language in which the *wh*-part of a complex NP can be semantically qualified by an associated element, be it relative clause or quantifying particle.

⁷ Some, but not all, speakers tolerate scope marking also when the relative clause appears adjacent to its nominal head in overt syntax:

- (i) %**Ki** [aki *hány pontot* szerez] megy át a vizsgán?
 who REL-who how.many point-ACC score-3SG go-3SG PV the exam-ON
 (lit.) ‘Who, who scores how many points, passes the exam?’

examples above, the relative clause in scope marking constructions is found in the rightmost position of the sentence. This position is reached by an extraposition step from a clause-internal position. Evidence for extraposition comes from binding facts that indicate that the relative clause reconstructs to a base position next to the matrix nominal.⁸ Consider the following two examples which are constructed such that they differ only in the function of the matrix *wh*-item. (19) contains a subject *wh*-item, and (20) an object *wh*-phrase:

(19) **Ki₁** ismert fel (ő_i), [akivel *mikor* találkozott Mari_i]₁?
 who recognized PV pron.3SG-ACC REL-who-with when met Mari
 lit. ‘Who recognized her_i, the person Mari_i met when?’

(19A) Az, akivel kedden találkozott Mari.
 that REL-who-with Tuesday-ON met Mari
 ‘(The person who recognized Mari was) the one who Mari met on Tuesday.’

(20) ?***Kit₁** ismert fel (ő_i) [akivel *mikor* találkozott Mari_i]₁?
 who-ACC recognized PV pron.3SG REL-who-with when met Mari
 lit. ‘Whom did she_i recognize, the person Mari_i met when?’

(20A) Azt, akivel kedden találkozott Mari.
 that-ACC REL-who-with Tuesday-ON met Mari
 ‘(The person whom Mari recognized was) the one who Mari met on Tuesday.’

In (20), the underlined R-expression *Mari* in the object relative clause cannot be co-indexed with the subject pronoun *ő* ‘she’ in the matrix clause. This ban on coreference can be derived as a BT-C violation if we assume that the extraposed relative clause originates from (and reconstructs to) a position lower than the subject. We take this position to be adjacent to the object argument. In (19), on the other hand, coreference between the matrix object pronoun *ő* ‘her’ and the subject of the extraposed relative *Mari* is possible, since in this case the relative originates from a position higher than the matrix object, namely from subject position. This provides unambiguous evidence to the effect that the relative clause is base-generated together with the matrix *wh*-expression: together with the subject of the matrix clause in (19), and together with the object in (20). As for its precise attachment site, we believe it to attach to the matrix *wh*-NP as a whole. We will come back to this issue in Sect. 5.3 below.

To summarize, this section has established that the constructions in (12) and (13) instantiate a special case of scope marking, where scope marking obtains with embedded adjunct clauses. It was shown that the semantic and intonational properties of these clauses are exactly parallel to those found with well-established cases of scope marking into embedded argument clauses. The scope marker is (found within) the head of relativization, and the embedded *wh*-item is contained inside the relative clause. The answer necessarily has to specify a value for the embedded *wh*-variable.

2.2.2 Scope marking with noun-associate clauses

In Hungarian, the behavior of relative clauses in scope marking is fully paralleled by adjunct noun-associate clauses. As Kenesei (1994) shows, Hungarian has two kinds

⁸ The grammaticality of (19)–(20) is based on the judgment of five speakers. For two of them, the contrast between (19) and (20) is not very sharp.

of noun-embedded clauses: argumental and adjunct ones, which clearly differ in their syntax.⁹ Scope marking into adjunct noun-associate clauses is grammatical for all speakers of Hungarian, while embedded argument clauses show some variation. Many informants found them just as good as embedded adjunct clauses; several, however, found them degraded or ungrammatical. Therefore, in the following we concentrate on adjunct noun-associate clauses only. A typical case of adjunct noun-associate case is illustrated in (21). Modified nominal and the modifying clause are coindexed:

- (21) Péter [azt az üzenetet]_i kapta [hogy a rendőrségre kell mennie]_i
 Péter that the message-ACC got-3SG that the police-TO need GO-INF-3SG
 ‘Péter got a message that he has to go to the police force.’

When the modified nominal is a *wh*-phrase and the noun-associate clause contains a question, we arrive at a scope marking construction:

- (22) [**Milyen üzenetet**]_i kapott Péter [hogy *hova* kell mennie]_i?
 what message-ACC got-3SG Péter that where need go-INF-3SG
 (lit.) ‘What message, that he has to go where, did Péter get?’

- (22A) Azt az üzenetet_i [hogy a rendőrségre kell mennie]_i
 that the message-ACC that the police-TO need go-INF-3SG
 ‘The message that he has to go to the police force.’

As far as intonation is concerned, these sentences are most frequently pronounced with the same intonation contour as argumental and relative clauses above:

- (22') |'Milyen üzenetet kapott Péter |□ hogy ^hhova kell mennie? |

⁹ The most obvious difference concerns case-marking. Argument clauses, which are selected by a derived event/process nominal, need case. Given that they cannot bear case (Stowell, 1981), they have to be linked to a case-marked clausal expletive *annak* ‘that-DAT’:

- (i) annak a belátása [hogy tévedtünk] argumental noun-associate clause
 that-DAT the realization-POSS.3SG that erred-1PL
 ‘the realization that we erred’

In nominals, the only position for such an expletive is Spec,DP, i.e. the dative case position (Szabolcsi, 1994):

- (ii) [DP *annak*_i [D₀ a [NP belátása [CP *hogy* ...]_i]]]

Due to this structural requirement, nouns with an argumental CP cannot have other possessors:

- (iii) *Péternek a belátása [hogy tévedtünk]
 Péter-DAT the realization-POSS.3SG that erred-1PL
 ‘Péter’s realization that we erred’

Adjunct noun-embedded clauses, on the other hand, do not have to comply with such restrictions, as they do not need case. This is due to the fact that the embedded CP in this case is not a selected argument, but an adjunct that is associated with the lexical-semantic frame of the (simplex or result) nominal. These clauses can co-occur in NP/DPs with overt possessors (iv):

- (iv) a. az az üzenet [hogy menjünk haza] adjunct noun-associate clause
 that the message that go-IMP-1PL home
 ‘the message, that we should go home’
 b. [DP az [NP az üzenet [CP *hogy* ...]]]
 c. Péternek az az üzenete [hogy menjünk haza]
 Péter-DAT that the message-POSS.3SG that go-IMP-1PL home
 ‘Péter’s message, that we should go home’

(22) also complies with all criteria for scope marking listed in (2) above: (i) there is a scope marker (*milyen üzenetet* ‘what message-ACC’; (ii) the choice of the embedded *wh*-phrase is free; (iii) the required answer specifies the embedded *wh*-phrase, using the long answer pattern (cf. 2iii’). Scope marking in these cases can be applied transitively (property iv), as illustrated in (23): the nominal with which the embedded clause associates has to be a ‘what kind’ *wh*-phrase in each clause.

(23) [**Milyen üzenetet**]_i kaptál, [hogy [**melyik állítást**]_j] ellenőrizzük
 what message-ACC got-2SG that which claim-ACC check-IMP-1PL
 [hogy *melyik gyár nyereséges*]_j]_i?
 that which factory profitable
 (lit.) ‘What message, that we should check which claim, that which factory is profitable, did you get?’

(23A) [Azt az üzenetet]_i, [hogy [azt az állítást]_j], [hogy az autógyár]_j]_i.
 that-ACC the message-ACC that that-ACC the claim-ACC that the car factory
 ‘The message that we need to check the claim that it is the car factory which is.’

The ban on selected <+wh>-clauses (property v) is complied with as well. If the embedding noun requires an associated question, like the noun *kérdés* ‘question’, scope marking is unavailable:

(24) *[**Milyen kérdéssel**]_i foglalkoztak_[CP+wh] hogy *mire* kell a pénz]_i?
 what question-WITH dealt-3PL that what-ON need the money
 (intended) ‘What question, that they need the money for what, did they discuss?’

It appears then that adjunct noun-associate clauses, just like relative clauses, are capable of hosting a *wh*-phrase with matrix interpretation as long as the nominal they are associated with is a ‘what kind’ *wh*-expression. For all intents and purposes, these data exemplify the same kind of construction as the relative clause data in the previous section: scope marking.

2.3 The cross-linguistic scene of adjunct scope marking

The previous section has illustrated standard cases of scope marking as well as the new adjunct scope marking facts that form the central concern of this paper. Before turning to the analysis of the latter, in this paragraph we illustrate adjunct scope marking from other languages as well, to show that this phenomenon is not restricted to Hungarian.

Looking at a sample of 17 languages (Moroccan Arabic, Bavarian, Mandarin Chinese, Danish, Dutch, English, Finnish, Flemish, Frisian, German, Greek, Hindi, Italian, Japanese, Serbian, Slovenian, Spanish, languages with and without scope marking), we have found that adjunct-type scope marking constructions parallel to the Hungarian ones occur in Frisian and in Slovenian.¹⁰ The following two examples illustrate noun-associate clauses in Frisian (25) and Slovenian (26) respectively:

(25) **Wat** boadskip hast krigen, *wêr*’tst hinne moatst?
 what message have-2SG got where-that-2SG to must
 (lit.) ‘What message, where do you have to appear, did you get?’

¹⁰ The Frisian data are based on the judgments of Siebren Dijk, Willem Visser and Henk Wolf; the Slovenian ones on the judgments of Franc Marušič, Tatjana Marvin and Rok Žaucer.

- (26) **Kakšno sporočilo** si dobil, *kam* da moraš iti jutri?
 what message AUX get-PTC where that must go tomorrow
 (lit.) ‘What message, where do you have to go tomorrow, did you get?’

Scope marking with relative clauses is illustrated in the following examples, (27) from Frisian and (28) from Slovenian.¹¹ These examples also show that while the examples above with noun-associate clauses involve overt *wh*-movement to Spec,CP, the *wh*-expressions in relative clauses stay in situ in these languages:

- (27) ?**Hokker student** komt dertroch, dy't *hoefolle punten* hat?
 which student come-3SG through REL-that how.many points have-3SG
 (lit.) ‘Which student, who scores how many points, passes the exam?’
- (28) **Koji student** prolazi ispit, koji dobije *koliko poena*?
 which student pass-3SG exam which get-3SG how.many points?
 (lit.) ‘Which student, who scores how many points, passes the exam?’

Both Frisian and Slovenian have ordinary subordinate scope marking constructions (see Hiemstra, 1986 for Frisian, and Golden, 1995 for Slovenian). It is not the case, however, that a language with ordinary subordinate scope marking always has adjunct scope marking, too. Consider the following examples from German (see (29)–(30)) and Hindi (see (31)–(32)): adjunct scope marking is not allowed in either of them:^{12,13}

¹¹ McDaniel (1989) mentions that scope marking occurs in Romani relative clauses as well. The construction she refers to, however, is different from the one we are dealing with in this paper. The Romani construction, illustrated in (i), is parallel to cases of long relativization, and assigns wide scope to an embedded relative pronoun: Although the relative pronoun *kas* ‘whom’ in (i) is located in the most deeply embedded clause, it takes scope over the verb *mislinav* ‘think’ in the presence of the scope marking relative pronoun *so* ‘what’.

- (i) Ake o čhavo [RC *so* mislinav [CP *kas* i Arifa dikhía]].
 here the boy what think-1SG whom the Arifa saw
 ‘Here’s the boy whom I think that Arifa saw.’

Our adjunct scope marking differs from the Romani facts as in (i) in two important ways. One is that while in Romani both scope marker and the second *wh*-phrase are found *inside* a relative clause, in our examples the scope marker is *outside* the relative clause. The other is that our examples involve scope marking for and by means of question *wh*-phrases, and not relative pronouns.

¹² While adjunct scope marking is clearly ungrammatical in Hindi, German marginally allows for noun-associate adjunct scope marking constructions. Consider (i), which is quite acceptable for some speakers:

- (i) ?Was ist dein Rat, wen wir um Hilfe bitten sollten?
 what is your advice who we for help ask should
 (lit.) ‘What is your advice, whom should we ask for help?’

Notice also that sometimes *wh*-copying can increase the acceptability of noun-associate clauses (see Höhle, 2000; Reis, 2000):

- (ii) Wen hat Peter das Gefühl, wen man fragen könnte?
 who-ACC has Peter the feeling who-ACC one ask could
 (lit.) ‘Who does Peter feel that one could ask?’

At this point, it is unclear to us why (i) should be more acceptable than (30), or why (ii) should be more acceptable than (i).

¹³ The German examples are due to Anne Breitbarth, Agnes Jäger, Peter Gallmann, Kleantes Grohmann, Martin Salzmann, Chris Reingtes, Kristina Riedel, and Kathrin Würth; the Hindi ones to Rajesh Bhatt and Veneeta Dayal.

- (29) ***Welcher Student** besteht die Prüfung, der *wieviele Punkte* erzielt?
 which student pass-3SG the exam who how.many points achieve-3SG
 (lit.) ‘Which student, who scores how many points, passes the exam?’
- (30) ***Was für eine Nachricht** hast du bekommen, *wo* du erscheinen
 what for a message have-2SG you got where you appear-INF
 musst?
 must-2SG
 (lit.) ‘What message, where do you have to appear, did you get?’
- (31) ***kaun-saa chaatra** [jo kitne *points haasil* kar-egaa] prize *jiit-egaa*?
 which student REL how.many points achieve do-FUT win-FUT
 (lit.) ‘Which student, who scores how many points, will win the prize?’
- (32) ***unhone** kaun-sii afvaah failaa dii [ki *kaun garbhvati* hai]?
 they which rumour spread that who pregnant is
 (lit.) ‘Which rumour, who is pregnant, did they spread?’

We will come back to the cross-linguistic availability of scope marking in Sects. 5.2 and 5.3 below.

To sum up, this section provided an empirical overview of all scope marking data in Hungarian. We started out with well-studied cases of scope marking, discussed extensively in earlier literature. These involved argumental clauses subordinated to a matrix predicate, as well as adjunct clauses like adverbial clauses of reason. We then proceeded to show that next to these, scope marking also exists with embedded clauses that are subordinated to a nominal: in ordinary instances of relativization and in noun-associate clauses that spell out the content of a noun. Both types of structures are productive and frequently occur in oral language use. In the rest of the paper, we will provide an analysis for these.

3 Previous analyses of scope marking

In order to see whether existing accounts of scope marking can account for cases of adjunct scope marking with relative and noun-associate clauses, let us take stock of the various approaches that have been proposed in the literature so far.

Scope marking constructions have been analysed in terms of two basic kinds of approaches: the *direct* and the *indirect* dependency approach. The two approaches differ in the kind of relationship they ascribe to the embedded *wh*-item and the matrix scope marker. In the so-called *direct dependency approach*, the embedded *wh*-item directly replaces the scope marker at LF, thereby gaining matrix scope. The other approach, the *indirect dependency approach*, argues that the link between the scope marker and the embedded *wh*-expression is indirect, and is mediated by a *syntactic* or a *semantic* link between the scope marker and the embedded clause. Depending on this difference, the indirect dependency approaches can be divided into *syntactic* indirect dependency and *semantic* indirect dependency approaches.

In this section, we briefly sketch each approach and examine whether it suits the newly discovered cases of adjunct scope marking introduced in the previous section. As it turns out, the direct dependency approach and the indirect syntactic dependency

approach cannot account for these. Only the *semantic indirect* dependency account is a feasible approach to these data.

3.1 Direct dependency approach

According to advocates of the direct dependency approach (van Riemsdijk, 1983; McDaniel, 1989; Cheng, 2000, among others), the embedded *wh*-item is directly linked to the matrix *wh*-item in the syntax and semantics, via LF-expletive replacement of the sort well-known from *there*-expletive constructions (Chomsky, 1986). The scope marker is an expletive placeholder for the embedded contentful *wh*-item in the main clause:

- (33) S-str [_{CP+wh} **scope marker** [_{CP-wh} *wh*-phrase_i [_{IP}...t_i...]]]
 LF [_{CP+wh} *wh*-phrase_i [_{CP-wh} t_i [_{IP}...t_i...]]]

That this approach is inadequate for adjunct scope marking can be seen from two things. One has to do with the nature of the scope marker, and the other with locality properties of the embedded clause.

The first problem that the direct dependency approach runs into is that the scope markers in relative and noun-associate constructions are by no means expletive elements. Instead, they are full-blown argument NP/DPs, with a lexical meaning of their own. Therefore, no analysis in terms of expletive replacement can account for these data.

The second problem for the direct dependency approach is that relative clauses and noun-associate clauses constitute islands for extraction. For this reason, movement of the embedded *wh*-phrase to the matrix clause incurs an island violation, namely a violation of the complex noun phrase constraint:

- (34) ***Hány pontot**_i megy át a vizsgán [aki t_i szerez]?
 how.many points-ACC go-3SG PV the exam-ON REL-who score-3SG
 (intended) ‘How many points does one have to score to pass the exam?’

For this reason, an analysis in terms of long extraction does not account for data with adjunct scope marking. Notice furthermore that the direct dependency approach is not only incompatible with adjunct scope marking into relative and noun-associate clauses, but also with scope marking into subject clauses and adverbial clauses, as illustrated in Sect. 2.1 above. Unlike long extraction, scope marking is generally possible across subject and adjunct islands (in other words, it does not show CED-effects, cf. Huang, 1982), as was pointed out by Horvath (1995). This precludes an analysis in terms of long LF-extraction for these constructions as well.

3.2 The syntactic indirect dependency approach

In contrast to the direct dependency approach, indirect dependency approaches posit an indirect relationship between the two *wh*-items: it is argued that the scope marker is directly linked not to the embedded *wh*-item, but to the entire embedded clause. According to this approach, the embedded *wh*-phrase does not gain matrix scope by raising into the matrix clause at any point in the derivation: scope marking constructions are not covert long movement constructions. The latter claim gains factual support from properties that distinguish scope marking and overt long extraction cases. As it turns out, scope marking constructions differ semantically from constructions in which the *wh*-item has undergone long overt extraction.

First, scope marking constructions and instances of long extraction do not share the same presuppositions (Herburger, 1994). (35a), an instance of scope marking, presupposes that the event in the embedded question actually took place. With long extraction, such a factive presupposition is absent (35b).

- (35)a. **Was** glaubt Georg, *wen* Rosa geküsst hat?
 what believes George whom Rosa kissed has
 (lit.) ‘What does George believe whom Rosa kissed?’ (presupposes: Rosa kissed somebody)
- b. **Wen** glaubt Georg, dass Rosa geküsst hat?
 whom believes George that Rosa kissed has
 ‘Who does George believe that Rosa kissed?’

Second, the two constructions differ concerning the scopal relations between a *wh*-item in the embedded interrogative and a quantifier in the matrix clause (Pafel, 2000)¹⁴: The scope marking construction in (36a) only allows for wide scope of the universal quantifier *jeder* ‘everyone’ in the matrix over the embedded *wh*-item *wo* ‘where’. In contrast, (36b) with long extraction allows for scopal ambiguity between the two elements.

- (36)a. **Was** glaubt jeder, *wo* die besten Weine wachsen?
 what believes everyone where the best wines grow
 ‘For every x, where does x think that the best wines grow?’
 (A: pair-list) $\forall \gg wh$
- b. **Wo** glaubt jeder, dass die besten Weine wachsen?
 where believes everyone that the best wines grow
 i. ‘Where does everyone think that the best wines grow?’
 (A: ‘In France’) $wh \gg \forall$
 ii. ‘For every x, where does x think that the best wines grow?’
 (A: pair-list) $\forall \gg wh$

The differences between the minimal pairs in (35) and (36) suggest that the embedded *wh*-item does not directly replace the scope marker at LF (by means of covert long extraction). Hence, there is no direct link between scope marker and embedded *wh*-item. As a result, proponents of the indirect dependency approach try to derive the observable semantic effects by postulating a link between the scope marker and the entire embedded *wh*-clause.

There are two lines of thinking about what provides the link between the scope marker and the embedded clause: in some analyses the link is syntactic, in others it is semantic in nature. In this section we briefly review the syntactic accounts. Apart from Mahajan (1990) and Fanselow and Mahajan (2000), the extant analysis of Hungarian,

¹⁴ Pafel (2000) does not use this difference as an argument *against* the direct dependency approach, as we do here. He argues for the direct dependency approach and uses these facts to exemplify the distinct nature of LF-movement that takes place in scope marking from the overt movement that takes place in long extraction cases. According to Pafel, the former is subject to intervention effects, but the latter is not, a claim also found in Beck (1996). The reader interested in this issue should consult Dayal (2002), which shows that intervention effects can be accounted for by the semantic indirect dependency approach as well, and Lahiri (2002), which shows that in Hindi (36a) is similarly ambiguous to (36b).

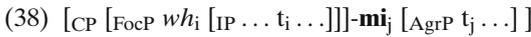
Horvath (1995, 1997, 1998, 2000), belongs to the syntactic type of approach as well. In the following short exposition, we are only concerned with Horvath’s analysis.

On Horvath’s analysis, the scope marker is a (*wh*-)pronominal anticipatory pronoun, generated in an A-position (AgrP in Horvath, 1997). It is associated with the embedded CP proposition and carries the case which is assigned to the CP, but which the CP cannot carry due to the case resistance principle (Stowell, 1981). Nonetheless, the subordinated CP needs to be associated with its case before the end of the derivation (to satisfy Full Interpretation) in scope marking constructions, just as with other instances of clausal subordination. To this end, the CP has to adjoin to the sentential pronominal at LF:



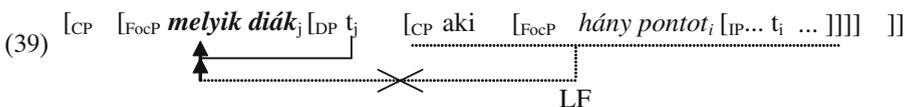
The LF-movement step of clausal pied-piping is further restricted to cases where the *wh*-features of the embedded CP and the sentential expletive *match*.¹⁵

The right interpretation of scope marking constructions (i.e. a meaning similar to long *wh*-questions) is due to the LF movement step by which the embedded clause adjoins to the matrix expletive, as a result of which the whole embedded CP, and therefore the embedded *wh*-item, acquires matrix scope:



Although other syntactic indirect approaches are slightly different in their technical implementation (for example, by referring to an expletive *replacement* mechanism), the treatment of the matrix *wh*-element as a sentential expletive is inherent and crucial to all of them.

This is also the very reason why these accounts do not suit the newly presented data of adjunct scope marking. Just like direct dependency approaches, these accounts crucially rely on the assumption that the scope marker is an expletive. While this is certainly an a priori possible stand for the analysis of embedded argumental clauses that combine with a uniform pronoun *mi* ‘what’, it is not an option for relative and noun-associate clauses for the simple fact that these are *never* associated with expletive elements. The scope markers in these constructions are not (*wh*-)expletives, but full-blown argument NP/DPs with a lexical meaning of their own. Therefore, an analysis in terms of expletive replacement by the embedded CP at LF is not tenable regardless of whether one subscribes to an expletive replacement account or one in which the embedded CP adjoins to the matrix pronominal:



¹⁵ The scope marker is a <+wh> item, which then requires the embedded clause to have a matching <+wh> feature as well. This <+wh> feature will have to come from the embedded *wh*-item (through percolation), since in scope marking constructions the embedded clause cannot be a question (see (4) above), and consequently it does not possess an inherent <+wh>-feature. After <+wh>-feature transmission from the *wh*-item onto the embedded CP, the *wh*-item loses its *wh*-hood and its operator nature. As a discharged *wh*-item, it does not cause any violation of the *Wh*-criterion.

In the next section we turn to the only account that can handle the newly observed cases of adjunct scope marking: Dayal's (1994, 2000) semantic indirect dependency account.

3.3 The semantic indirect dependency approach (Dayal, 1994, 2000)

The semantic type of indirect dependency approach (Dayal, 1994, 2000), argues for an underlying *semantic* link between the scope marker and the embedded clause.¹⁶ The scope marker on this account is a standard argumental *wh*-phrase, which quantifies over propositions. The embedded clause, a full-blown question, restricts the domain of propositions that the scope marker ranges over.

Looking at the semantics in more detail, Dayal follows Hamblin (1973) in taking questions to denote the set of possible answers to them. *Wh*-expressions are existential quantifiers whose restriction is either implicit or provided by some overt restriction. The matrix propositional *wh*-expression can only be restricted by a question (due to its semantic type). For illustration, consider (40), repeated from (8b) above:

- (40) **Mitől** fél Mari, hogy *ki* lesz az igazgató?
 what-FROM fear-3SG Mari that who be-FUT.3SG the director
 (lit.) 'What does Mari fear that who will be the director?'

The matrix question in (40) has the following logical representation: $\lambda p \exists q [p \text{ a proposition} \ \& \ p = \hat{\text{fear}}(\text{Mari}, q)]$. The propositional *wh*-expression *mi* 'what' in *mitől* 'what-FROM' denotes an existential quantifier over propositions *q*. Dayal assumes that quantification is always restricted in natural languages, thus also with quantification over propositions. The overt or covert restrictor of the matrix propositional quantifier enters the derivation in form of a variable *T* when the meaning of the matrix question is constructed: $\lambda p \exists q [T(q) \ \& \ p = \hat{\text{fear}}(\text{Mari}, q)]$. *T* stands for a set of propositions. The embedded interrogative clause denotes just such a set of propositions: $\lambda p \exists x [p = \hat{\text{will-be-director}}(x)]$. Since it is of the right semantic type, this denotation can serve as the restrictor for the matrix question. Technically, this is done by λ -abstracting over the restrictor variable *T* in the denotation of the matrix question, and then filling in the denotation of the embedded clause for *T*. The end result is: $\lambda p \exists q [\exists x [q = \hat{\text{will-be-director}}(x)] \ \& \ p = \hat{\text{fear}}(\text{Mari}, q)]$ (see Dayal, 2000 and below for details). In an informal paraphrase, (40) denotes the following question: 'what proposition *p*, such that *p* is a possible answer to 'who will be the director?' is such that Mari fears *p*?' Possible answers to the embedded question 'who will be the director' are propositions like *Péter will be the director; Anna will be the director; Hugo will be the director*. From this set of propositions, (40) asks for the one that Mari fears.

Of the three analyses sketched above, a Dayal-style semantic analysis is the only one that is able to account for adjunct scope marking in Hungarian in principle — given two modifications to be introduced in the next section. As we have seen, scope marking in this language does not only occur with standard sentential subordination,

¹⁶ This allows for the option that there is a syntactic link between them as well. The syntactic relation between the matrix *wh*-item and the embedded clause can range from a loose juxtaposition to a real syntactic dependency. Crucial to this analysis is the treatment of sentential pronominals as full arguments, which follows the spirit of a number of syntactic proposals (Bennis, 1986; É.Kiss, 1987; Moro, 1997; Müller, 1995; Rosenbaum, 1967; Stepanov, 2000; Torrego & Uriagereka, 1989), and the analysis of the embedded clause as a syntactic adjunct, a semantic *restrictor* over the matrix argument nominal.

but also with other types of embedding, where an expletive–associate relationship is completely out of the question. After all, relative and noun-associate clauses do not combine with expletives, but with lexical NPs/DPs. Furthermore, their semantic role is exactly the one described by Dayal: they provide a restriction for the NP/DP they modify.

4 The analysis of adjunct scope marking constructions: extending Dayal’s approach

As the previous section has shown, Dayal’s account can neatly accommodate the adjunct scope marking data due to its semantic approach to standard scope marking, which identifies the scope marker-embedded clause relationship as that between a restricted item and a restrictor.

The full proposal, however, does not carry over directly to the adjunct scope marking data. To cover these data as well we need to extend Dayal’s proposal in two directions. First, we propose that matrix *wh*-scope markers can range over different kinds of semantic objects: they can range over propositions, as in standard cases of indirect scope marking discussed by Dayal, or sets of propositions (with *why*-phrases modified by *because*-clauses; see Sternefeld, 2001, 2002), but in addition they can also range over all kinds of properties, such as for instance individual properties (with *who/which*-phrases), degree properties (with *how many*-phrases), and manner properties (with *how*-phrases). As a second extension of Dayal’s analysis, we propose that the embedded clauses that contain the second *wh*-element denote different objects depending on their syntactic type. Embedded *wh*-questions denote sets of propositions and serve to restrict matrix questions about propositions, as in Dayal (1994). In contrast, embedded *wh*-RCs denote sets of individual properties and serve to restrict matrix questions about individual properties. As will be shown with reference to Sternefeld’s (2001, 2002) analysis of scope marking with *because*-clauses (see (9) above), such a generalization about the semantic denotations of embedded clauses containing *wh*-elements is required independently.

In this section, we spell out all these assumptions and our semantic analysis in detail. Sect. 4.1 will provide the compositional semantics for adjunct scope marking with relative clauses. It will specify the meaning of the relative clause, as well as the matrix scope marking item in a detailed manner and it will introduce the generalized question formation procedure. Sect. 4.2 will do the same for noun-associate clauses. Sect. 4.3 discusses a number of extensions and predictions of the proposed analysis, such as the matching conditions on the matrix *wh*-item and relative clause. In Sect. 4.4, finally, we put forward a slight modification to the semantic analysis in view of the syntactic attachment site of *wh*-RCs.

4.1 Scope marking into relative clauses: relative clause questions (*wh*-RCs)

In this section, we will look at adjunct scope marking in cases where the embedded *wh*-expression is found in a relative clause. Let us repeat from above our first example for scope marking into relative clauses:

- (41) **Ki_i** megy át a vizsgán [aki *hány* *pontot* *szerez*]_i?
 who go-3SG the exam-ON REL-who how.many points-ACC scores-3SG
 (lit.)‘Who_i, who_i scores how many points, passes the exam?’
 (intended)‘How many points does one have to score to pass the exam?’

The relative clause (RC) contains a *wh*-element that is interpreted with matrix scope. We will refer to this type of relative clause as a *wh*-RC. As is clear from the syntactic build-up of these sentences, it is the *wh*-RC that introduces the restriction on the matrix *wh*-phrase.

How to derive the meaning of this complex question? Recall that instances of argumental scope marking involve a question word that asks for propositions. What kind of propositions these are is further specified by the embedded question, which denotes a set of propositions (i.e., a property of propositions). This situation is schematized in (42):

- (42) *Indirect scope marking with wh-questions*
- i. matrix-*wh what*: ranges over propositions (type $\langle s, t \rangle$)
 - ii. embedded question: denotes a set of propositions that restricts the matrix question ($\langle st, t \rangle$)

There are two major differences between instances of standard argumental scope marking, as sketched in (42), and instances of adjunct scope marking into *wh*-RCs, such as (41).¹⁷ First, these sentences differ from the Dayal cases in that the matrix question is not about propositions, but about individual properties Q. What kind of properties these are is further specified by the content of the *wh*-RC. This brings us to the second difference: a *wh*-RC does not denote a set of propositions, nor an individual property like ordinary RCs, but a set (i.e. a property) of individual properties \wp .

- (43) *Indirect scope marking with wh-RCs*
- i. matrix-*wh who/which*: ranges over properties (type $\langle e, t \rangle$)
 - ii. embedded *wh*-RC: denotes a set of properties that restricts the matrix question ($\langle et, t \rangle$)

Applied to (41), \wp would contain the following properties as elements: $\lambda x. x$ scores 0 points, $\lambda x. x$ scores 1 point, $\lambda x. x$ scores 2 points, . . . With these assumptions in place, the derivation proceeds as follows (with D_d referring to the domain of degrees):

- (44)a. $[[\text{matrix-Q}]] = [[\text{ki megý át a vizsgán}]] =$
 $\lambda p. \exists Q \in D_{et} [\wp(Q) \wedge p = \text{a Q-person passes the exam}]$
- b. $[[\text{wh-RC}]] = [[\text{aki hány pontot szerez}]] = [[\wp]] =$
 $\lambda P_{\langle et, t \rangle}. \exists n \in D_d [P = \lambda x. x \text{ scores } n\text{-many points}]$
- c. $[[\text{(41)}]] = \lambda p. \exists Q \in D_{et} [\exists n \in D_d [Q = \lambda x. x \text{ scores } n\text{-many points} \wedge p = \text{a Q-person passes the exam}]]^{18}$

¹⁷ As will emerge shortly, we adopt a different analysis for *wh*-expressions in addition. Like Dayal (1994, 2000) we treat *wh*-expressions as indefinites. However, unlike both Dayal (1994, 2000) and Karttunen (1977), we do not consider them to denote existential quantifiers. Instead, we assume that *wh*-expressions should be treated like other indefinites as introducing variables into the semantic derivation (see e.g. Heim, 1982; Kuroda, 1972). The question meaning itself (and – depending on the semantic framework adopted – the existential force) is introduced later in the derivation by an overt or covert question-operator Q. We further assume that the variable introduced by the *wh*-expression always comes with a covert restriction C, as e.g. in $[[\text{which student}]] = x, \text{student}(x) \ \& \ C(x)$, or in $[[\text{who}]] = x, \text{person}(x) \ \& \ C(x)$, where C is a contextually bound variable. Again, this is in full parallel to ordinary indefinites, e.g. in $[[\text{a student}]] = x, \text{student}(x) \ \& \ C(x)$, or in $[[\text{someone}]] = x, \text{person}(x) \ \& \ C(x)$. The possibility of introducing variables together with a covert restriction will prove important for the final account of *wh*-RCs to be presented in Sect. 4.4 below. Observe finally that this change in conception of the semantic contribution of *wh*-expressions is of no consequence to the main argument: the same result could be obtained using a Karttunen-style analysis of *wh*-expressions as existential quantifiers.

Given the denotations for matrix question and *wh*-RC in (44a,b), the meaning of the entire scope marking construction in (44c) is derived by λ -abstraction over the variable \wp in (44a), which is followed by functional application of the result to (44b). This is the very same mechanism proposed by Dayal for standard argument scope marking (see Sect. 3.3). The meaning of (41) in (44c) can thus be paraphrased as ‘the set of propositions p such that there is an individual property Q and a degree n , such that Q falls into the class of properties of the form *scoring n-many points* and p has the content *a person with property Q passes the exam*’.

Two remarks are in order at this point: first, the derivation in (44) is simplified and somewhat misleadingly suggests that the meaning of the matrix question is computed before it combines with the meaning of the *wh*-RC. In Sects. 4.4 and 5.3, we argue that this is not quite correct, and that the meaning of the *wh*-RC combines first with the *wh*-NP, before the rest of the question is computed. Second, the presentation here remains vague as to the source of the implicit restriction variable (see fn. 17 above), which could either enter the derivation together with existential quantification (at the sentential level), or directly together with the variable introduced by the *wh*-expression. The assumption that the meanings of *wh*-NP and *wh*-RC directly combine will force us to assume that variables introduced by *wh*-expressions can bring their own implicit restriction variable along (see fn. 17 again).

With this caveat in place, the meaning of the variant in (45), with a *which*-NP replacing *ki* ‘who’ in matrix position, can be derived in parallel fashion, by simply replacing the restriction *person* with *student*, as shown in (46a–c):

- (45) **Melyik diák_i** megy át a vizsgán [aki *hány* pontot szerez]_i?
 which student go-3SG PV the exam-ON REL-who how.many points-ACC szerez]_i?
 score-3SG
 (lit.) ‘Which_i student, who_i scores how many points, passes the exam?’
 ≈ ‘How many points does a student have to score to pass the exam?’
- (46)a. [[matrix question]] = [[melyik diák megy át a vizsgán]] =
 $\lambda p. \exists Q \in D_{et} [\wp(Q) \wedge p = a \text{ Q-student passes the exam}]$
- b. [[*wh*-RC]] = [[aki *hány* pontot szerez]] = [[\wp]] =
 $\lambda P_{\langle et \rangle}. \exists n \in D_d [P = \lambda x. x \text{ scores } n\text{-many points}]$
- c. [[(45)]] = $\lambda p. \exists Q \in D_{et} [\exists n \in D_d [Q = \lambda x. x \text{ scores } n\text{-many points} \wedge p = a \text{ Q-student passes the exam}]]$
- d. = the set of propositions p such that there is an individual property Q and a degree n , such that Q falls into the class of properties of the form *scoring n-many points* and p has the content *a student with property Q passes the exam*.

¹⁸ The sequence of two existential quantifiers with equal scope in (44c) may give the incorrect impression that (41) has the meaning of a multiple question. Notice, however, that (44c), repeated as (ib), can be resolved into (ic), using the general equivalence scheme in (ia):

- (i) a. $(\exists x) [x = a \wedge \varphi(x)] \equiv \varphi(a)$
 b. $\lambda p. \exists n \in D_d [\exists x \in D_{et} [Q = \lambda x. x \text{ scores } n\text{-many points} \wedge p = a \text{ Q-person passes the exam}]] \equiv \varphi(x)$
 c. $\lambda p. \exists n \in D_d [p = a \text{ person that scores } n\text{-many points passes the exam}] \equiv \varphi(a)$

The equivalent expression in (ic) brings out that (41) does not denote a multiple question, but a single question over properties. We thank Ede Zimmermann for bringing this particular point to our attention.

The semantic derivation of (17), repeated below as (47), where the matrix *wh*-item *kinek* ‘who-DAT’ takes the role of a possessive element inside a larger NP, proceeds in entirely parallel fashion to (44) and (46), as shown in (48). The only difference derives from the basic relational meaning of the larger NP *kinek a diákja* ‘whose student’, which can be informally paraphrased as ‘the unique person *y* such that *y* is a student of *x*’, plus the obligatory covert restriction on *x*.

(47) **Kinek_i a diákja** megy át a vizsgán,
 who-DAT the student-POSS.3SG go-3SG PV the exam-ON
 [aki *hány pontot* szerez]_i?
 REL-whoc how.many point-ACC get-3SG
 (lit.) ‘Whose_i student_j, who_{i/*j} scores how many points, passes the exam?’

(48)a. [[matrix question]] = [[kinek a diákja megy át a vizsgán]] =
 $\lambda p. \exists Q \in D_{et} [\wp(Q) \wedge p = \text{the student of a } Q\text{-person passes the exam}]$

b. [[*wh*-RC]] = [[aki *hány pontot* szerez]] = [[\wp]] =
 $\lambda P_{\langle et \rangle}. \exists n \in D_d [P = \lambda x. x \text{ scores } n\text{-many points}]$

c. [[(47)]] = $\lambda p. \exists Q \in D_{et} [\exists n \in D_d [Q = \lambda x. x \text{ scores } n\text{-many points} \wedge p = \text{the student of a } Q\text{-person passes the exam}]]$

d. = the set of propositions *p* such that there is an individual property *Q* and a degree *n*, such that *Q* falls into the class of properties of the form *scoring n-many points* and *p* has the content *the student of a person with property Q passes the exam*.

Finally, the proposed interpretive mechanism also accounts for sentences such as (14), repeated as (49), in which the scope marking relation applies transitively between the matrix *wh*-item and a doubly embedded *wh*-item, mediated by another *wh*-item in the intermediate relative clause:

(49) [Melyik diák]_i megy át a vizsgán, [aki [milyen könyvből]_j tanul
 which student go-3SG PV the exam-ON REL-who what book-FROM study-3SG
 [amit *ki* írt]_j?
 REL-what-ACC who wrote-3SG
 (lit.) ‘Which student_i, who_i studies from what kind of book_j, that_j who wrote, passes the exam?’

The semantic derivation of (49) is spelled out in (50). The only difference between (50) and the previous derivations is that the interpretive mechanism that combines the restriction of the *wh*-item in the higher clause with the denotation of the embedded relative clause applies twice, i.e. (50d,e):

(50)a. [[matrix question]] = [[melyik diák megy át a vizsgán]] =
 $\lambda p. \exists Q \in D_{et} [\wp(Q) \wedge p = \text{a } Q\text{-student passes the exam}]$

b. [[*wh*-RC 1]] = [[aki milyen könyvből tanul]] = [[\wp]]
 $\lambda Q_{\langle et \rangle}. \exists P \in D_{et} [\wp(P) \wedge Q = \lambda v. v \text{ studies from a } P\text{-book}]$

c. [[*wh*-RC 2]] = [[amit ki írt]] = [[\wp]]
 $\lambda P_{\langle et \rangle}. \exists x \in D_e [P = \lambda y. x \text{ wrote } y]$

- d. $[[wh\text{-RC } 1 + wh\text{-RC } 2]] = [[\text{aki milyen könyvből tanul amit ki írt}]] = \lambda Q_{\langle \text{et} \rangle}. \exists P \in D_{\text{et}} [\exists x \in D_e [P = \lambda y. x \text{ wrote } y \wedge Q = \lambda v. v \text{ studies from a P-book}]]$
- e. $[[(49)]] = \lambda p. \exists Q \in D_{\text{et}} [\exists P \in D_{\text{et}} [\exists x \in D_e [P = \lambda y. x \text{ wrote } y \wedge Q = \lambda v. v \text{ studies from a P-book} \wedge p = a \text{ Q-student passes the exam}]]]$

The reader may verify for herself that the rather complex representation in (50e) is logically equivalent to (50f), using the equivalence scheme $(\exists x) [x = a \wedge \varphi(x)] \equiv \varphi(a)$ from (ia) in fn. 18 above:

- (50)f. $[[(49)]] = \lambda p. \exists x \in D_e [p = a \text{ student that studies from a book written by } x \text{ passes the exam}]$

As desired, (50f) represents a question about the person that has written the book such that the student who studies from this book will pass the exam.

Concluding so far, we have demonstrated that a Dayal-style semantic analysis can account for a range of constructions involving scope marking into relative clauses, given the modification of the meaning of matrix *wh*-item and *wh*-RC that was proposed above. It remains to be shown how the denotations of the two parts of the scope marking construction, i.e. the denotations of matrix question and *wh*-RC are derived. As will emerge, the derivation generalizes from Dayal's analysis in two directions.

4.1.1 Deriving the meaning of the *wh*-RC

The meaning of the *wh*-RC can be derived by a generalization of the question-formation procedure to different kinds of clauses containing a *wh*-element. That such a generalization is required independently has been argued for by Sternefeld (2001, 2002) in discussing pied-piping and scope marking with sentential adjuncts such as the Hungarian *because*-clause in (9), repeated as (51):

- (51) **Miért** vagy dühös, mert *kivel* találkoztál?
 why be-2SG angry because who-WITH met-2SG
 'lit. Why are you angry because you met whom?'

According to Sternefeld (2001), there is a general semantic procedure that maps semantic objects of arbitrary type τ to objects of a higher type $[\tau, t]$. By way of example, adjunct *because*-clauses usually denote a set of propositions of type $\langle \text{st}, t \rangle$.¹⁹ However, the *because*-clause containing the *wh*-element *kivel* 'who-WITH' in (51) no longer denotes such a set of propositions. Rather, it denotes a set of sets of propositions (type $\langle \langle \text{st}, t \rangle, t \rangle$) after type-shifting has applied (Sternefeld, 2002), where the high-typing of the adjunct clause is presumably triggered by the presence of a *wh*-item in the adjunct clause. This set of sets of propositions then serves to constrain the matrix question word *miért* 'why', which asks for a reason and is therefore about sets of propositions (see fn. 19).

Adopting Sternefeld's idea, we propose to generalize the question formation procedure to *wh*-RCs as well. As mentioned, what seems to be at the heart of the question-formation procedure is that it takes sentential objects of arbitrary semantic

¹⁹ The denotation of an explanatory clause *because p* can be conceived of as the set of all propositions that are caused by *p*'s being true.

(i) $[[\text{because } p]] = \lambda q. q \text{ is caused by } p$

type and raises their type, yielding a set of such objects. Assuming a question-operator Q, located in the complementizer position, to be responsible for question formation (see fn. 17), generalized question formation with Q and arbitrary syntactic objects ϕ of semantic type τ can be formalized as follows:

$$(52) \quad \textit{Generalized Wh-Question Formation} \\ [[Q]] \ (\ ([\phi]) \in \mathbf{D}_\tau) = [[Q\phi]] \in \mathbf{D}_{\langle \tau, t \rangle}$$

In the standard case of matrix or embedded *wh*-questions, Q takes an open proposition containing one or more open variables and yields a set of propositions. For concreteness, let us assume that Q binds the open variable(s) under co-indexation (see 53b). Co-indexation triggers λ -abstraction over the open variable(s) (Heim & Kratzer, 1998), as in (54b). The denotation of Q in (54c) then functionally applies to (54b), yielding (54d), which is of the raised type $\langle st, t \rangle$ as desired.²⁰

(53)a. Who scores 50 points?

b. $[Q_i \text{ [who}_i \text{ scores 50 points]}]$

(54)a. $[[\text{who}_i \text{ scores 50 points}]] = \lambda w. x \text{ scores 50 points in } w$

b. $\Rightarrow \lambda x. \lambda w. x \text{ scores 50 points in } w$ (λ -abstraction over x , triggered by co-indexation)

c. $[[Q]] = \lambda P_{\langle e, st \rangle} . \lambda p_{\langle st \rangle} . \exists x \in D_e [p = P(x)]$

d. $[[Q_i \text{ who}_i \text{ scores 50 points}]] = [[Q_i]] \ (\ [[\text{who}_i \text{ scores 50 points}]]) = \lambda p_{\langle st \rangle} . \exists x [p = x \text{ scores 50 points}]$

Turning to other instances of generalized question formation, in adjunct *wh*-clauses such as (51) from above, Q takes a set of propositions and yields a set of sets of propositions:

(55)a. $[[\text{because you met whom}_i]] = \lambda p. p \text{ is caused by your meeting } x$

b. $\Rightarrow \lambda x. \lambda p. p \text{ is caused by your meeting } x$ (λ -abstraction over x , triggered by co-indexation)

c. $[[Q]] = \lambda P_{\langle e, stt \rangle} . \lambda \Pi_{\langle stt \rangle} . \exists x \in D_e [\Pi = P(x)]$

d. $[[Q_i \text{ because you met whom}_i]] = [[Q_i]] \ (\ [[\text{because you met whom}_i]]) = \lambda \Pi_{\langle stt \rangle} . \exists x \in D_e [\Pi = \lambda p. p \text{ is caused by your meeting } x]$

²⁰ A question analysis in terms of alternative semantics, where the semantic contribution of a *wh*-expression basically consists in the introduction of alternatives (ib), yields the same result. In (ic), these alternatives have expanded to the propositional level. Finally, the question operator Q applies to its complement by making its focus value the ordinary value of the entire construction (see e.g. Beck, 2004).

(i) a. $[[\text{who}]]^o = \text{undefined}$

b. $[[\text{who}]]^f = \{x \mid x \text{ a person}\}$

c. $[[\text{who scores 50 points}]]^f = \{p \mid p = x \text{ scores 50 point, } x \text{ a person}\}$

d. $[[Q \phi]]^o = [[\phi]]^f$

e. $[[Q [\text{who scores 50 points}]]]^o = [[\text{who scores 50 points}]]^f = \{p \mid p = x \text{ scores 50 points, } x \text{ a person}\}$

As can be easily seen, (ie) is equivalent to the result of the alternative derivation in (54d) in the main text. Since the choice of framework is immaterial for present purposes, we will stick with the binding approach.

Finally, in the case of *wh*-RCs, *Q* takes a set of individuals, the denotation of the RC containing the *wh*-element, and yields a set of sets of individuals, or – equivalently – a set of individual properties. Again, type *d* stands for the type of degrees introduced by the degree question words *how many/how much*.

(56) [_{*wh*-RC} aki hány_{*i*} pontot szerez]
REL-who how.many point-ACC score-3SG

(57)a. [[aki hány_{*i*} pontot szerez]] = λx . *x* scored *n* points

b. $\Rightarrow \lambda n \lambda x$. *x* scores *n* points (after λ -abstraction over *n*, triggered by *Q*'s index)

c. [[*Q*_{RC}]] = $\lambda R_{\langle d, et \rangle} \lambda P_{\langle et \rangle} \cdot \exists n \in D_d [P = R(n)]$

d. [[*Q*_{*i*} aki hány_{*i*} pontot szerez]] = $\lambda P_{\langle et \rangle} \cdot \exists n \in D_d [P = [\lambda n \lambda x$. *x* scores *n*-many points] (*n*)]
= $\lambda P_{\langle et \rangle} \cdot \exists n \in D_d [P = \lambda x$. *x* scores *n*-many points]
= (46b)

As desired, (57d) specifies the set of individual properties *P* of the form *the property of scoring 0, 1, 2, ... n points*. This set of properties appropriately restricts the answer space of the otherwise unrestricted matrix question about properties of persons that pass the exam (see Sect. 4.1.2). The procedure is essentially the same with RC-internal *wh*-expressions such as *who(se)*, *what* etc., which range over individuals. In this case, the existential quantifier introduced by *Q*_{RC} in (57b) ranges over individuals instead of degrees.

Finally, notice that it is possible to generalize over the different denotations of *Q* in (embedded) *wh*-questions, *wh*-adjuncts, and *wh*-RCs. The generalized lexical entry for *Q* is given in (58):

(58) *Generalized Meaning of Q*
[[*Q*]] = $\lambda P \in D_{\langle \tau(\sigma, t) \rangle} \cdot \lambda Q \in D_{\langle \sigma, t \rangle} \cdot \exists x \in D_\tau [Q = P(x)]$

The denotation of *Q* in (58) is general enough to also cover cases of scope marking into multiple *wh*-RCs, as illustrated in (59):

(59A) **Ki**_{*i*} kap diplomát [aki melyik vizsgán hány pontot
who get-3SG certificate-ACC REL-who which exam-ON how.many points-ACC
szerez]_{*i*}?
scores

(lit.) ‘Who will get a certificate, who scores how many points in which exam?’

All that needs to be assumed for (59) is that there is a high-typed version of *Q*_{RC} in (57c) which selects not for a function from individuals into properties into sets of properties, but for a function from *pairs of individuals* into properties into sets of properties. This is in full analogy to what one would have to assume for *Q*-operators in matrix multiple *wh*-questions anyway.

In Sect. 5 below, we will return to the cross-linguistic availability of the generalized *Q*-morpheme and to cross-linguistic differences concerning the availability of indirect scope marking with relative clauses.

4.1.2 Deriving the meaning of the matrix question: a case of type coercion

The meaning of the matrix question can be derived by changing the semantic type of the question words *ki* ‘who’ and *melyik* ‘which’ to a higher type. On this higher order

reading, the *wh*-elements are synonymous to the complex expression *what kind of*: they no longer ask for an individual variable *x*, but rather for an individual property *P*.²¹ We take such higher order readings for the Hungarian *wh*-elements *ki* and *melyik* to be motivated on independent grounds.

The existence of a property reading for the basically individual-denoting *wh*-items *ki* ‘who’ and *melyik* ‘which’ may be surprising at first glance. Like English *who* and *which*, *ki* and *melyik* do not allow for property readings when used as internal arguments of intensional verbs (cf. Moltmann, 1997). The questions in (55a,b) typically require not just a property, but an individual as a complete answer (see also Groenendijk & Stokhof, 1984: ch.5, von Stechow & Zimmermann, 1984, for claims that *who* and *which* are accurately answered by individual-denoting terms only):

- | | |
|---|---|
| (60)a. Kit keresel?
whom look.for-2SG
‘Who are you looking for?’ | A1: #Egy okos embert.
a clever man-ACC
‘A clever person.’
A2: Apá-ma-t.
father-POSS.1SG-ACC
‘My father.’ |
| b. Melyik diákot keresed?
which student-ACC look.for-2SG
‘Which student are you looking for?’ | A1: #Egy okos diákot.
a clever student-ACC
‘A clever student.’
A2: Aki megbukott.
REL-who failed
‘The one who failed.’ |

These items thus differ from *wh*-items such as *milyen* ‘what (kind)’, which do allow for such property readings.²²

- | | |
|--|--|
| (61) Milyen diákot keresel?
what.kind student-ACC look.for-2SG
‘What kind of student are you looking for?’ | A: Egy okos diákot.
a clever student-ACC
‘A clever student.’ |
|--|--|

However, there are two kinds of evidence that suggest that the Hungarian *wh*-items in question may be coerced to a higher type at least in the presence of (*wh*)-RCs. The type-coercing nature of relative clauses is witnessed by the following case. In (62), the demonstrative element *az* ‘that’ (presumably of type $\langle e \rangle$, cf. *János, az újra vizsgázik* ‘John, that (one) will take the exam again’) must be re-interpreted as being

²¹ It would be more accurate to say that the *wh*-elements introduce a property variable $P \in D_{\langle et \rangle}$ instead of an individual variable $x \in D_e$ on their type-coerced reading.

²² Interestingly, some speakers seem to allow for a property reading with the *wh*-item *kit* in (60a) as well. As an anonymous reviewer points out to us, in a context where John is browsing the Yellow Pages and Mary asks (60a), (i) makes a good answer on a non-specific interpretation of the NP:

- (i) Egy jó ügyvédet.
a good lawyer-ACC
‘A good lawyer.’

To the extent that (i) is acceptable for some speakers, it provides direct evidence for our account. At least for these speakers, the question word *ki* would be lexically ambiguous (or underspecified) between an individual and property reading, just like the English short form *what* in (ii):

- (ii) What are you looking for? A1: A green sweater.
A2: My favorite sweater.

of a higher type in order to yield the observed reading. The sentence as a whole is not about a specific individual, as may be first suggested by the presence of the demonstrative:

- (62) Az, aki megbukott, újra vizsgázik.
 that REL-who failed-3SG again exam-take-3SG
 (lit.) ‘That who failed will take the exam again.’
 ‘Whoever failed will take the exam again.’

Secondly, indefinite determiners can be re-interpreted by means of type coercion even in English. As argued in Zimmermann (2005), English indefinites like *something* (the non-interrogative counterpart of *who*) can and even have to be high-typed in certain contexts. Consider (63) (Zimmermann’s (18)), which is three-ways ambiguous:

- (63) Jones is looking for something Smith is looking for.
 i There is a specific object that both Jones and Smith are looking for.
 ii Jones is looking for anything specifically sought by Smith.
 iii Both Jones and Smith are looking for the same thing (e.g. a green sweater) without either of them looking for a particular thing (e.g. a particular sweater).

The first two readings (63i,ii) are expected on a construal of *something* as being of type $\langle et, t \rangle$: in (i), the complex phrase *something* plus RC takes wide scope over the intensional verb, whereas in (ii) it takes narrow scope. The relevant reading here is (63iii), formalized as (64), which — as Zimmermann (2005) argues — cannot be derived with *something* being of type $\langle et, t \rangle$:

- (64) $(\exists Q)$ [seek ‘(Smith’, Q) \wedge seek ‘(Jones’, Q)]
 (with Q an existential quantifier of type $\langle et, t \rangle$ standing for a (non-empty) set of properties, which corresponds to a maximally unspecified object)

Rather, the object *something* RC has to quantify over sets of properties (or quantifiers) in order to yield the desired reading in (64). That means it has to be interpreted as being of type $\langle \langle et, t \rangle, t \rangle$.²³ Thus, we see that type-coercion of indefinites is possible in principle. Notice incidentally, that (63iii) constitutes another example where type coercion takes place in the presence of a relative clause.²⁴

Given the possibility of type-coercion with non-interrogative indefinites, and given the type-coercing nature of relative clauses (e.g. (62)), we propose to apply the mechanism of type-coercion to interrogative indefinites (*ki*) and determiners (*melyik*) in Hungarian, too. More specifically, we assume that in Hungarian the presence of a *wh*-RC (a special kind of relative clause; see Sect. 5.3) triggers a type-change in the

²³ The exact derivation proceeds as shown in (i) (see Zimmermann (2005) for details):

- (i) a. [[thing (that) Smith is looking for]] = λQ . seek’ (Smith’, Q)
 b. [[some]] = $\lambda \Sigma$. $\lambda \Pi$. $(\exists Q)$ [$\Sigma(Q) \wedge \Pi(Q)$]
 c. [[something Smith is looking for]] = $\lambda \Pi$. $(\exists Q)$ [seek’ (Smith’, Q) $\wedge \Pi(Q)$]
 Quantifying into the matrix clause ‘Jones is looking for Q :
 d. [$\lambda \Pi$. $(\exists Q)$ [seek’ (Smith’, Q) $\wedge \Pi(Q)$]] (λQ . seek’ (Jones, Q)
 = $(\exists Q)$ [seek’ (Smith’, Q) \wedge seek’ (Jones, Q)] = 64)

²⁴ But see Zimmermann (2005) for evidence that type-coercion with (non-interrogative) indefinites is also possible in (some) contexts without relative clauses.

wh-item it associates with. After type-coercion, the *wh*-item ranges over individual properties instead of individuals.

Furthermore, we contend that changing the type of the *wh*-item is a necessary but surely not a sufficient condition for the availability of scope marking with relative clauses. After all, in English the construction is impossible even with the *wh*-item *what*, which does have a property-reading (see fn. 22 above):

(65) *What student that scores how many points will pass the exam?

In Sect. 5.1, we will show that it is the existence of relative clause questions (*wh*-RCs) in a language that is responsible for the availability of scope marking into relative clauses.

Before concluding this section, we would like to quickly discuss a difference between our analysis and the one by Sternefeld (2001). As pointed out in Sternefeld (2001), a major problem raised by scope marking into adjunct clauses, and also into *wh*-relative clauses, has to do with the fact that the raised type of the embedded clause is too high to combine directly with the matrix clause denotation. We tackled this problem by coercing the type of the matrix *wh*-item to a higher type, i.e. from type $\langle e \rangle$ for individuals to type $\langle et \rangle$ for properties. Sternefeld (2001), in contrast, proposes an alternative solution couched in terms of generalized choice functions. He proposes — again for the case of scope marking into adjunct *because*-clauses — that the scope marking *wh*-item in the matrix clause denotes a choice function variable that applies to a set of entities, in his case a set of sets of propositions, and yields an entity of the basic type, namely a set of propositions, that *can* combine with the matrix clause denotation in the usual way. The application of the choice function thus reverses the effects of generalized question formation in the embedded clause.

At first sight, then, the two analyses achieve the same result by way of similar means: while Sternefeld changes the denotation of the matrix *wh*-item from an ordinary choice function to a higher order choice function, we change its denotation from individual denoting to property-denoting. Nonetheless, we will stick to our approach for the following reasons. Most importantly, our approach allows for a unified analysis of matrix and embedded *wh*-items alike, namely as introducing variables to be bound by a question operator, modulo type-coercion of the matrix *wh*-item. In contrast, Sternefeld assumes different denotations for matrix and embedded *wh*-items. On his analysis, the scope marking matrix *wh*-item denotes a higher order choice function, whereas the embedded *wh*-items denote mere sets of entities and contribute to the high-typing of the embedded clause by triggering a general semantic rule. Apart from non-uniformity, the analysis of matrix *wh*-items as denoting choice functions has other potentially unwanted consequences when we consider scope marking into relative clauses, in particular relatives headed by a *which*-NP. In such cases, the choice function must be the denotation of the matrix *wh*-item *melyik* ‘which’. It applies semantically to the higher order meaning of the relative clause, giving back a property. This property can then combine with the denotation of the NP-complement by way of predicate modification (see e.g. Heim & Kratzer, 1998). Notice that this interpretive procedure is quite different from the usual choice-function approach to *which*-NPs, where a choice function denoted by *which* applies directly to its NP-complement, giving back an individual. A second problem concerns the repeated application of scope marking into doubly embedded *wh*-RCs, as discussed in connection with instances of repeated scope-marking, such as (14), repeated here as (66):

- (66) [**Melyik diák**]_i megy át a vizsgán, [_{RC1}aki [*milyen könyvből*]_j] tanul
 which student go-3SG PV the exam-ON REL-who what book-FROM study-3SG
 [_{RC2} amit *ki* írt]_j]_i?
 REL-what-ACC who wrote-3SG
 (lit.) ‘Which student_i, who_j studies from what kind of book_j, that_j who wrote,
 passes the exam?’

Since matrix and embedded *wh*-items play a different semantic role in Sternefeld’s account, it is not immediately obvious how the intermediate *wh*-item *milyen könyvből* ‘what book-FROM’ in (66) could play both roles at the same time: as a scope marker introducing a choice function variable relative to the most embedded clause, and as a trigger for type-raising relative to the matrix clause. This is not to say that Sternefeld’s analysis cannot derive the correct interpretation for sentences such as (66) at all. For instance, it could be that the high-typing of the intermediate clause RC₁ is triggered by the choice function variable introduced by the intermediate *wh*-item. However, in the absence of a clearly articulated choice function semantics for the various occurrences of *wh*-items in scope marking constructions, and in the absence of clear evidence in favor of a choice function approach, we opt for the proposed account in terms of type-coercion, which is (at least in our view) both simpler and more transparent.

Summing up, of the two extensions to Dayal’s indirect scope marking account that we proposed, one concerns the embedded relative clause, and one the semantics of the matrix *wh*-item. The relative clause contains a relative Q-operator that yields a set of properties as the meaning of the relative clause question (as a special instantiation of the general question formation procedure). This set of properties restricts the matrix *wh*-item, which asks for a property (after type-coercion) and can be restricted in the way envisaged by Dayal.

4.2 Noun-associate *wh*-clauses

The semantics of adjunct scope marking into noun-associate clauses differs only slightly from that of scope marking into *wh*-RCs. Semantically, noun-associate clauses represent the intermediate case between standard argument scope marking and scope marking into *wh*-RCs, as spelled out in the previous section.

The nouns occurring in these constructions (*message, claim, order* etc.) associate with propositions that spell out a restricting property, namely their *content*. Syntactically, these types of noun-associate clauses have been argued to be adjuncts (Grimshaw, 1990; Stowell, 1981, and for Hungarian Kenesei, 1994, see also fn. 9 above), so these can be treated in the same way as relative clauses for our purposes. This means that just as in the case of relative clauses, the question in a noun-associate clause is about an (individual) property that in this specific case takes on the shape of a proposition. This property is restricted by the denotation of the embedded question, which denotes a set of propositions, just like with standard argument scope marking. Assuming this, example (67), repeated from above, has the informal semantic representation in (68):

- (67) **Milyen üzenetet**_i kapott Péter [hogy *hova* kell mennie]_j?
 what message-ACC got-3SG Péter that where need go-INF-3SG
 (lit.) ‘What message, that he has to go where, did Péter get?’

- (68) the set of propositions p such that there is a proposition q , with q an element of the set of propositions of the kind ‘Péter has to go to x ’, and $p =$ Péter got a message with propositional content q

How the embedded proposition can be construed as a property of an entity is far from trivial. This, however, is not a problem that is specific to the present analysis. It concerns all noun-associate clause relations with or without a *wh*-item in the associated clause.

The intermediate nature of indirect scope marking with noun-associate *wh*-clauses is schematized in (69).

- (69) *The intermediate case: indirect scope marking with noun-associate clauses*
- i. matrix-*wh* *which*: ranges over propositional properties (type $\langle s, t \rangle$), (cf. 42i)
 - ii. embedded question: denotes a set of propositions that restricts the matrix question ($\langle st, t \rangle$), (cf. 42ii)

Put differently, scope marking with noun-associate *wh*-clauses embodies properties of both ordinary scope marking into embedded questions and scope marking into *wh*-RCs, because it asks for a property of an entity that takes the shape of a proposition due to the special semantic status of that entity. Assuming the denotation in (70a) for the speech act noun *üzenet* ‘message’, the semantic derivation proceeds as follows.²⁵

- (70)a. $[[\text{message}]] = \lambda x. x$ is a message with content Q
- b. $[[\text{embedded } wh]] = [[\text{hogy hova kell mennie}]]$
 that where need go-INF-3SG
 $= \lambda p. \exists x [\text{place}(x) \wedge p = \text{Peter should go to } x] = \wp$
 - c. $[[\text{matrix question}]] = [[\text{milyen üzenetet kapott Péter}]]$
 what.kind message-ACC got-3SG Péter
 $= \lambda p. \exists Q \in D_{\langle st \rangle} [\wp(Q) \wedge p = \text{Peter got a message with content } Q]$
 - d. $[[67]] = \lambda p. \exists Q \in D_{\langle st \rangle} [\exists x [\text{place}(x) \wedge Q = \text{Peter should go to } x \wedge p = \text{Peter got a message with content } Q]]$

The semantic representation in (70d) can be paraphrased as ‘the set of propositions p , such that there is a proposition Q and a place x , such that the proposition Q is of the form *Peter should go to x* , and p is of the form ‘*Peter got a message with content Q* ’. This seems to appropriately capture the meaning of (67).

To summarize, the present and the previous sections have spelled out the semantics of our account of scope marking with relative clauses and noun-associate clauses in Hungarian. The account took the form of a Dayal-style analysis, extending the original proposal in Dayal (1994, 2000) in two directions: (i) by extending the range of denotations of *wh*-expressions to include variables of type $\langle e, t \rangle$ (individual properties); and (ii) by extending the range of possible semantic restrictions provided by the embedded clause hosting the second *wh*-element. The latter extension was achieved by means of a process we introduced under the name *Generalized Question Formation* (GQF). GQF applies to clausal (CP) elements of various types that denote semantic objects of various kinds (matrix clause: propositions; adjunct clause: sets of propositions; relative clause: sets of properties), and delivers a set of the respective semantic objects as its output.

²⁵ The derivation we assume here is based on the fact that these clauses are adjuncts, which is clearly reflected in the syntactic properties of these clauses that were mentioned in fn. 9.

4.3 Extensions and predictions

As shown in the preceding section, our extension of Dayal's semantic analysis of scope marking constructions is flexible enough to capture instances of scope marking both into *wh*-RCs and into noun-associate *wh*-clauses. In this section, we show that the proposed semantics is flexible enough to account for additional data that can be observed in connection with adjunct scope marking (Sects. 4.3.1 and 4.3.2). At the same time, we show that the semantics is restrictive enough to exclude ungrammatical sentences, such as (16) in Sect. 2.2.1, on grounds of their uninterpretability (Sect. 4.3.3). Finally, we show that languages like Frisian and Slovenian provide syntactic evidence for our assumption that *wh*-RCs and noun-associate *wh*-clauses with speech act nouns denote different kinds of semantic objects, namely sets of individual properties and sets of propositions respectively (Sect. 4.3.4).

4.3.1 Questions about individual properties of speech act nouns

Speech act nouns, such as *message*, *claim*, *order*, etc. not only have propositional properties (their content), but also individual properties such as being long, being boring, being unexpected. Due to this, we predict that it should also be possible to ask for such 'ordinary' properties of speech act nouns. More specifically, we expect that this questioned property should be restricted by a *wh*-RC, as was demonstrated in Sect. 4.1. The well-formedness of (71) shows this prediction to be borne out:

- (71) **Melyik vád** zavarta Pétert, amit *hány ember előtt*
 which accusation bothered Péter-ACC REL-what how.many people in.front
 mondtak ki?
 said-3PL PV
 (lit.) 'Which accusation bothered Peter that was announced in front of how many people?'

- (71A) Az, amelyiket ötszáz ember előtt mondtak ki.
 that REL-which-ACC five.hundred person in.front said-3PL PV
 'The one they announced in front of five hundred people.'

The question in (71) asks for a non-propositional property of the kind 'was announced in front of n many people'. This restriction on the questioned property is introduced by the *wh*-RC, which, by means of generalized question formation, denotes a set of properties. The derivation is entirely parallel to the derivation of sentence (41), as laid out in (44) in Sect. 4.1.

These data come out the same way in Slovenian and Frisian, according to our informants: questions about individual properties of speech act nouns are expressed by *wh*-RCs, as demonstrated by the following examples.

- (72) ?**Hokker útstel** wie Jan yn 'e wei, datst foar *hoefolle minsken*
 which claim was Jan in the way REL-that-2SG before how.many people
 op it aljemint brochtst?
 on the alignment brought-2PSG
 'Which claim bothered Jan, the one that you discussed in front of how many people?'

- (73) **Kaj za ena novica,** ki da je bila razglasena pred *koliko*
 what for one piece.of.news that that AUX been announced in.front how.many
 ljudmi je motila Petra?
 people AUX bothered Petra
 ‘Which news bothered Petra, which was discussed in front of how many people?’

4.3.2 Questions about degree and other kinds of properties

So far, we have illustrated scope marking into *wh*-RCs with examples that ask for individual properties. In these cases, the matrix question is typically introduced by the *wh*-expressions *ki* ‘who’ or *melyik N* ‘which N’. This is, however, not the only possible pattern: any type of *wh*-expression can occur in the matrix clause and inside the relative clause. Consider, for example, the possibility of having scope marking into *wh*-RCs with degree questions containing a *how many/much*-phrase (74), (75):

- (74)Q: **Hány dollárt,** amit *hány hónap* alatt keresel meg,
 how.many dollar-ACC REL-what-ACC how.many month under earn-2SG PV
 fizettél a kocsiórt?
 paid-2SG the car-FOR
 ‘How many dollars, which you earn in how many months, did you pay for the car?’

A: Annyit, amennyit öt hónap alatt keresek meg.
 that.much REL-how.much five months under earn-1SG PV
 ‘The amount I earn in five months.’

- (75)Q: **Mennyi dinnyét** vettél, ami *hány kocsiba* fér be?
 how.much melon-ACC bought-2SG that how.many car-INTO fit-3SG PV
 ‘How many melons did you buy, which would fit into how many cars?’

A: Annyit, amennyi három kocsiba fér.
 that.much-ACC REL-how.much three car-INTO fit-3SG
 ‘The amount which fits into three cars.’

The possibility of scope marking with degree *wh*-expressions corresponding to *how much/many* is expected, if we assume that the meaning of these degree expressions can be type-coerced — like that of their counterparts in the individual domain — so that they introduce a variable over *degree properties* in place of simple degrees. This assumption is supported by the felicity of the following question-answer pair in Hungarian (and its English counterpart in the gloss):

- (76)Q: Mennyit keresel egy hónapban?
 how.much-ACC earn-2SG one month-IN
 ‘How much (money) do you earn in a month?’

A1: 100,000 forintot.
 100 thousand forint-ACC type: <d>
 ‘100 thousand forints.’

A2: Annyit, amennyiből pont megélek.
 that.much REL-how.much just PV-live.1SG
 ‘The amount I can just live on.’ type: <d,t>

As (76) shows, a degree question can be answered either by a degree expression (76A1), or by an expression denoting a property of degrees (76A2). On the property reading, the meaning of the question can be represented as in (77):

$$(77) \quad [[(76)]] = \lambda p. \exists N \in D_{dt} [\emptyset(N) \wedge p = \text{you spend } N\text{-much money each month}].$$

Granted the possibility of a type-coerced reading for degree *wh*-expressions, the meaning of (74) can be derived following the semantic procedure introduced in Sect. 4.1 for questions about individual properties. This is illustrated for (74) in (78a–d):

$$(78)\text{a.} \quad [[\text{matrix question}]] = [[\text{hány dollárt fizettél a kocsiért}]] = \\ \lambda p. \exists N \in D_{dt} [\emptyset(N) \wedge p = \text{you paid } N\text{-many dollars for the car}]$$

$$\text{b.} \quad [[\text{wh-RC}]] = [[\text{amit hány hónap alatt keresel meg}]] = [[\emptyset]] = \\ \lambda P. \exists m \in D_d [P = \lambda n. \text{you earn } n \text{ in } m\text{-many months}]$$

$$\text{c.} \quad [[(74)]] = \lambda p. \exists N \in D_{dt} [\exists m \in D_d [N = \lambda n. \text{you earn } n \text{ in } m\text{-many months} \\ \wedge p = \text{you paid } N\text{-many dollars for the car}]]$$

d. = the set of propositions *p* such that there is a *degree* property *N* and a degree *m*, such that *N* falls into the class of degree properties of the form ‘*being earned by you in 0, 1, 2, . . . m-many months*’, and *p* has the content ‘*you paid N-many dollars, e.g. as much as you earn in 6 months, for the car*’

Apart from the domain change from individuals to degrees, the representation in (78c) is structurally equivalent to the ones we proposed for questions about individual properties in (44) and (46) in Sect. 4.1. We conclude that the proposed semantic analysis for scope marking into *wh*-RCs is flexible enough to account for scope marking with questions about degree properties.

Finally, notice that there is nothing in the analysis that would restrict it to the ontological domains of individuals or degrees. As a result, the analysis applies equally well to instances of scope marking where the matrix question is about properties of yet other ontological entities. For illustration, consider (79), where the matrix question ranges over properties of manners.

$$(79) \quad \text{Hogyan énekeltél, ahogy ki szokott?} \\ \text{how sang-2SG REL-how who HABIT} \\ \text{‘How did you sing, like who does?’}$$

$$(79\text{A}) \quad \text{Úgy, ahogy Paul McCartney szokott.} \\ \text{so REL-how Paul McCartney HABIT} \\ \text{‘I sang like Paul McCartney does.’}$$

4.3.3 Ungrammatical instances of adjunct scope marking

In this section, we show that the proposed semantic analysis of scope marking with *wh*-RCs in Hungarian is restrictive enough to exclude a certain type of ungrammatical scope marking constructions as uninterpretable. In particular, we will give an account for why questions such as (16) in Sect. 2.2.1, repeated here as (80), are ill-formed.

$$(80) \quad * \text{Hány diák}_i \text{ megy át a vizsgán [aki}_i \text{ hány pontot szerez]?} \\ \text{how.many student go-3SG PV the exam-ON REL-who how.many points get-3SG} \\ \text{(lit.) ‘How many students who score how many points pass the exam.’}$$

At first sight, the ungrammaticality of (80) is surprising, given that it does not differ from the grammatical examples in (74), (75) in the preceding section in featuring two degree *wh*-expressions, one in the matrix clause and one in the *wh*-RC. At the same time, we know that domain identity of the two *wh*-expressions in the matrix clause and the *wh*-RC is not even a necessary condition for well-formedness, as shown by the examples (12) and (13), repeated here as (81a,b), from Sect. 2.2.1:

- (81)a. **Ki** megy át a vizsgán [aki hány pontot szerez]?
 who go-3SG PV the exam-ON REL-who how.many point-ACC score-3SG
 (lit.) ‘Who_i, who_i scores how many points, passes the exam?’
 (intended) ‘How many points does one have to score to pass the exam?’

- b. **Melyik diák** megy át a vizsgán [aki hány pontot szerez]?
 which student go-3SG PV the exam-ON REL-who how.many point-ACC score-3SG
 (lit.) ‘Which student_i, who_i scores how many points, passes the exam?’
 (intended) How many points does a student have to score to pass the exam?’

The question is, then, what is the reason behind the ungrammaticality of (80)? The answer to this question is revealed by taking into account not only the respective domains of the two *wh*-expressions, but also the domain of relativization. A closer look reveals that the grammatical structures differ from the ungrammatical ones in that the domain of the matrix *wh*-expression matches the domain of relativization in the grammatical cases. In (81a,b), both matrix *wh*-expression and relative pronoun range over the domain of individuals (*who_i/which_i student . . . who_i*): The matrix question asks for an individual property and the *wh*-RC specifies a set of individual properties. In (74)–(75), both matrix *wh*-expression and relative pronoun range over the domain of degrees (*how many_i/much_i N . . . that_i*): The matrix question asks for a degree property and the *wh*-RC specifies a set of degree properties. In (80), however, the matrix *wh*-expression ranges over the domain of degrees, whereas relativization ranges over the domain of individuals (as indicated by the use of the pronoun *aki*). In other words, (80) is ungrammatical because the matrix question is about a *degree* property, but the *wh*-RC supplies a set of *individual* properties as the only potential restriction for the matrix question. This mismatch leads to non-interpretability as shown in (82a–d).

- (82)a. *How many* students [_{*wh*-RC} *who* score how many points] pass the exam?
- b. [[matrix *wh*]] = $\lambda p. \exists N \in \mathbf{D}_{dt} [\wp(N) \wedge p = \text{An } N\text{-amount of students passes the exam}]$
- c. [[*wh*-RC]] = $\lambda P \in \mathbf{D}_{et}. \exists n \in \mathbf{D}_d [P = \lambda x. x \text{ scores } n\text{-many points}] = \wp$
- d. $\lambda p. \exists N \in \mathbf{D}_{dt} [\exists n \in \mathbf{D}_d [N = \lambda x. x \text{ scores } n \text{ points} \wedge p = \text{An } N\text{-amount of students passes the exam}]]$
 = the set of propositions *p* such that there is a degree property *N* and a degree *n*, such that *N* is a property of the form ‘scores *n* points’ . . .

In (82) the matrix *wh*-element *how many* introduces a question about degree properties. Possible values for the degree property *N* could be the property of fillings

classroom, of being embarrassingly few etc. As argued above, the denotation of the *wh*-RC in (82c) specifies the set of individual properties *P* of scoring *n*-many points. The result of combining (82b) and (82c), shown in (82d), is ill-formed because the individual property $\lambda x. x \text{ scores } n \text{ points}$ is outside the domain of the degree property variable *N*. Because of this domain mismatch between matrix *wh*-expression and *wh*-RC, configurations such as in (82) are uninterpretable, hence ungrammatical.

Based on the foregoing discussion, we are now in a position to predict a general pattern concerning the grammaticality or ungrammaticality of scope marking into *wh*-RCs. For expository purposes, we will concentrate on individual and degree questions only. The observed patterns, however, are taken to hold for other types of questions in exactly the same way.

Table 1 gives an overview of all possible combinations of individual and degree questions in the matrix and the embedded clauses. Examples of configurations that have not yet been discussed are given in (83) to (87).

(83) **Ki** ment át a vizsgán, aki *kit* fizetett le?
 who passed PV the exam-ON REL-who who-ACC bribed PV
 lit. ‘Who passed the exam, who bribed whom?’
 ≈ ‘Who did one need to bribe to pass the exam?’

(83A) Az, aki a tanársegédet.
 that who the teaching.assistant-ACC
 ‘The person who bribed the teaching assistant.’

(84) **Mennyi** pénzünk van, amennyiből *mit* tudunk
 how.much money-poss.1PL is REL-how.much-FROM what-ACC able-1PL
 venni?
 buy-INF
 ‘How much money do we have, from which we can buy what?’

(84A) Annyit, amennyiből nyomtatót.
 that.much-ACC REL-how.much-FROM printer-ACC
 ‘The amount from which we can buy a printer.’

Table 1 Grammatical and ungrammatical cases of *wh*-RCs with individual and degree questions

Domain matrix <i>wh</i>	Domain relativization	Domain embedded <i>wh</i>	Example
<i>Grammatical cases</i>			
Individual (who, which N, etc.)	Individual	Individual	(83) above
Individual	Individual	Degree	see (41), (45) above
Degree (how many/much)	Degree	Individual	(84) above
Degree	Degree	Degree	see (74), (75) above
<i>Ungrammatical cases</i>			
Degree	Individual	Individual	(85) below
Degree	Individual	Degree	see (80) above
Individual (who, which N)	Degree	Individual	(86) below
Individual	Degree	Degree	(87) below

- (85) ***Hány diák** ment át a vizsgán, aki *kit* fizetett
 how.many student passed-3SG PV the exam-ON REL-who who-ACC bribed-3SG
 le?
 PV
 ‘How many student passed the exam, that bribed whom?’
- (86) ***Kiket** vádoltak meg, amennyien *min* hajóznak?²⁶
 who-PL-ACC accused-3PL PV REL-how.many what-ON sail-3PL
 ‘Who did they accuse, the number of people who were sailing on what?’
- (87) ***Kiket** vádoltak meg, amennyien *hány hajón* dolgoznak?
 who-PL-ACC accused-3PL PV REL-how.many how.many ship-ON work-3PL
 ‘Who did they accuse, the number of people who work on how many ships?’

As these examples show, our analysis correctly predicts only a subset of all possible combinations in Table 1 to be grammatical. As purely syntactic approaches cannot make such fine-grained distinctions, the grammaticality pattern in Table 1 constitutes strong evidence in favor of our semantic analysis of scope marking.

Before closing this section, a note of clarification is in order. With the above discussion of semantic mismatches we do not intend to suggest that semantic mismatches are responsible for *all* ungrammatical instances of adjunct scope marking. Scope marking into relative and noun-embedded clauses can be ungrammatical under certain other conditions that are yet to be explored. For example, matrix negation is felicitous in some cases, but not in others.

- (88) **Ki** nem megy át a vizsgán [*aki hány pontot szerez*]?
 who not go-3SG PV the exam-ON REL-who how.many points-ACC scores
 (lit.) ‘Who scores how many points, fails the exam?’
- (89) *??**Miért** nem énekéltél, amiért **ki** nem énekelt?
 why not sang-2SG REL-how who not sang-3SG
 ‘For what reason did you not sing, the reason why who did not sing?’
- (90) *??**Hogyan** nem tudsz énekelni, ahogy **ki** énekel?
 why not potential-2SG sing-INF REL-how who sing-3SG
 ‘In which way can you not sing, the way who does?’

This state of affairs is reminiscent of standard cases of scope marking, which allow for matrix negation in some but not all cases:

- (91) **Mit** nem ismert be János, hogy hányszor hamisította az
 what-ACC not admitted PV János that how.often forged the
 aláírásodat?
 signature-POSS.2SG-ACC
 ‘What did János not admit? How often did he forge your signature?’

²⁶ This sentence, as well as the next one, attempts to describe the situation on Pitcairn island (November 2004): if the island had imprisoned every man who committed sexual harassment in the past 30 years, there would be no men left to run life on the island. Notice that these sentences would also be ungrammatical without a *wh*-item in the relative clauses, due to the syntactic ill-formedness of the relative clause.

- (92) *Mit nem hallottál, hogy hányszor hamisította János az
 what-ACC not heard-2SG that how.often forged János the
 aláírásodat?
 signature-POSS.2SG-ACC
 ‘What did you not hear? How often did he forge your signature?’

While these patterns are certainly interesting, we will not address the effects of negation on scope marking in this article, as this would merit a study on its own. We hope to come back to these issues in future work.

4.3.4 Evidence from Slovenian and Frisian

Recall that on our semantic analysis, *wh*-RCs and noun-associate clauses denote different kinds of semantic objects, namely a set of properties in the case of *wh*-RCs, and a set of propositions in the case of noun-associate clauses. The latter is the normal type of embedded question.

Evidence to the effect that the embedded clause denotes a different semantic object in the case of relativization and noun-embedding comes from Slovenian and Frisian. As shown above, both languages have adjunct scope marking with relative clauses and noun-associates. Interestingly, the embedded question exhibits different word orders in the two cases. In relatives, the *wh*-element is found in situ; in noun-associate clauses it moves to Spec,CP, as is the case with ordinary embedded questions.²⁷ The examples here are repeated from (25)–(28) above:

- (93) ?**Hokker student** komt dertroch, dy't *hoefolle punten* hat?
 which student come-3SG through REL-that how.many points have-3SG
 (lit.) ‘Which student, who scores how many points, passes the exam?’
- (94) **Koji student** prolazi ispit, koji dobije *koliko poena*?
 which student pass-3SG exam which get-3SG how.many points?
 (lit.) ‘Which student, who scores how many points, passes the exam?’
- (95) **Wat** boadskip hast krigen, *wêr'tst hinnemoatst*?
 what message have-2SG got where-that-2SG to must
 (lit.) ‘What message, where do you have to appear, did you get?’
- (96) **Kakšno sporočilo** si dobil, *kam* da moraš iti jutri?
 what message AUX get-PTC where that must go tomorrow
 (lit.) ‘What message, where do you have to go tomorrow, did you get?’

In Sect. 4.3.1 above we discussed another prediction concerning noun-associate clauses, which is also confirmed by these languages. There, it was pointed out that in cases where the question is about genuine individual properties of the noun denotation, the embedded clause takes the form of a *wh*-RC, not a noun-associate clause. See examples (72), (73) for illustration.

²⁷ Recall that in Hungarian, the *wh*-item is fronted in both contexts, as in all other interrogative clauses (see Sect. 2.2. above).

4.4 Final revisions of the semantic analysis

In concluding our semantic analysis of adjunct scope-marking constructions, we would like to introduce one last revision to the interpretive procedure sketched above. In the preceding sections, we have made the simplifying assumption that the meanings of matrix question and embedded clause are composed separately, before the two combine to give the overall meaning. This semantic procedure is not in line with the observable syntactic facts, though. We have seen in connection with the binding phenomena in (19) and (20) in Sect. 2.2.1 that *wh*-RCs are base-generated as part of the *wh*-XP, from which they are later extraposed. We will encounter yet more evidence to this effect in Sect. 5.3. Assuming that the *wh*-RC is interpreted in its base position as part of the *wh*-XP, we therefore require a slight revision of the interpretive procedure for (45), as sketched in (46) in Sect. 4.1. Instead of combining with a full question denotation, the *wh*-RC first combines locally with the denotation of the *wh*-XP. In a second step, the resulting denotation combines with the predicate of the matrix clause, giving the full question interpretation. This is illustrated in (97). Notice that the *wh*-expression must introduce a covert restriction variable into the semantic derivation in (97a), for otherwise the denotations of *wh*-RC and *wh*-XP could not combine (see fn. 17).

(97)a. $[[\textit{which} \text{ (kind of) student}]] = Y\text{-kind of student} \ \& \ \wp(Y)$

b. $[[[\textit{wh-RC that scores how many points}]]] = \lambda P. \exists n [P = \lambda x. x \text{ scores } n \text{ points}]$
 $\Rightarrow \lambda\text{-abstraction over } \wp \text{ in (ia), functional application of the result to (ib):}$

c. $[[[\textit{which} \text{ (kind of) student } [\textit{wh-RC}]]]] = Y\text{-kind of student} \ \& \ \exists n [Y = \lambda x. x \text{ scores } n \text{ points}]$
 $\Rightarrow \text{combining with the predicate denotation plus existential closure:}$

d. $a \text{ Y-kind of student passes the exam} \ \& \ \exists n [Y = \lambda x. x \text{ scores } n \text{ points}]$
 $\Rightarrow \lambda\text{-abstraction over } Y, \text{ combining the result with the matrix question operator } Q:$

e. $[[[45]]] = \lambda p. \exists Q \in D_{et} [p = a \text{ Q-kind of student passes the exam} \ \& \ \exists n [Q = \lambda x. x \text{ scores } n \text{ points}]]$

f. = the set of propositions p such that there is an individual property Q , such p holds if a student with property Q , such that Q belongs to the set of properties of ‘scoring 0, 1, 2, . . . points’, passes the exam.

The reader may verify that this is equivalent to the denotation of (45) given in (46d) in Sect. 4.1.

5 Further syntactic properties: answer patterns, cross-linguistic variation and the height of RC attachment

After discussing the semantics of adjunct scope marking in Sect. 4, this final section turns to its syntactic properties again. In the first part we discuss the distribution of answer patterns that scope marking constructions can get. It will be shown that the availability of short answers follows from the theory of answers put forward in Merchant (2004). In the second part, we offer some tentative speculations as to the cross-linguistic availability of adjunct scope marking and the structural licensing of *wh*-RCs.

5.1 Answer patterns

As mentioned in Sects. 2.1 and 2.2, Hungarian scope marking questions can receive answers of two types: short answers, spelling out the embedded *wh*-variable only, or long answers, in which the embedded *wh*-variable is spelled out together with (some parts of) the embedded clause. In this section, we turn to the relevance of these facts for the syntactic analysis of scope marking constructions.

The task we face is to explain why there are two different answer patterns and what determines their distribution across types of scope marking. These questions are important as the distribution of short versus long answers can be thought to provide evidence for the direct and indirect dependency approach respectively (cf. Sect. 3.1), the idea being that a short answer is available when the embedded *wh*-expression occupies a matrix position at LF, parallel to cases of overt extraction. The lack of short answers, on the other hand, is often taken as evidence for the indirect dependency approach (cf. Sect. 3.2–3.3) — that is to say, since the embedded *wh*-expression stays part of the embedded clause at LF, the answer will have to spell out the whole embedded clause.

New developments in the study of answer patterns (Merchant, 2004) however, provide clear evidence that such construal of the facts is inconclusive for choosing between the direct or indirect dependency analyses. Using various pieces of evidence from all domains of syntax, Merchant (2004) shows that so-called *fragment answers* (answers consisting of non-sentential material to a sentential question) are sentential constituents in which everything but the fragment constituent has undergone ellipsis. During the derivation of such answers the fragment undergoes A-bar movement to the left periphery of the sentence that constitutes a full sentential answer to the question. Once it has moved to the periphery (into a specific focal functional projection), the rest of the sentence undergoes ellipsis, similarly to the mechanism of sluicing (PF-deletion of the constituent that is complement to the functional projection hosting the fragment phrase).

For the study of embedded questions, this means that the answer phrase corresponding to the embedded *wh*-expression always has to move to the left periphery of its containing clause. This predicts that *wh*-expressions that are embedded in an island cannot receive a short answer (in our terminology), as extraction out of islands is ungrammatical. The only available answer pattern for these constructions is one in which the answer spells out the whole island. For illustration of this generalization, consider the following question-answer pairs from English:²⁸

- (98) Did Abby claim she speaks GREEK fluently?
 (98A) No, Albanian.
 (99) Does Abby speak the same Balkan language that BEN speaks?
 (99A)a. *No, Charlie.
 b. No, (she speaks) the same Balkan language that Charlie does.

While (98) contains an argumental clause, extraction of which is felicitous (*Which language did Abby claim she speaks fluently?*), (99) contains a relative clause, which

²⁸ Since island-violating questions are ungrammatical to begin with, the triggering question needs to be a yes/no question with a focused item in place of the questioned variable. Consult Merchant (2004) for the validity of this test, as well as other tests that show the same result.

constitutes a complex noun phrase island (**Who does Abby speak the same Balkan language that speaks?*). The short answer is only available in the first case, but not in the latter. In other words, the availability of short answers correlates with the availability of extraction in a given configuration. When extraction can proceed, a short answer is felicitous, when extraction cannot proceed, the minimal structure that needs to be spelled out by the answer has to contain the island itself.

After this introduction to fragment answers, let us return to the Hungarian facts of scope marking. Section 2 above already introduced some basic facts in passing, but for expository purposes, the discussion has been tangential. We showed there that from among our examples, the only sentence type that can receive a short answer is example (6), repeated here as (100):

(100) Mit szeretnél, hogy hova utazzunk a nyáron?
 what-ACC like-COND-2SG that where travel-SUBJ-3PL the summer-ON
 (lit.) ‘What would you like, where should we go in the summer?’

(100A) Olaszországba.
 Italy-INTO
 ‘To Italy.’

This sentence features an object embedded clause, but it would be too hasty to conclude on the basis of this example alone that scope marking into object clauses always allows for a short answer. The following example shows that some other object clauses behave differently:²⁹

(101) Mit bántál meg, hogy hova utaztunk a nyáron?
 what-ACC regret-2SG PV that where travelled-3PL the summer-ON
 (lit.) ‘What do you regret, where did we travel in the summer?’

(101A)a. *Olaszországba.
 Italy-INTO
 b. Azt, hogy Olaszországba.
 that-ACC that Italy-INTO
 ‘The fact that (we travelled) to Italy.’

In this case, a short answer is infelicitous. Comparing (100) and (101), we notice that just like in the English case observed above ((98–99)), the availability of the short answer correlates with the availability of extraction from the embedded clause in the two cases. Extraction can proceed in the configuration in (100), as *szeretne* ‘would like’ is a bridge verb, but it cannot in (101), as *megbán* ‘regret’ is not:

(102) Hova_i szeretnéd, [hogy utazzunk t_i a nyáron]?
 where like-COND-2SG that travel-SUBJ-3PL the summer-ON
 (lit.) ‘Where would you like us to go in the summer?’

²⁹ When consulting speakers about these sentence types, we found that there is extreme individual variation between speakers as to the availability of short answers to the various questions above. Often the availability of the short answer is a matter of personal preference that does not seem to correlate with any well-defined syntactic or semantic property of a given question type. The above judgments concerning the answer patterns are thus indicative of a tendency rather than a categorical judgement. Notice also that (101A) reflects the judgment of those speakers for whom (101) is an acceptable scope marking construction. Some speakers do not find such sentences with factive predicates acceptable in scope marking.

Table 2 Answer patterns in Hungarian scope marking constructions

		<i>Short answer</i>	<i>Long answer</i>	<i>Extraction</i>	<i>Example</i>	
Standard scope marking into	Subject clause	*	✓	*	(7)	
	Object clause selected by	Bridge verbs	✓	✓	✓	(6/100/102)
		Non-bridge verbs	*	✓	*	(101/103)
	Oblique clause		*	✓	*	(8/104/105)
	Adjunct clause		*	✓	*	(9)
Scope marking into relative clauses		*	✓	*	(12)	
Scope marking into noun-associate clauses		*	✓	*	(22)	

- (103) *Hova bántad meg, [hogy utaztunk t_i a nyáron]?
 what-ACC regret-2SG PV that travelled-3PL the summer-ON
 (lit.) ‘Where do you regret that we went in the summer?’

A correlation of answer pattern with extraction possibilities can be observed with other sentence types as well. Subject clauses, oblique argument clauses, and adjunct clauses in standard scope marking constructions do not typically receive short answers. Neither do they allow for extractions. For reasons of space, we illustrate this for oblique argument clauses only (see Sect. 2.1. for the discussion of the other types).

- (104) Mitől fél Mari, hogy *ki* lesz az igazgató? (= (8b))
 what-FROM fear-3SG Mari that who be-FUT.3SG the director
 (lit.) ‘What does Mari fear that who will be the director?’

- (104A)a. *Péter.
 Péter.
 b. Attól, hogy Péter. (= (8A))
 that-FROM that Péter
 ‘(Mari fears that it will be) Péter.’

- (105) *Ki fél Mari, [hogy t_i lesz az igazgató]?
 who fear-3SG Mari that be-FUT.3SG the director
 (lit.) ‘Who does Mari fear that he will be the director?’

Scope marking into relative clauses and noun-associate clauses shows the same paradigm as subject clauses, oblique clauses and adjunct clauses in standard scope marking constructions: they do not allow for short answers, nor do they for extraction. The answer patterns in scope marking constructions are summarized in Table 2.

As this table and the above discussion shows, answer patterns in Hungarian scope marking structures are determined by the syntactic configuration in which the embedded *wh*-phrase finds itself in the question. The long answer is required with scope marking into syntactic islands. The short answer is only possible with scope marking into clauses that allow for extraction. Therefore, it can be concluded that the availability of short answers is fully predicted by the laws of ellipsis as defined in Merchant (2004).

5.2 The cross-linguistic availability of adjunct scope marking with relative clauses: locating the variation

As indicated in Sect. 2, adjunct scope marking is not a widespread phenomenon. In the languages we looked at, it only occurs in Hungarian, Frisian and Slovenian (see Sect. 2.3). In this section and the next, we try to locate the source of the observed variation in the availability of adjunct scope marking, and point out what properties a language needs to have to allow for adjunct scope marking. The discussion will concentrate on adjunct scope marking into relative clauses, as this is the structurally more complex of the two constructions discussed in this paper. At the end of Sect. 5.3 we turn to scope marking into noun-associate clauses as well. Since the discussion is based on a small number of languages, it is highly tentative in nature, suggesting possible ways of thinking about cross-linguistic variation, rather than offering final solutions.

To begin the discussion, recall Sect. 4.1 above, where it was shown that the semantic analysis of adjunct scope marking with relative clauses is based on the fact that (i) the matrix *wh*-expression is type-coerced to denote an individual property, and (ii) the relative/noun-complement clause that modifies the matrix *wh*-phrase contains a Q_{RC} operator, located in the C-domain. This operator, like any other question operator, takes sentential objects and raises their type, yielding a set of such objects. The semantics we offered for this phenomenon is not language-specific when it comes to type-coercion. We have seen in Sect. 4.1.2 that the availability of a property reading for the matrix *wh*-item is not a sufficient criterion for licensing adjunct scope marking (see (65) above). Thus, the availability of type-coercion cannot be responsible for cross-linguistic variation. Since the semantics is unable to predict variation, we have to conclude that the cross-linguistic variation concerning the availability of adjunct scope marking has to follow from syntactic factors instead.

The syntactic property that is responsible for cross-linguistic variation is arguably related to the C-domain of the embedded sentence. Two things motivate this view. The first is the assumption that adjunct scope marking into relatives requires the presence of a Q_{RC} question operator in the relative clause, an assumption that our semantic analysis rests on. Such a question operator, like any question operator, needs to be located in the complementizer domain of the clause. The other indication that the C-domain is responsible for licensing adjunct scope marking comes from the behaviour of *participial* relative clauses that license *wh*-constituents with an interrogative meaning.

The cases of scope marking into relative clauses that we looked at in this paper all contained *finite* relative clauses. As we have shown, such relative clauses can contain a *wh*-phrase with question interpretation in languages like Hungarian, provided the head of the relative clause is a *wh*-phrase itself. Interestingly, *wh*-phrases with question interpretation can also occur in *non-finite* relative clauses – in more languages than just those that exhibit adjunct scope marking. Moreover, participials do not require that the head of the relative clause be itself a *wh*-phrase (i.e. they do not instantiate a scope marking construction). Consider for example sentences (106) and (107) from German, a language without scope marking into relative clauses. (106) shows that participial relative clauses can contain interrogative *wh*-phrases, while (107) shows that finite relatives cannot, regardless of the *wh*-nature of the head constituent:

- (106) Ein [wie schnell fahrendes] Auto möchtest du kaufen?
 a how fast going car like-2SG you buy-INF
 (lit.) ‘A how-fast going car would you like to buy?’
 ‘What kind of car would you like to buy, a car that can go how fast?’
- (107)a. *Du möchtest ein Auto kaufen, [das *wie schnell* fährt]?
 you like-2SG an auto buy-INF that how fast go-3SG
 b. *Was für ein Auto möchtest du kaufen, [das *wie schnell* fährt]?
 what for an auto like-2SG you buy-INF that how fast go-3SG

As the translation of (106) indicates, the meaning conveyed by a participial clause is the same type of meaning that is conveyed by adjunct scope marking discussed in this article: the sentence is a question about an individual property of the NP it modifies.

While the precise syntactic analysis of participial relative clauses is beyond the scope of this paper, one thing seems to be beyond doubt concerning their structure: participial clauses differ from finite relative clauses in that they have a less articulate or a completely missing C-domain (Keenan, 1985, De Vries, 2002). As can be seen in (106), for example, the participial clause contains no relative pronoun or relative complementizer element. We contend that due to the lack of an articulate C-domain the *wh*-phrase *wie schnell* ‘how fast’ in (106) can percolate its [+wh] out of the participial clause onto the containing NP and turn the whole NP into a *wh*-phrase. In finite relative clauses, this percolation process cannot take place, as structural conditions are not met: percolation is blocked by the presence of the articulated C-domain in finite relative clauses. Participial relative clauses therefore provide indirect evidence for our contention that the C-domain is crucial for the licensing of adjunct scope marking.

The question that remains is, what parts of the C-domain are relevant in the licensing of adjunct scope marking? As we mentioned before in our semantic analysis, adjunct scope marking with relative clauses is possible only in languages that have a special (relative) question operator Q_{RC} . Languages that have such a question operator in their lexicon allow for adjunct scope marking in principle, provided additional conditions on adjunct scope marking are satisfied, while those which lack such an element do not.³⁰ Taking the relative question operator to occupy a head position in the CP-domain, this view is in line with the common assumption that cross-linguistic variation follows from variation in the inventory of functional heads (Chomsky, 1991; Fukui, 1986).

What languages can accommodate such a Q_{RC} question operator? To answer this question, we need to take a closer look at the left clausal periphery in languages that show adjunct scope marking. Taking Hungarian as the prime example of an adjunct scope marking language, one is tempted to interpret the availability of relative question operators in the C-domain to be the result of this language having structurally different positions for relative pronouns and question words/question operators. The surface position of question words is FocP, a low quantifier position, while that of relative pronouns is in the C-domain. The more exact location of relative pronouns is pinpointed by Kenesei (1994): relative pronouns are lower than CP and higher than the focus position, FocP.³¹

³⁰ A legitimate question to ask is whether there is morphological evidence for the existence of such an operator in languages. We do not know of any language that overtly spells out such an operator in relative clauses. Our prediction, however, is that such languages can exist.

³¹ Kenesei uses three arguments to argue for this position, of which we present two. First, relative pronouns can be preceded by topics in free relatives (i) (although not in headed relatives (ii)):

(108) [CP [RelP REL(ative pronoun) [TopP ... [FocP *wh* [...]]]]

The position responsible for question *interpretation* in Hungarian is CP, in the view of Lipták (2001).³² Since CP is responsible for question interpretation, this must also be the position where the relative question operator is found:

(109) [CP_{QRC} [RelP REL(ative pronoun) [TopP ... [FocP *wh* [...]]]]

The alignment of Q_{RC} and the relative pronoun in (109) shows that there is no structural clash between relative and question specification of the clause. They are not found in the same functional projection, as there are two distinct projections hosting them.

Based on the properties of Hungarian, we can formulate the following generalization: adjunct scope marking is possible in languages where the complementizer layer contains not only a single CP projection, but several C-related projections. Adjunct scope marking occurs in languages with a split CP. In other words, the relevant aspect of cross-linguistic variation in adjunct scope marking is that between split functional heads, as opposed to fused ones (Bobaljik & Thrainsson, 1998). In split CP languages, the sublayer of CP responsible for question interpretation can be different from the position which is responsible for relative clause formation, allowing for scope marking into relative clauses.

Note that although this formulation comes from observations about the structural properties of the Hungarian CP-domain, it readily extends to the other two adjunct scope marking languages in our sample, Slovenian and Frisian. According to Hoekstra (1993) and Marvin (1999), both Frisian and Slovenian have a rich CP system comprising more than one functional projection. The split CP system is clearly present in the case of relative clauses as well, evidenced by the material that surfaces to the left of the lowest complementizer in these languages. Consider the following Frisian sentence in which one can identify a relative pronoun (*dy* 'which') and a distinct complementizer element (the cliticized 't):

(110) De film dy 't ik juster sjoen ha.
 the film which that I yesterday watched have
 'the movie I have watched yesterday'

Similarly, the following relative constructions show that the same state of affairs obtains in Slovenian. (111) illustrates that in one type of relativization one finds two independent complementizers, *ki* '(relative) that' and *da* 'that', which according to Marvin (1999) are both base-generated in the left periphery, in distinct complementizer positions (see also (73) above):

Footnote 31 continued

- (i) Pétert aki látja, szóljon.
 Péter-ACC REL-who see-3SG call-IMP-3SG
 'Whoever sees Péter should let me know.'
- (ii) ??*Az a fiú, Pétert aki látja, szóljon.
 that the boy Péter-ACC REL-who see-3SG call-IMP-3sg
 'The boy who saw Péter should let me know.'

Second, historical data show that the finite complementizer *hogy* 'that' could co-occur with the relative pronouns in a lower position. See Kenesei (1994) for further details.

³² Surányi (2003) presents an account of ordinary questions in which FocP itself is the locus of question interpretation, where the <+wh> feature is checked. Notice that we do not follow his approach here as it would complicate our semantic account above in non-trivial ways.

- (111) To je študent, [CP₁ ki [CP₂ da [ga je profesor vrgel na izpitu]]].
 this the student that that him the professor failed on exam
 ‘This is the student that the professor (supposedly) failed at the exam.’

The presence of two base-generated complementizers strongly argues for a split CP in Slovenian relative clauses. Using this as evidence, Marvin analyses the *wh*-relativization strategy in the same way, i.e. involving a split CP, as indicated in (112):

- (112) To je študent, [CP₁ katerega [CP₂ da [IP je profesor vrgel na izpitu]]].
 this the student whom that the professor failed on exam
 ‘This is the student that the professor failed at the exam.’

Following Hoekstra (1993) and Marvin (1999) in attributing a split CP system to these languages, we thus assume that it is the split CP-system of these languages that makes enough space available to locate the relative question operator in a position distinct from that of the relative pronoun itself. A possible position for the Q_{RC} operator is shown in the following structures:

- (113) **Hokker student** komt dertroch [CP₁ Q_{RC} [CP₂ dy [CP₃ 't *hoefolle punten* hat]]]?
 which student comes through REL that how.many points has
 (lit.) ‘Which student, who scores how many points, passes the exam?’
- (114) **Koji student** prolazi ispit... [CP₁ Q_{RC} [CP₂ koji [CP₃ dobije *koliko poena*]]]?
 which student passes exam which gets how.many points?
 (lit.) ‘Which student, who scores how many points, passes the exam?’

As illustrated here, the split CP system of Frisian/Slovenian provides the possibility of Q_{RC} appearing in a position distinct from that of relative pronouns. Notice that the position of Q_{RC} can also turn out to be lower in the structure than the relative complementizer/pronoun. Whichever turns out to be the case, what matters for our purposes is that both (113) and (114) share the property of Hungarian (109) that the location of relativization and that of question interpretation are distinct in the left periphery. As this property is shared by all languages with adjunct scope marking in our sample, we hereby propose that this is a necessary condition underlying adjunct scope marking into relative clauses: adjunct scope marking into relative clauses is dependent on the availability of a split CP in which the structural positions of relativization and question formation are distinct. Such a split CP allows for the successful placement of relative Q-operators inside the relative clause.

At the same time, it is immediately clear that this is not the *only* condition that a language needs to satisfy in order to have adjunct scope marking. There are many languages that have an articulated split CP system, such that they could in principle accommodate a Q_{RC} operator, yet they lack adjunct scope marking. Dutch, for example, has a split CP (Hoekstra & Zwart, 1994), similar to Frisian, but does not have ordinary scope marking, unlike Frisian.³³ We have to conclude then that the requirement for an articulated CP is a necessary but not a sufficient condition for the availability of scope marking. Next to this, there must be other conditions that play a role in the licensing of adjunct scope marking. One obvious condition is a successful licensing of the Q_{RC} operator, which can only take place under specific structural conditions. We turn to this in the next section.

³³ Another counterexample is Bavarian, where the presence of multiple complementizers (*ob dass* ‘whether that’) in a clause, as well as the lack of doubly filled comp effects (Bayer, 1984) might argue for a split CP analysis. Yet Bavarian does not have adjunct scope marking (Eric Fuss, p.c).

5.3 Licensing properties of Q_{RC} and the height of relative clause attachment

Next to the availability of sufficient structural space inside the relative clause, adjunct scope marking into relative clauses also seems to require that the Q_{RC} operator in the relative clause be licensed from outside the relative clause. Licensing has to be done in a local manner by a *wh*-item that the relative clause modifies (the head noun of relativization). Arguments to this effect come from the following considerations, based on Hungarian.

As shown in (15) above, repeated here as (115), structures in which the relative question clause finds itself in a matrix indicative clause are ungrammatical. The embedded *wh*-phrase cannot have question interpretation:

- (115) ***Az** megy át a vizsgán [aki hány pontot szerez]?
 that go-3SG PV the exam who-REL how.many point-ACC score-3SG
 (lit.) ‘Who(ever) scores how many points, passes the exam.’

We have formulated this restriction by saying that the head constituent that the relative modifies needs to be a *wh*-phrase in grammatical cases of scope marking. It is important to notice that the ungrammaticality of (115) must follow from syntactic reasons, not semantic ones. This is indicated by the fact that it is possible to construct declaratives of the type in (115) which are interpretable in principle. Consider (116a) with the possible semantic analysis in (116b).

- (116)a. *[Aki kire szavaz] buta.
 REL-who who-FOR vote-3SG dumb
 ‘That who votes for whom is dumb.’

- b. [[(116a)]] = [[RC]] ([[dumb]])
 = $(\lambda P. \exists y [P = \lambda x. x \text{ votes for } y]) (\lambda z. z \text{ is dumb})$
 = $\exists y [\lambda z. z \text{ is dumb} = \lambda x. x \text{ votes for } y]$
 = There is some person *y* such that the set of people voting for *y* equals the set of dumb people.

According to our analysis of *wh*-RCs from Sect. 4.1.1, the relative clause in (116a) would denote an object of the same semantic type as the *wh*-RCs in (41/44): it would be of semantic type $\langle et, t \rangle$ and denote a set of individual properties of the kind ‘voting for George Walker Bush Jr.’, ‘voting for John Kerry’, ‘voting for Gerhard Schröder’, etc. This object of type $\langle et, t \rangle$ could functionally apply to the predicate *buta* ‘dumb’, which is of type $\langle et \rangle$, yielding a truth value with truth conditions as specified in the last line of (116b). However, despite being interpretable in principle, (116a) is ungrammatical. This shows that the matrix clause has to be an interrogative clause. Moreover, it has to be an interrogative of a particular kind, for example (116) remains ungrammatical even when it is assigned a *yes/no* question intonation. This shows that the matrix interrogative has to be a *wh*-interrogative. Furthermore, it has to be a *wh*-interrogative in which the relative clause modifies, i.e. is base-generated next to, the *wh*-expression. This is shown by the ungrammaticality of (117), where the relative clause does not modify the *wh*-expression *kit* ‘whom’ in the matrix:

- (117) *Kit szeret [aki hol dolgozik]?
 who-ACC love-3SG REL-who where work-3SG
 ‘Who does the person that works where love?’

We therefore conclude that the underlying structure of grammatical *wh*-RC constructions is as illustrated in (118) (see (19)–(20) for additional arguments from binding to

the effect that the *wh*-RC originates from and is interpreted in the position next to the *wh*-phrase):

(118) [_{matrix} CP[*wh*-XP [RC...Q_{RC}... *wh*...]]]

This structure intends to capture the fact that the relative clause containing the Q_{RC} operator needs to be base generated next to the matrix *wh*-expression, with which it stands in a modification relation. Furthermore, the relative clause combines with the entire *wh*-XP, and not with the head noun alone.

The latter condition is uncontroversially satisfied when the relative clause combines with a phrasal *wh*-word like *who*, *what*, *when*, etc, as there is no other adjunction site for the relative clause in these cases. It is more controversial in cases where the matrix *wh*-phrase is complex and consists of both a *wh*-part and a non-*wh*-part, as in *which student*, *how many melons*, etc. The standard assumption for the latter cases is that a restrictive relative clause directly combines with the head noun (Partee, 1975). We would like to contend, however, that these constructions do not constitute instances of relative restriction of the head noun (N), as shown by the semantic derivations above. Instead, the relative clause serves to restrict a variable introduced by the *wh*-item located higher, in D. This is reflected by the more complex type $\langle\langle e, t \rangle, t \rangle$ of the *wh*-RC. Hence there is no semantic motivation for the relative clause to combine with the head noun directly. What's more, it could not combine with the head noun semantically without resulting in non-interpretability. Since we believe the RC cannot combine with the D-head directly, we contend that the *wh*-RC combines at the earliest possible point in the derivation, which is at the *wh*-XP-level.

Note that the present analysis of *wh*-RCs entails that there are at least two kinds of restrictive RCs in Hungarian: the classical instance, where the RC restricts and combines with the head noun; and *wh*-RCs, where the RC restricts a variable introduced by the *wh*-expression (in D) and combines with the entire *wh*-NP at the phrasal level. Notice that the mere presence of a *wh*-item in the relativized NP does not force the relative clause to adjoin at the phrasal level. Consider (119), where the relative clause modifies and combines with a head noun inside a *wh*-expression:

(119) Which student that is in your class speaks French?

It seems then that it is the presence or absence of a *wh*-expression *within* the relative clause that determines its adjunction site (qua interpretability in the sense of Partee, 1975). This recognition leads us to formulate another important condition on the availability of adjunct scope marking cross-linguistically. For relative clause scope marking to go through, a language must be able to adjoin relative clauses on a *wh*-item at the level of *phrases*: the whole DP (e.g. *which student*) in the cases discussed above. It is well-known (since at least Bach & Cooper, 1978) that the availability of low/high attachment sites is subject to variation across languages. Our prediction is that adjunct scope marking will only occur in those language in which high adjunction is possible.

To wrap up, the discussion here and in the previous section has addressed the cross-linguistic availability of adjunct scope marking into relative clauses. We concluded that adjunct scope marking can only occur in languages that satisfy the syntactic and lexical conditions listed in (120):

(120) *Conditions on adjunct scope marking with relative clauses*

- (i) the availability of a Q_{RC} relative operator in the lexicon of the language

- (ii) the availability of a split CP in which the location of relativization and that of question formation (placement of *wh*-phrase, placement of Q_{RC}) are separate
- (iii) the licensing of the Q_{RC} by adjunction of the relative clause at the phrase level

Due to the limitations of our rather restricted cross-linguistic database on adjunct scope marking, with (120) we do not aim higher than to set the first steps towards comparative research on these construction types.

Before closing this section, we must spell out the cross-linguistic availability of scope marking with noun-associate clauses. This task is quite easy, as the legwork has already been done above for relative clauses.

The structural conditions on noun-associate clause scope marking are very similar to those on relative clauses with one exception. Condition (i) carries over fully: the proper meaning of a noun-associate clause can be derived if we assume that there is a Q question operator present in the embedded clause. Since the nominals that associate with such clauses do not select for a question (see Sect. 2.2.2), the presence of this Q question operator is not a selectional property. Condition (iii) carries over in the same way as in (120): the question interpretation of the embedded *wh*-phrase is only available if the embedded Q operator is licensed by a *wh*-nominal that the associated clause modifies. Without such a *wh*-NP, the sentence is ungrammatical:

- (121) *Péter azt az üzenetet kapta [hogy hova kell mennie]?
 Péter that the message-ACC got-3SG that where need go-INF-3SG
 lit. 'Péter got a message that he has to go to where?'

The only point where noun-associate clauses depart from relative clauses is condition (ii). This condition does not get fulfilled in noun-associate clauses, as noun-associate clauses are formally identical to embedded argumental clauses, which are known to be able to host questions. For this reason, the placement of the embedded *wh*-element and a question operator in them is expected to pose no problem, as the embedded clause can structurally be a question (accommodate a *wh*-phrase, an interrogative complementizer, etc.). These considerations give us the following list of conditions that characterize the availability of noun-associate scope marking therefore can be summarized in (122):

- (122) *Conditions on adjunct scope marking with noun-associate clauses*
- (i) the availability of a Q in non-selected interrogative clauses
 - (ii) the licensing of this Q by adjunction to the *wh*-nominal at the phrase level

Because noun-associate clauses are subject to fewer conditions, we would expect them to occur more often across languages than relative clause scope marking. We did not manage to check this prediction on a large scale. Nonetheless, it seems to be on the right track for individual languages, e.g. when we consider German again. In German, scope marking into noun-associate clauses is marginally accepted by some speakers, whereas relative clause scope marking is accepted by no speaker (see fn. 12).

6 Summary and relevance of findings

This paper introduced and analysed a curious construction in which a *wh*-expression with question interpretation is found in a relative clause or in an unselected noun-asso-

ciate clause. We showed that the grammaticality of such embedded questions depends on the nature of the head constituent they modify: the head has to be a *wh*-phrase, too. We have identified these constructions as instances of *scope marking* structures (calling them *adjunct scope marking*) as they exhibit the characteristic properties of scope marking constructions in general.

As far as their analysis is concerned, we started out by reviewing the literature on scope marking, in order to see if previous accounts could account for these new data. We found that of the two main kind of approaches to scope marking (the direct and the indirect dependency approaches), only one type of indirect approach can account for these facts: the indirect dependency account à la Dayal (1994, 2000), which analyzes the embedded *wh*-clause as a semantic restriction on the matrix question. We interpreted our data in a compositional fashion, applying Dayal's analysis to our data with two modifications that mainly consisted in generalizing the interpretive procedure put forward in Dayal (2000). First, scope marking is not only possible with matrix questions about propositions, but — as is the case with scope marking into relative and noun-associate clauses — also with questions about individual or other kinds of properties. Second, a process of general question formation raises the semantic type of arbitrary syntactic clauses containing a *wh*-item, such that the resulting semantic object is a set of entities of the type typically denoted by these clauses. When applied to relative and noun-associate clauses containing a *wh*-item, generalized question formation effects that these clauses are of the right semantic type to restrict the matrix question over properties.

In the syntactic part of the analysis, we showed that the internal properties of the relative/noun-associate clause in adjunct scope marking are like that of run-of-the-mill relative and noun-associate clauses, except they contain a special question complementizer, Q. The presence of the Q operator ensures that these embedded clauses containing a *wh*-expression denote a set of properties because of the semantic procedure of generalized question formation. Basing ourselves on data from few languages, we put forward the tentative claim that adjunct scope marking with relative clauses is only available in languages with a split CP system, where the Q operator can be located in a position distinct from that of relative pronouns. Another requirement for adjunct scope marking to be possible is a relatively high attachment site of the relative clause/noun-associate clause on the nominal it modifies: attachment has to apply at the level of the phrase. These are the beginnings of a cross-linguistic theory, to be verified against empirical evidence from more languages in the future.

We believe the research presented on these pages has important repercussions both for the study of questions in general and for the study of scope marking constructions in particular. It must be emphasized that our intention concerning the latter was primarily to bring new facts into the theoretical discussion and to underscore the fact that these new data receive an adequate analysis in the indirect dependency framework of Dayal's, thereby supporting the feasibility of Dayal's account in general.

We hope to have shown that our data qualify to be handled under the theoretical construct that is called scope marking, yet we are aware that this might raise eyebrows with those who would like to keep the term scope marking for constructions in which the scope marker is meaningless. For the sake of these, we want to stress the point that our analysis (or that of Dayal's) would not be disqualified should it turn out that these data are better not treated as instances of scope marking after all. Scope marking is a theoretical concept, its definition is a largely theory-internal affair. When providing a definition, a lot depends on one's convictions about a particular theory. We have

adopted a rather loose definition such that our data fall under its scope. We think we are justified in doing so, as we know of no other terminology that would capture our data as fruitfully as scope marking does. Future research can prove if we are right in this.

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