

Arabic Relativization Patterns: A Unified HPSG Analysis [□]

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Summary. Classical Arabic (CA) and Modern Standard Arabic (MSA) have several relativization patterns, including relative clauses with and without relativizers and adjectival modification patterns. Previous generative work has targeted several areas, but there is no analysis which covers all relativization patterns in any generative framework. We generalize previous HPSG analyses by Melnik (2006) and Haddar et al. (2009) and provide an analysis covering all relativization patterns, including some data which have not received attention in the generative literature. It will be shown that the phenomena can be analyzed as arising from the interaction of basic relativization constructions known from English with language-specific phenomena that also occur outside of relative clauses.

Keywords: Arabic, relative clauses, adjectival modifiers, broad subjects

1 Phenomena and Previous Analyses

1.1 Relative Clauses

Arabic relative clauses (in the narrow sense, excluding adjectival modifiers) can be classified into *unmarked* clauses without a relativizer and *marked* clauses with relativizer. Unmarked relative clauses (almost, see below) always modify an indefinite NP:

- (1) a. risaal-at-un_i [hammala-nii(=haa)_i Mahmud-un]
letter-SG.F-NOM.INDEF gave-me=it.SG.F Mahmud-NOM
‘a letter Mahmud gave me’ (MSA)
- b. ?ahaadiith-u_i [quddimat (hiya)_i]
lectures-NOM.INDEF were.presented PRON.3FS
‘lectures which were presented’ (MSA)

As illustrated by the examples, both resumptives or gaps can occur. Only gaps are subject to island constraints. Nominal and adjectival predicates show nominative case marking:

- (2) mra?at-i-n [Zaydun ?abuu=haa]
woman-GEN-INDEF Zayd-NOM father-NOM=her
‘of a woman whose father is Zayd’

For marked relative clauses, two sets of relativizers have to be distinguished. The ‘Inflected Relativizers’ *llaðii* etc. mark definite relative clauses which may be free or modifying. They agree with the antecedent in case, number and gender (3a). The ‘Uninflected Relativizers’ *man* ‘who’ and *maa* ‘what’ mark free relative clauses and do not show case marking, nor agreement in any other feature other than animacy (3b).

[□]I would like to thank Armin Buch and two anonymous reviewers for their helpful comments.

- (3) a. l-marʔ-at-ayni_i [llatayni raʔataa=ka]
 DEF-woman-F-DU.OBL RELTVZR.F.DU.OBL they.saw=you
 ‘the two women that saw you’
- b. [maa raʔayta=(hu)_i fii l-bayti]_i
 RELTVZR.INANIM you.saw=(it) in the-house
 ‘what you saw in the house’

Haddar et al. (2009) present an HPSG analysis of Arabic marked relative clauses under which the relativizer is a marker (in the sense of Pollard and Sag 1994) selecting a VP. While the analysis accounts for marked relative clauses where the extracted element is the highest subject as in (3a), it is not obvious how it can be extended to cover cases like (3b), where the extracted element is not the highest subject. Furthermore, unmarked relative clauses and free marked clauses are not included in their analysis.

1.2 Adjectival Modifiers: Direct Attribute and Indirect Attribute

The other type of relativization patterns is adjectival modification. The simpler pattern, also called the ‘Direct Attribute’, is similar to ordinary adjectival modification in English, but the adjective agrees with the modified NP in number, gender, animacy/humanness, case and definiteness (4). Adjectival phrases can also be used as independent NPs:

- (4) a. (buyuut-i-n) [zadiid-at-i-n] b. (l-buyuut-i) [l-zadiid-at-i]
 house.PL-GEN-INDEF new-F.SG-GEN-INDEF DEF-house.PL-GEN DEF-new-F.SG-GEN
 ‘of new (houses)’ ‘of the new (houses)’

In the ‘Indirect Attribute’ (Polotsky, 1978) construction, the adjective has a subject that is distinct from the modified NP, which is linked to a resumptive pronoun inside the adjectival phrase. The adjective agrees with the head only in case and definiteness, while agreeing with its subject with respect to number, animacy, and gender. The phrase may be attributive (5a-b) or free (5c). The resumptive may be embedded arbitrarily deeply and is not subject to island constraints.

- (5) a. buyuut-i-n_i [haasʕil-i-n fii=haa_i l-ħariiq-u]
 house.PL-GEN-INDEF broken.out.M.SG-GEN-INDEF in=them.PL DEF-fire.M.SG-NOM
 ‘houses in which the fire broke out’
- b. s-sayaar-at-u_i [l-muʕtarii=haa_i ʔahmad-u]
 DEF-car-F.SG-NOM DEF-bought.M.NOM=it.F.SG Ahmad-NOM
 ‘the car that Ahmad bought’
- c. maʕa [l-munkasir-at-i quluub-u=hum_i]_i
 with DEF-broken-PL.INANIM-GEN heart.PL-NOM=their.ANIM
 ‘with those whose hearts are broken’

2 The Structure of Adjectival Modifiers

The question that arises is what the structure of these four relativization patterns is and whether they can be reduced to more general patterns. In traditional and modern Arabic linguistics, the two adjectival modification patterns are usually discussed as distinct and apparently unrelated structures (*naʕt ħaqiiqiyy* and *naʕt sababiyy*). The HPSG analysis by Melnik (2006) introduces two phrasal types for the two structures, but expresses some properties that both types share on a more general level. In the direct attribute, represented by *subject-non-fin-rel-cl*, the modified

NP controls the unrealized subject argument of the adjective. The type of the indirect attribute, *non-subject-non-fin-rel-cl*, establishes the coindexation of the modified NP and a resumptive pronoun via the nonlocal feature RESUMP(TIVE), which is similar to SLASH. The first type corresponds to the analysis of English reduced relatives by Sag (1997), while the second type is more similar to standard HPSG analyses of relative clauses.

Doron and Reintges (2005) argue that the indirect attribute is based on the phenomenon of ‘broad subjects’. In this phenomenon, an NP is extracted and appears in a subject-like position, often in a higher clause, leaving a resumptive pronoun. This construction can result in simple preposing (6a) similar to English topicalization, but the broad subject can also participate in raising or control (6c). (6b) and (6c) exemplify this. In the more simple (6b), which syntactically corresponds to its English translation, ζAmr -un is realized as the subject of the subject-to-subject raising verb *kaana*. In (6c), the subject ζAmr is realized as a dependent of *yaraa* ‘sees’, while the object *Hind* becomes the broad subject and is realized as the subject of the raising verb, as shown by the feminine agreement on *kaan-at*. The canonical object position of *Hind* is filled by a bound resumptive pronoun (*haa*).

- (6) a. Hind-un_i [yað^sunnu ζAmr -un [ʔanna=ka raʔayta=haa_i]]
 Hind(f)-NOM he.thinks Amr(m)-NOM that=you you.saw=her
 ‘Hind_i (f), Amr (m) thinks that you saw *t_i*’
- b. ζAmr -un kaan-a [yaraa Hind-an]
 Amr(m)-NOM used.to-MASC sees=her Hind(f)-NOM
 ‘Amr (m) used to see Hind (f)’
- c. Hind-un_i kaan-at [yaraa=haa_i ζAmr -un]
 Hind(f)-NOM used.to-FEM sees=her Amr(m)-NOM
 ‘Hind_i (f), Amr (m) used to see *t_i*’

Given this phenomenon, the direct attribute, and an analysis which assimilates broad subjects to normal (‘narrow’) subjects, the existence of the indirect attribute is actually *expected*: While the modified NP is coindexed with the lexically required (‘narrow’) subject in the direct attribute, it is coindexed with a broad subject in the indirect attribute. In (5a), for instance, *buyuut* and *haa* are coreferent with an (unrealized) broad subject of *haasⁱil-i-n*. This treatment is supported by the distribution of resumptives and gaps: Like the indirect attribute, broad subjects do not leave gaps¹, and their resumptives are not subject to island constraints.

One might go one step further and derive all relative clauses with resumptives using the broad subject construction. However, extraction of the highest subject is not possible in unmarked nonfinite relative clauses without a resumptive:

- (7) buyuut-i-n [ʒadiid-at-u-n *(hiya)]
 house.PL-GEN-INDEF new-F.SG-NOM-INDEF they
 ‘of houses that are new’

We therefore only analyze adjectival modifiers using the broad subject construction, while marked and unmarked relative clauses are analyzed as unbounded dependency constructions.

3 An HPSG Analysis

1 Arabic as a pro-drop language has zero resumptives. The distribution of zero elements in the canonical position of a broad subject is the same as the distribution of pro-drop, i.e. they can always be analyzed as empty resumptives.

3.1 An Analysis of Broad Subjects

We follow Taghvaipour (2005) in assuming a uniform treatment of resumptives and gaps using the SLASH feature, whose elements are objects of type *ud-object* with the features LOCAL and UD-TYPE, for which the types *resumptive* and *gap* are appropriate. The advantage over using separate features SLASH and RESUMPTIVE (Vaillette 2001, 2002) is that constructions allowing gaps also allow resumptives in Arabic. Broad subjects are connected to the resumptive by a nonlocal dependency with UD-TYPE *resumptive*. Unlike English topics, which are realized constructionally in a *head-filler-phrase*, Arabic broad subjects are introduced on the lexical level by an adaptation of the *SLASH Amalgamation Constraint* (Bouma et al., 2001) into the SUBJ list of the predicate in whose projection the broad subject is realized or from whose domain it is raised.² This is the SUBJ list of *yaḏʿunnu* in (6a) and the list of *yaraa* in (6c). This account, which is similar to the analysis of English missing object constructions by Grover (1995), explains why broad subjects behave very much like ordinary, lexically required subjects and allows a straightforward analysis of the data in (6). We thus obtain the analyses in Figure 1 (appendix). (6a) uses the normal subject-head-phrase (Figure 1,a), while (6c) uses the standard analysis of raising verbs (Figure 1,b). (6b) is a standard raising construction as in English.

3.2 Basic Structure of Relativization Constructions

Adopting a surface-oriented approach, we assume that the head of an Arabic relative clause is the relativizer in marked clauses and the highest predicate in unmarked clauses and adjectival modifiers. Both assumptions are justified by the case-marking of the putative heads visible on case-marked relativizers and adjectival predicates. A second justification is provided by the distribution of gaps. Gaps are possible only if the highest predicate is a finite verb³ or if the clause has a relativizer. Thus, the possibility of gaps depends on the category of the putative head, and not just on the category of the predicate, nor just on the presence of a relativizer.

In the surface-oriented account by Sag (1997), English relatives are analyzed as clauses with a nominal *synsem* object as MOD value. While this analysis could be used for modifying relativization patterns in Arabic, it is not obvious how free relatives can be captured. Müller (1999) analyzes free relative clauses in German using a unary projection introducing an XP over a relative clause. We will adopt this solution (but without using empty relativizers) and generalize it to all relative clauses, i.e. we treat all relative clauses as NPs: (we use *rel-phrase* rather than *rel-clause* because NPs are not clauses)

$$(8) \quad rel\text{-}phrase \rightarrow \left[\begin{array}{l} N\text{-}HD\text{-}DTRS \quad \langle \langle [clause\text{-}or\text{-}relativizer\text{-}with\text{-}clause] \rangle \rangle \\ SYNSEM|LOC|CAT \quad \left[\begin{array}{ll} HEAD & noun \\ COMPS & \langle \rangle \end{array} \right] \end{array} \right]$$

The type *clause* is defined in the sense of Sag (1997). *relativizer-with-clause* is a *head-complement-phrase* consisting of a relativizer and a clause. Modifying relative clauses are instances of *relative-phrase* with MOD value of type *synsem*, while free relatives have MOD *none*. The motivation for assuming this more complex structure for all Arabic relative clauses is that most Arabic relativization patterns can be used both as modifiers and freely, without major syntactic differences.⁴ In fact, all relativization patterns are attested as free relatives in Classical

2 A feature LINEARIZATION (appropriate for *cat*) indicating the position of an argument relative to the head can be used to ensure that the broad subject is realized in a clause-initial position. This feature is also motivated by asymmetries in subject-predicate agreement, where agreement on the verb depends on the relative position of the subject.

3 Gaps in unmarked relative clauses are sometimes considered ungrammatical, but they are attested in corpus data.

4 The full paper will outline a basic analysis of the semantic differences.

Arabic.

A constraint enforcing coindexation and agreement of modifying relative clauses with the modified NP value can be stated as follows (the complex antecedent could be eliminated by introducing *mod-rel-phrase* and *free-rel-phrase*):

$$(9) \left[\begin{array}{l} \textit{relative-phrase} \\ \text{SS|L|C|H|MOD} \quad \textit{synsem} \end{array} \right] \rightarrow \left[\begin{array}{l} \text{SS|L} \\ \text{CAT|HEAD} \end{array} \left[\begin{array}{l} \text{CONT|INDEX} \quad i \\ \text{CONCORD} \quad \boxed{1} \\ \text{MOD|LOC} \end{array} \left[\begin{array}{l} \text{CONT|INDEX} \quad i \\ \text{CAT|HEAD} \quad \left[\begin{array}{l} \textit{noun} \\ \text{CONCORD} \quad \boxed{1} \end{array} \right] \end{array} \right] \right] \right]$$

Rel-phrase has the subtypes *adjective-rel-phrase* and *slash-rel-phrase*, where *adjective-rel-phrase* licenses adjectival modifiers, while *slash-rel-phrase* licenses relative clauses in the narrow sense. *Adjective-rel-phrase* combines the control-based analysis of English reduced relative clauses by Sag (1997) with the phrasal introduction of an NP:⁵

$$(10) \textit{adjective-rel-phrase} \rightarrow \left[\begin{array}{l} \text{N-HD-DTRS} \\ \text{SYNSEM|LOC|CONT|INDEX} \quad i \end{array} \left\langle \begin{array}{l} \text{SYNSEM|LOC|CAT} \\ \text{HEAD} \quad \left[\begin{array}{l} \textit{adjective} \\ \text{PRED} \quad + \end{array} \right] \\ \text{SUBJ} \quad \textit{list}(\textit{pro-ss}) \oplus \langle \textit{pro-ss}_i \rangle \end{array} \right\rangle \right]$$

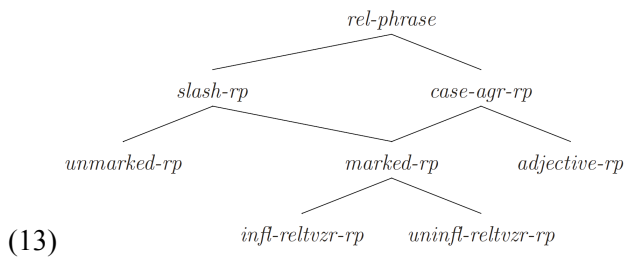
Figure 2 (appendix) shows partial analyses for (4a) and (5a). Allowing the clause to contain unrealized pro elements on SUBJ is motivated by the possibility of apparent pro-drop with adjectival modifiers (Polotsky, 1978, 162-168). The other subtype, *slash-rel-phrase*, is modeled by combining the unary projection with Sag's analysis of ordinary English relatives, in which the modified phrase is connected to the bottom of a nonlocal dependency:

$$(12) \textit{slash-rel-phrase} \rightarrow \left[\begin{array}{l} \text{N-HD-DTRS} \\ \text{SYNSEM|LOC|CONT|INDEX} \quad i \end{array} \left\langle \begin{array}{l} \text{SYNSEM} \\ \text{LOC|CAT} \quad \left[\begin{array}{l} \text{HEAD} \quad \textit{reltvzr-or-predicate} \\ \text{SUBJ} \quad \langle \rangle \end{array} \right] \\ \text{NONLOC|SLASH} \quad \langle \text{[L } \textit{loc}_i \text{]} \rangle \end{array} \right\rangle \right]$$

The UD-TYPE of the slashed element is constrained by another constraint to be resumptive if the head of the relative clause is a nonfinite predicate, accounting for the restricted distribution of gaps.

3.3 Variation in Internal Structure

It remains to be shown how restrictions on case and definiteness can be analyzed. We define the following type hierarchy below *rel-phrase*:



5 An anonymous reviewer points out that in some languages, the sets of attributive and predicative adjectives are not identical. Indeed, there are words like *xayr* 'best' which cannot be used in an indirect attribute (Sibawayh, 1988, §§ 106-111), but they could probably also be analyzed as nouns.

Unmarked-rp and *marked-rp* correspond to unmarked (1-2) and marked relatives (3), respectively. Unmarked relatives are subject to the following constraint:

$$(14) \quad \text{unmarked-rp} \rightarrow \left[\begin{array}{l} \text{N-HD-DTRS} \left\langle \left[\begin{array}{l} \text{clause} \\ \text{SYNSEM|LOC|CAT|HEAD} \quad \text{not-case-marked-head} \vee [\text{CASE} \quad \text{nom}] \end{array} \right] \right\rangle \\ \text{SYNSEM|LOC|CAT|HEAD} \left[\begin{array}{l} \text{DEF} \quad (-) \\ \text{MOD} \quad (\text{synsem}) \end{array} \right] \end{array} \right]$$

The bracketed restrictions are not valid for all speakers, as definite or free unmarked relative clauses are attested in corpus data, mainly in Classical Arabic (Reckendorf, 1921). *Not-case-marked-head* subsumes finite verbs, prepositions and other heads without morphological case marking. Other heads, i.e. nominal and adjectival predicates, are constrained to show nominative case marking, which accounts for (2).

Case-agr-rp comprises marked relative clauses (3) and adjectival attributes (4-5). The feature that sets them apart from *unmarked-rp* is that they show case agreement, and that the head, which is the relativizer in marked relative clauses and the adjective in adjectival modifiers, has to appear at the beginning. These two properties are captured by the following constraint:

$$(15) \quad \text{case-agr-rp} \rightarrow \left[\begin{array}{l} \text{N-HD-DTRS} \left\langle \left[\begin{array}{l} \text{hereditarily-head-initial-sign} \\ \text{SYNSEM|LOC|CAT|HEAD|CASE} \quad \boxed{1} \end{array} \right] \right\rangle \\ \text{SYNSEM|LOC|CAT|HEAD|CASE} \quad \boxed{1} \end{array} \right]$$

A sign is *hereditarily head-initial* if it is a word, a non-headed phrase, or a head-initial phrase whose head is also hereditarily head-initial. (If all trees are flat, *hereditarily head-initial* just means head-initial) This accounts for (16), where only the reading without case agreement, i.e. *unmarked-relative-phrase*, is possible, because the relative clause is not head-initial:

- (16) marartu bi=raʒul-i-n_i [ʔab-uu=hu_i ḥasan-u-n/*ḥasan-i-n]
 I.went.past by=man-GEN-INDEF father-NOM=his beautiful-NOM-INDEF/beautiful-GEN-INDEF
 ‘I went past a man whose father is beautiful’

Only some very simple constraints are needed for the types below *case-agreement-rel-phrase*. *Marked-rel-phrase* stipulates complete CONCORD agreement. *Infl-reltvzr-rel-phrase* specifies DEFINITENESS as +. MOD is specified as *none* for *uninfl-reltvzr-rel-phrase*.

The agreement of adjectival modifiers with their subject in number and gender is accounted for by a general agreement mechanism, which is independently required in order to account for subject-predicate agreement in independent clauses and which is similar to Melnik' constraint 22. This is confirmed by the fact that adjectives seem to show the same agreement patterns in the indirect attribute as in independent clauses in which the subject follows the predicate; in particular, number may be neutralized in both cases (Hasan, 1975, III 453; Reckendorf, 1921, 29). An additional constraint enforcing total agreement in the direct attribute, as constraint 24 in Melnik (2006), is not needed, since the direct attribute has a nonempty SUBJ list under our analysis, as shown in Figure 1 (a).

3.4 The definiteness marker

Unlike Melnik (2006), we have not specified definiteness agreement in the same constraint as case agreement (*case-agreement-relative-phrase*). The reason is that definiteness agreement was not restricted to adjectival modifiers in Classical Arabic; it also occurred on unmarked relative clauses. This is illustrated by the following examples of definite relative clauses that do not have

a relativizer, but show a definiteness marker on the first word⁶:

- (17) a. min l-qawm-i_i [r-rasuul-u llaah-i min=hum_i]
 from DEF-tribe-GEN DEF-prophet-NOM God-GEN from=them
 ‘from the tribe the prophet of God is from’ (CA)
- b. man laa yazaalu jaakiran ʕalaa [l-maʕa=hu]
 who not he.ceases thankful for DEF-with=him
 ‘who does not cease to be thankful for what is with him’ (CA)

The definiteness marker always appears at the left edge of the relative clause, even if it has to attach to a non-nominal element (17b) or an element that is not the head of the clause (17a). Therefore, it seems adequate not to treat it as an inflectional morpheme, at least in the context of relativization. However, the appearance of the definiteness marker is still morphologically restricted. Apparently, it is not found on nouns or adjectives having the indefinite ending *-n* or a lexically triggered definiteness marker. Furthermore, the definiteness marker is assimilated to certain word-initial consonants. The interaction of the constructionally required definiteness marker with morphological properties of the first word in the phrase suggests a treatment in terms of edge inflection (Nevis, 1985; Zwicky, 1987; Miller and Halpern, 1992; Tseng, 2003; Crysmann, 2010) rather than phrasal affixation (Anderson, 2005). In the HPSG formalization presented by Crysmann (2010), some morpheme on the edge of a phrase is realized morphologically, but the requirement percolates up to be accessible on the phrasal level in the feature EDGE|MARKING.

In Arabic, definite relative clauses add a *definiteness-marker-trigger* object via their EDGE|TRIGGER|LEFT list. This object percolates down to the word at the left edge of the relative clause, where it is realized morphologically (note that the definite relativizers *lladhii* etc. also contain the definiteness marker *l-*). Certain exceptions, where the lexical choice of the adjective and its tense/aspect play a role (Reckendorf, 1921), can be taken care of by introducing a binary head feature ALLOWS-DEFINITENESS MARKER appropriate for the type *adjective-head*.

4 Relation to Previous Analyses

Although the analysis by Haddar et al. (2006) seems to be intended only for relativization on the highest subject, the relation to the broad subject construction noticed by Doron and Reintges (2005) allowed us to account for the nonlocal dependencies at least in adjectival modifiers using a simple constraint which on the surface only appears to license relativization on the highest subject (10).

The main differences between Melnik's and our account of adjectival modifiers are: (I) all relativization patterns are analyzed by a unary projection introducing an NP in our analysis, which allows a uniform account of free and modifying relative clauses, while Melnik's analysis does not cover free nonfinite relative clauses; (II) *adjective-rel-phrase* covers all adjectival modifiers and marked relative clauses, and there are no distinct phrasal types for the direct and the indirect attribute; (III) we stipulated definiteness agreement and case agreement on different levels, because definiteness agreement is found in all relativization patterns, while case agreement has a more restricted distribution.

These differences should not be understood as arguments against Melnik's analysis or her conclusion that the indirect attribute provides evidence for the distinction between morphosyntactic and semantic agreement. While the syntactic structures that we assume are

⁶ In (17a), the scope of the definiteness marker must be the entire relative clause, since possessed nouns in this construction (the *construct state*) are never marked for definiteness.

different from those obtained under her analysis, the mechanisms responsible for the hybrid agreement strategy remain essentially the same.

Although our analysis covers significantly more phenomena than either of the previous analyses, the constraint set that is needed to derive the Arabic relativization patterns is rather simple, even in comparison with the constraints Melnik uses to license adjectival modifiers only. This is made possible by making essential use of constraints that are independently required for other phenomena in Arabic.

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Appendix

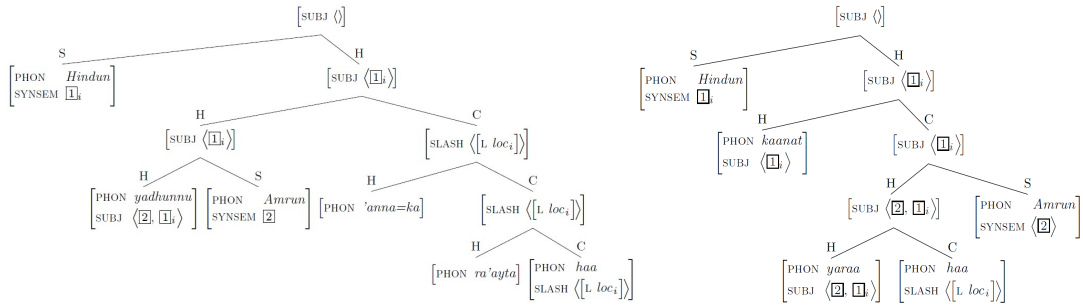


Figure 1: Analyses of (6a) (left) and (6b) (right).

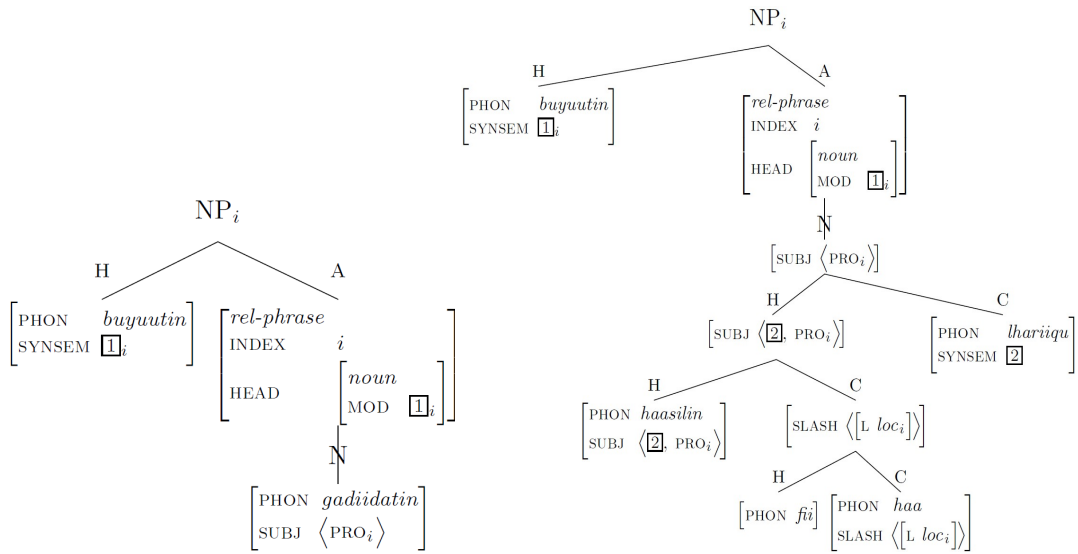


Figure 2: Analysis of (4a) (left) and (5a) (right).