Prosodically-conditioned relative clause extraposition in Armenian

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Abstract. Armenian is an SOV language with post-nominal finite relative clauses (RCs). These clauses are typically immediately post-nominal: *N-RC*. But in various contexts, the relative clause is extraposed to the right edge of the sentence: *N-V-RC* instead of **N-RC-V*. The contexts are united by how the modified noun is prosodically phrased with an immediately following verb. We argue that extraposition is conditioned by prosodic phrasing. A host of syntactic factors (definiteness, subject/object, valency) are indirectly involved in extraposition, but these factors are tied directly to prosodic phrasing. Exceptions are limited and come from verb focus and possible recursive phrasing.

Keywords. relative clause; extraposition; Armenian; phonological phrase; phonological movement

1. Introduction. In studies on the syntax-phonology interface, a traditional notion is "phonology-free syntax", whereby syntactic processes like word order are blind to phonological factors (Zwicky & Pullum 1986). But, a growing body of work shows that *optional* variation in word order is affected by phonological factors (whether segmental, metrical, or prosodic) (Anttila 2016; Shih & Zuraw 2017; Breiss & Hayes 2020). We discuss relative clause (RC) extraposition in Armenian, where word order shows obligatory constraints on the placement of RCs. We argue these constraints are based on prosodic phrasing.

Armenian is an Indo-European language with two standard dialects: Western and Eastern. We focus on Western Armenian, but most of our generalizations extend to Eastern Armenian. In Armenian, there are different types of RCs. We focus on finite post-nominal RCs. In the default case, such RCs are immediately post-nominal (Table 1a). The noun and RC are pronounced as separate phonological phrases ϕ. But, if the noun is pre-verbal, then we see variation. If the noun and verb are in the same phonological phrase, then the RC is extraposed after the verb (Table 1b). If the noun and verb are in separate phonological phrases, then we usually don't see extraposition (Table 1c).

	a)	b)	c)
Sentence without relative clause:	$(N)_\phi$	$(N\ V)_\phi$	$(N)\ (V)_\phi$
Sentence with relative clause:	$(N)_\phi\ (RC)_\phi$	$(N\ V)_\phi\ (RC)_\phi$	$(N)_\phi\ (RC)_\phi\ (V)_\phi$

Table 1. Outline of possible word orders for relative clauses and prosodic phrasing

Our prosodic data is based on the first author's native intuitions on phrasal stress and boundaries. Armenian prosody is relatively undocumented (Toparlak & Dolatian 2022).

This paper is organized as follows. §2 provides background information on Armenian syntax and prosodic phrasing. §3 introduces data on extraposition and argues that the

main factor is prosodic phrasing. §4 goes through a catalog of contexts where we see extraposition, with consistent correlations with prosodic phrasing. We formalize the analysis in §5, and discuss various other nuances and problems in §6. We conclude in §7.

2. Syntax and prosodic phrasing in Armenian. We discuss the basic syntax and prosody of noun phrases (NP), verb phrases (VP), and relative clauses (RC). For larger discussion on prosodic phrasing in Armenian, see Dolatian & Sigler (prep).

For words (1), stress is generally word-final. It is on the final vowel if it is a non-schwa, otherwise on the rightmost non-schwa vowel (Vaux 1998; 132; Dolatian 2021).

(1) akʰaˈrag   'farm'   ազարակ
     akʰarag-neˈr-ov   'farm-PL-INS'   ազարակներով
     akʰarag-neˈr-ov-ə   'farm-PL-INS-DEF'   ազարակներովը

Syntactically, noun phrases (NPs) are head-final (X-N). Prosodically, an NP forms a right-headed phonological phrase ϕ (Աբեղյան1933; 25,33; Fairbanks 1948; 24-7; Vaux 1998; 59,145; Dolatian 2022; 62). For example, the two-word phrases in (2) have word-level stress on both words. But the stress on the final word (the noun) is the strongest and has phrasal stress. The syllable with phrasal stress is in boldface. For illustration, prosodic boundaries are marked in the first level of our annotation in terms of syntactic categories.

(2) a. (Adj   **N**)$_\phi$ b. (N   **N**)$_\phi$
         gabujd agˈʁa-n   maroj-i-n   dəˈʁa-n
         blue   tooth-DEF   Mary-GEN-DEF son-DEF
         'the blue tooth'   'Mary's son'
         կապույտ ակռան   Մարոյին տղան

Verb phrases (VPs) are also head-final (X-V). For Western Armenian, OV orders are more typical than VO orders; while Eastern Armenian uses VO orders more often in certain syntactic contexts (Dum-Tragut 2009; Donabédian 2018; Faghiri & Samvelian 2020; Samvelian et al. 2023). Prosodically, the final verb is deaccented, and the preverbal item carries phrasal stress (3). Sentence stress (nuclear stress) is on the last phrasal stress of the sentence, and this is typically whatever precedes the verb (Dolatian 2022).

(3) a. (**N**   V)$_\phi$ b. (**Adj** V)$_\phi$
         naˈmag uni   uˈraχ jeʁa
         letter   has   happy became
         'He has a letter.'   'I became happy.'
         Նամակ ունի: Ուրախ եղայ:

Armenian has different types of relative clauses (RC). We focus on simple finite RCs. These have the obligatory complementizer /v or/ 'that', and are post-nominal. The RC is parsed as a separate phonological phrase with its own phrasal stress (4). We underline the noun and place the RC in brackets.

(4) a. $(\underline{\mathbf{N}})_\phi$ (that **RC**   )$_\phi$ b. (Adj $\underline{\mathbf{N}})_\phi$ (that **RC**)$_\phi$
       <u>nɑˈ**mɑg**-ə</u> [voɾ gɑɾˈ**miɾ** e]   gɑɾmiɾ <u>nɑˈ**mɑg**-ə</u> [voɾ gɑɾtɑˈ͡**tsi**]
       letter-DEF that red   is   red   letter-DEF that read
       'the letter that is red'   'the red letter that I read'
       նամակը որ կարմիր է   կարմիր նամակը որ կարդացի

3. Relative clauses and extraposition. By default, the RC is placed directly after the head noun. For example in (5), the sentence is an SOV sentence and the subject is relativized. The subject and RC are adjacent: S-RC-O-V.

(5) $(\underline{\mathbf{S}})_\phi$ (that **RC**   )$_\phi$ (**O**   V)$_\phi$
     ˈ<u>**mɑɾt**ʰ-ə</u> [voɾ hiˈ**vɑnt**ʰ e] nɑˈ**mɑg**-mə uni
     man-DEF that sick   is letter-INDF has
     'The man who is sick has a letter.'
     Մարդը որ հիւանդ է նամակ մը ունի:

But if the relativized noun is the verb's object (6), then we see extraposition. That is, the linear sequence is S-O-V-RC where the verb intervenes between the object and the RC, instead of S-O-RC-V where the object and RC are adjacent.

(6) $(\mathbf{S})_\phi$ $(\underline{\mathbf{O}}$ V)$_\phi$ (that **RC**   )$_\phi$
     ˈ**mɑɾt**ʰ-ə <u>nɑˈ**mɑg**-mə</u> uni [voɾ gɑɾˈ**miɾ** e]
     man-DEF letter-INDF has that red   is
     'The man has a letter that is red.'
     Մարդը նամակ մը ունի որ կարմիր է:

Pragmatically, extraposition of a preverbal object's RC is the default. Lack of extra-position is possible (7), but it implies that the object is heavily topicalized. Focus is on the verb, while the preverbal material are heavily backgrounded.

(7) $(\mathbf{S})_\phi$ $(\underline{\mathbf{O}})_\phi$ (that **RC**   )$_\phi$ $(\mathbf{V})_\phi$
     ˈ**mɑɾt**ʰ-ə <u>nɑˈ**mɑg**-mə</u> [voɾ gɑɾˈ**miɾ** e] uˈ**ni**
     man-DEF letter-INDF that   red   is   has
     'The man, a letter that is red, he HAS.'
     Մարդը, նամակ մը որ կարմիր է, ունի:

If the object is already post-verbal, then extraposition is unneeded. VO orders are marked. They can be used for verb focus or for topicalizing the verb. For focus (8), we see post-focal deaccenting after the verb in (8).

(8) $(\mathbf{S})_\phi$ $(\mathbf{V})_\phi$ $(\underline{\mathbf{O}})_\phi$ (that RC   )$_\phi$
     ˈ**mɑɾt**ʰ-ə uˈ**ni** <u>namɑg-mə</u> [voɾ gɑɾmiɾ e]
     man-DEF has   letter-INDF that red   is
     'The man HAS a letter that is red.'
     Մարդը ունի նամակ մը որ կարմիր է:

As we will argue later, the generalization is that extraposition is correlated with prosodic phrasing. A noun's RC will extrapose if the noun is prosodically phrased with the verb. Before we formalize this correlation, the next section goes through more syntactic configurations where we see RC extraposition.

4. Catalog of extraposition. The previous section looked at extraposition out of a simple preverbal indefinite object in SOV sentences. This section goes over extraposition data from diverse types of noun phrases. The generalization is that we find extraposition again from the immediately preverbal noun, such that this noun is phrased with the verb.

4.1. DEFINITE OBJECTS. The previous examples involved an indefinite object. The same patterns apply for a definite object (9-a). In Western Armenian, the default is for the definite object to take phrasal stress and be phrased with the verb (Dolatian 2022) We thus see extraposition (O-V-RC). The lack of extraposition is pragmatically marked (9-b).

(9)   a.   (**O**   V)$_\phi$ (that **RC**   )$_\phi$
           na'**maɡ**-ə uni [voɾ ɡaɾ'**miɾ** e]
           letter-DEF has that red is
           'He has the letter that is red.'
           Նամակը ունի որ կարմիր է:

      b.   (**O**)$_\phi$ (that **RC**   )$_\phi$ (**V**)$_\phi$
           na'**maɡ**-ə [voɾ ɡaɾ'**miɾ** e] u'**ni**
           letter-DEF that red is has
           'The letter that is red, he HAS.'
           Նամակը որ կարմիր է, ունի:

4.2. OBJECTS OF DITRANSITIVE VERBS. Prosody is more superficial than syntax, so we expect to see effects of linearity, such as in ditransitive sentences (10). The verb takes two objects (direct and indirect). The immediately pre-verbal object is phrased with the verb. The objects can come in either order (DO-IO or IO-DO).

(10)   a.   (**DO**)$_\phi$ (**IO**   V)$_\phi$
           na'**maɡ**-ə vaɾbe'**d-i-n**   dəvi
           letter-DEF boss-DAT-DEF gave
           'I gave the letter to the boss.'
           Նամակը վարպետին տուի:

      b.   (**IO**)$_\phi$ (**DO**   V)$_\phi$
           vaɾbe'**d-i-n**   na'**maɡ**-ə dəvi
           boss-DAT-DEF letter-DEF gave
           'I gave the letter to the boss.'
           Վարպետին նամակը տուի:

The first argument is not immediately preverbal (11). If it gets an RC, there is no extraposition. It doesn't matter whether it is a direct object or an indirect object.

(11)   a.   (<u>**DO**</u>)$_\phi$ (that **RC**   )$_\phi$ (**IO**   V)$_\phi$
           na'**maɡ**-ə [voɾ ɡaɾ'**miɾ** eɾ] vaɾbe'**d-i-n**   dəvi
           letter-DEF that red was boss-DAT-DEF gave
           'I gave the letter that was red to the boss.'
           Նամակը որ կարմիր էր վարպետին տուի

      b.   (<u>**IO**</u>)$_\phi$ (that **RC**   )$_\phi$ (**DO**   V)$_\phi$
           vaɾbe'**d-i-n**   [voɾ ɡaɾ'**miɾ** eɾ] na'**maɡ**-ə dəvi
           boss-DAT-DEF that red was letter-DEF gave
           'I gave the letter to the boss who was red.'
           Վարպետին որ կարմիր էր նամակը տուի

The second argument is however immediately preverbal (12). If that argument gets an RC, that RC is extraposed. Again, the order between the two objects does not matter.

(12)   a.   (**DO**)$_\phi$ (<u>**IO**</u>   V)$_\phi$ (that **RC**   )$_\phi$
           na'**maɡ**-ə <u>vaɾbe'**d-i-n**</u>   dəvi [voɾ ɡaɾ'**miɾ** eɾ]
           letter-DEF boss-DAT-DEF gave that red was
           'I gave the letter to the boss who was red.'

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Նամակը վարպետին տուի որ կարմիր էր:

b. $(\textbf{IO})_\phi$ $(\underline{\textbf{DO}}$ V$)_\phi$ (that **RC** $)_\phi$
vɑɾbeˈ**d-i-n**   nɑˈ**mɑɡ-ə** dəvi [voɾ ɡɑɾˈ**miɾ** eɾ]
boss-DAT-DEF letter-DEF gave that red   was
'I gave the letter that was red to the boss.'
Վարպետին նամակը տուի որ կարմիր էր:

4.3. SUBJECTS OF TRANSITIVE VERBS. The previous sentences focused on objects. In a typical SOV sentence, the transitive subject's RC does not extrapose (13).

(13) $(\underline{\textbf{S}})_\phi$ (that **RC** $)_\phi$ $(\underline{\textbf{O}}$ V$)_\phi$
ˈ**mɑɾtʰ-ə** [voɾ ɡɑɾˈ**miɾ** e] nɑˈ**mɑɡ-ə** uni
man-DEF that red   is letter-DEF has
'The man who is red, has the letter.'
Մարդը որ կարմիր է նամակը ունի:

If the object is overt, the extraposed RC is interpreted as modifying the object, not the subject (14).

(14) $(\underline{\textbf{S}})_\phi$ $(\underline{\textbf{O}}$ V$)_\phi$ (that **RC** $)_\phi$
ˈ**mɑɾtʰ-ə** nɑˈ**mɑɡ-ə** uni [voɾ ɡɑɾˈ**miɾ** e]
man-DEF letter-DEF has that red   is
'The man has the letter that is red.'
#'The man who is red, has the letter. '
Մարդը նամակը ունի որ կարմիր է:

If the object is covert, then the extraposed RC is uninterpretable (15).

(15) #$(\underline{\textbf{S}})_\phi$ (**V**$)_\phi$ (that **RC** $)_\phi$
ˈ**mɑɾtʰ-ə** uˈ**ni** [voɾ ɡɑɾˈ**miɾ** e]
man-DEF has that red   is
#'The man (that is red) has a thing (that is red).'
Մարդը ունի որ կարմիր է:

But in an OSV sentence where the SV is a single phonological phrase, then we can get extraposition from the subject (16). The preverbal subject in such sentences is a case of agent pseudo-incorporation (Kalomoiros 2022), meaning that the subject and verb form a tight semantic and syntactic unit, which also translates to a tight prosodic unit.

(16) $(\textbf{O})_\phi$ $(\underline{\textbf{S}}$ V$)_\phi$ (that **RC** $)_\phi$
mɑɾjaˈ**m-i-n** me͡ˈʁu-mə χad͡zav [voɾ ɡɑɾˈ**miɾ** eɾ]
Mariam-DAT-DEF bee-INDF bit   that red   was
'A bee that was red stung Mariam.'
Մարիամին մեղու մը խածաւ որ կարմիր էր:

4.4. SUBJECTS OF INTRANSITIVE VERBS. For intransitive verbs, we see split-behavior based on unaccusative verbs vs. unergative verbs, and between definite vs. indefinite subjects. This split behavior correlates prosodic phrasing with extraposition. Similar prosodic patterns are found in Turkish (Özçelik & Nagai 2011).

    For unaccusative verbs, the grammatical subject acts as the undergoer of the verbal

action. The subject and verb form a single phonological phrase, regardless of whether the subject is indefinite (17-a) or definite (17-b). We see extraposition in both cases.

(17) a. (**S**   V)$_\phi$ (that **RC**   )$_\phi$
          ˈ**mar**ʰ-mə jegav [vor   uˈraχ   er]
          man-INDF came who   happy was
          'A man came who was happy.'
          Մարդ մը եկաւ որ ուրախ էր:

      b. (**S**   V)$_\phi$ (that **RC**   )$_\phi$
          ˈ**mar**ʰ-ə jegav [vor   uˈraχ   er]
          man-DEF came who   happy was
          'The man came who was happy.'
          Մարդը եկաւ որ ուրախ էր:

For unergatives, the subject performs the verbal action. An indefinite subject is phrased with the verb (18-a) and shows extraposition (18-b).

(18) a. (**S**   V)$_\phi$
          ˈ**mar**ʰ-mə bora͡ ts
          man-INDF yelled
          'A man yelled.'
          Մարդ մը պոռաց:

      b. (**S̲**   V)$_\phi$ (that **RC**   )$_\phi$
          ˈ**mar**ʰ-mə bora͡ ts [vor   uˈraχ   er]
          man-INDF yelled who   happy was
          'A man yelled who was happy.'
          Մարդ մը պոռաց որ ուրախ էր:

But for a definite subject, the subject and verb form separate phonological phrases (19-a), without extraposition (19-b).

(19) a. (**S**)$_\phi$ (**V**)$_\phi$
          ˈ**mar**ʰ-ə boˈ**rats**͡
          man-DEF yelled
          'The man yelled.'
          Մարդը պոռաց:

      b. (**S̲**)$_\phi$ (that **RC**   )$_\phi$ (**V**)$_\phi$
          ˈ**mar**ʰ-ə [vor   uˈraχ   er] boˈ**rats**͡
          man-DEF who   happy was yelled
          'The man who was happy yelled.'
          Մարդը որ ուրախ էր պոռաց:

To force extraposition, the definite subject needs to be heavily focused (20), e.g. contrastively.

(20) (**S̲**   V)$_\phi$ (that RC   )$_\phi$
      ajt   ˈ**mar**ʰ-ə   bora͡ ts [vor   uraχ   er]
      DEM man-INDF yelled who   happy was
      'That MAN who was happy yelled.'
      Այդ մարդը պոռաց որ ուրախ էր:

4.5. PASSIVIZED OBJECTS. Passivized objects show split behavior and they pattern like unergative subjects, not unaccusative subjects (contra English: Göbbel 2020; 42ff). Indefinite passivized objects are phrased with the verb (21-a) and trigger extraposition (21-b).

(21) a. (**S**   V)$_\phi$
          ˈ**mar**ʰ-mə əspannəve͡ tsav
          man-INDF was.killed
          'A man was killed.'
          Մարդ մը սպաննուեցաւ:

      b. (**S̲**   V)$_\phi$ (that **RC**   )$_\phi$
          ˈ**mar**ʰ-mə əspannəve͡ tsav [vor   hiˈ**vanl**ʰ er]
          man-INDF was.killed   who   sick   was
          'A man was killed who was sick.'

Մարդ մը սպաննուեցաւ որ հիւանդ էր:

Definite passivized objects are phrased separately (22-a) without extrapositon (22-b).

(22)   a. $(\mathbf{S})_\phi$ $(\mathbf{V})_\phi$
          ˈ**maɾtʰ-ə**   əspannəveˈt͡sav
          man-DEF was.killed
          'The man was killed.'
          Մարդը սպաննուեցաւ:

       b. $(\underline{\mathbf{S}})_\phi$ (that $\mathbf{RC}$ $)_\phi$ $(\mathbf{V})_\phi$
          ˈ<u>**maɾtʰ-ə**</u> [voɾ hiˈ**vantʰ** eɾ]   əspannəveˈt͡sav
          man-DEF who sick   was was.killed
          'The man who was sick was killed.'
          Մարդը որ հիւանդ էր սպաննուեցաւ:

Extraposition is possible if the subject is heavily focused and phrased with the verb (23); note the post-focal deaccenting.

(23)   ($\underline{\mathbf{S}}$ V$)_\phi$ (that RC $)_\phi$
      ajt   ˈ<u>**maɾtʰ-ə**</u> əspannəvet͡sav [voɾ   hivantʰ er]
      DEM man-INDF was.killed   who sick   was
      'That MAN who was sick was killled.'
      Այդ մարդը սպաննուեցաւ որ հիւանդ էր:

4.6. SUBJECT AND OBJECT FOCUS. Based on the data so far, one could hypothesize that extraposition is directly conditioned by focus. But we argue that the main correlation between extraposition and phonology is prosodic phrasing. Any effect that focus would have on extraposition is indirect via prosodic phrasing. For example, sentences with subject focus or object focus show the same prosodic phrasing and extraposition patterns as sentences with neutral focus (out of the blue sentences).

    Consider subject focus in SOV sentences (24). Here, the focused item (the subject) is not immediately preverbal. The subject gets nuclear stress, and the OV-RC sequence is deaccented but still forms phonological phrase boundaries. If the non-focused objects gets an RC, that RC is extraposed. We thus see extraposition from a non-focused constituent.

(24)   a. $(\mathbf{FocS})_\phi$ $(\underline{O}$ V$)_\phi$ (that RC $)_\phi$
          ˈ**ov**   <u>namag-mə</u> uni [voɾ gaɾmiɾ e]
          who   letter-INDF has that red   is
          'Who has a letter that is red?'
          Ո՞վ նամակ մը ունի որ կարմիր է:

       b. $(\mathbf{FocS})_\phi$ $(\underline{O}$ V$)_\phi$ (that RC $)_\phi$
          maɾˈ**ja-n**   <u>namag-mə</u> uni [voɾ gaɾmiɾ e]
          Maria-DEF letter-INDF has that red   is
          'MARIA has a letter that is red.'
          Մարիան նամակ մը ունի որ կարմիր է:

Consider subjects with focus and an RC (25-a). Because the subject is not prever-bal, then we don't see extraposition (25-b). We see non-extraposition on the focused constituent.

(25) a. $(\mathbf{FocS})_\phi$ (O   V)$_\phi$
          ˈ**ov**   namag-mə uni
          who   letter-INDF has
          'Who has a letter?'
          Ո՞վ նամակ մը ունի:

     b. $(\underline{\mathbf{FocS}})_\phi$ (that **RC**   )$_\phi$ (O   V)$_\phi$
          ˈ**mar**tʰ-mə [vor hiˈ**vant**ʰ e] namag-mə uni
          man-INDF that   sick   is letter-INDF has
          'A MAN that is sick has a letter.'
          Մարդ մը որ հիւանդ է նամակ մը ունի:

For object focus, the object is preverbal (26-a). We extrapose from the focused item (26-b).

(26) a. $(\mathbf{S})_\phi$ $(\underline{\mathbf{FocO}}$ V)$_\phi$
          ˈ**mar**tʰ-ə ˈ**in͡ʧ**   uni
          man-DEF what   has
          'What does the man have?'
          Մարդը ի՞նչ ունի

     b. $(\mathbf{S})_\phi$ $(\underline{\mathbf{O}}$ V)$_\phi$ (that **RC**   )$_\phi$
          ˈ**mar**tʰ-ə na**ˈmag**-mə uni [vor garˈmir e]
          man-DEF letter   has that red   is
          'The man has A LETTER that is red.'
          Մարդը նամակ մը ունի որ կարմիր է

There is thus no correlation between subject/object focus and extraposition. Extraposition affects both focused and non-focused nouns. The only factor above was prosodic phrasing.

5. Formalization: Extraposition is prosodic. Cross-linguistically, extraposition is subject to many variables, whether syntactic, pragmatic, or prosodic (Göbbel 2013, 2020). For Armenian, it seems extraposition has a single consistent and obligatory variable. A noun's RC will extrapose if that noun is parsed with the verb's phonological phrase, in order to create the structure $(NV)_\phi(RC)_\phi$. Such purely prosodically-conditioned extraposition is attested in Malagasy (Potsdam 2022). In what follows, we formalize this analysis.

5.1. SKETCHES OF FORMALIZATION. Given our analysis, there are two obvious options to formalize it: cyclic vs. movement-based (Figure 1).

The first option is a cyclic analysis (Figure 1a). The syntax creates the base sentence without the RC. This sentence is then prosodified. The RC is created later in the derivation, and it is added outside of the pre-existing prosodic structure. Syntactic operations (adding a RC) try to maintain faithfulness to previously constructed phonological structure (Newell & Piggott 2014; McPherson & Heath 2016).

The second option is a movement-based analysis (Figure 1b). The syntax generates the entire syntactic structure and the RC is placed next to the noun. The syntactic structure is sent to the phonology. Prosodic phrasing causes movement as a type of phonological movement or prosodic movement (Agbayani & Golston 2010, 2016).

We adopt the movement-based analysis for illustration, although there is no obvious evidence for one formalization over another. Note that we don't entertain analyses that

(a) Cyclic: RC is added late after phonology   (b) Movement: RC is moved by phonology

Syntax	N V
Prosody	(N V)$_\phi$
Syntax again	(N V)$_\phi$ (RC)$_\phi$

| Syntax	N RC V
Prosody	(N RC V)$_\phi$
Movement	(N V)$_\phi$ (RC)$_\phi$

Figure 1. Cyclic and movement-based analysis for extraposition

move the RC via a syntactic process, simply because there is no obvious syntactic motivation for extraposition, nor are there any semantic effects of extraposition (see §6.2).

5.2. OT ANALYSIS WITH MOVEMENT. We formalize our prosodic analysis of extraposition using OT constraints on the syntax-prosody interface. We draw heavily from Göbbel (2020) and Potsdam (2022). We use the following simple Armenian examples (27).

(27) a. (Adj **N**)$_\phi$
          gaɾmiɾ naˈ**mag**-ə
          red   letter-DEF
          'the red letter'
          կարմիր նամակը

      b. (**N**)$_\phi$ (that **RC**   )$_\phi$
          naˈ**mag**-ə [voɾ gaɾˈmiɾ e]
          letter-DEF that red   is
          'the letter that is red'
          նամակը որ կարմիր է

      c. (**N**   V)$_\phi$
          naˈ**mag**-ə uni
          letter-DEF has
          'He has the letter.'
          Նամակը ունի։

      d. (**N**   V)$_\phi$ (that **RC**   )$_\phi$
          naˈ**mag**-ə uni [voɾ gaɾˈmiɾ e]
          letter-DEF has that red   is
          'He has the letter that is red.'
          Նամակը ունի որ կարմիր է։

First consider how to map a noun phrase (28). A syntactic phrase XP maps to a phonological phrase ϕ. A simple left-alignment constraint ALIGN-L makes the left edge of every XP start a phonological phrase (McCarthy & Prince 1993).

(28) a. ALIGN-L: Assign a violation if the left edge of an XP does not align with the left edge of a ϕ.

      b. *Mapping an NP to a ϕ*
          Syntax → Prosody
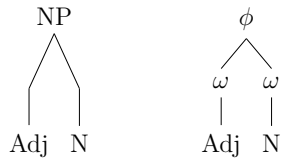
| [Adj N]$_{NP}$		ALIGN-L
a. ☞	(Adj N)$_\phi$	
b.	Adj N	*!

A relative clause is mapped to its own separate phonological phrase (29). A constraint NONREC blocks recursive phrasing of the RC with the head noun (Selkirk 1996).[1]

(29) a. NONREC: Assign a violation if a ϕ contains another ϕ.

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[1] We use alignment constraints instead of Match-theoretic constraints (Selkirk 2011). Match Theory would not distinguish the parse (N-RC)$_\phi$ (where the lower CP is unmatched) from (N)$_\phi$(RC)$_\phi$ (where the higher NP is unmatched).

b. *Mapping an NP-RC to two φ's*
   Syntax → Prosody
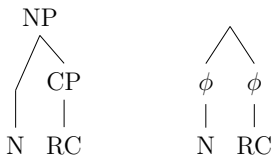
	$[N\ [RC]_{CP}]_{NP}$	NONREC	ALIGN-L
a.	$(N\ RC)_\phi$		*!
b.	$(N\ (RC)_\phi)_\phi$	*!	
c. ☞	$(N)_\phi\ (RC)_\phi$		

Verb phrases map to a phonological phrase ϕ (30). When the VP has no RC, the constraints ALIGN-L and NONREC ensure that we have a single ϕ. We use a constraint AR-GUMENT-ϕ (ARG-ϕ) that ensures that the verb and its complement are phrased together (Clemens 2019). Armenian follows the cross-linguistic tendency for verbs to phrase with their objects (Nespor & Vogel 1986).

(30) a. ARGUMENT-ϕ (ARG-ϕ): Assign a violation if the verb does not form a ϕ with its argument/complement.
  b. *Mapping VP to ϕ*
   Syntax → Prosody
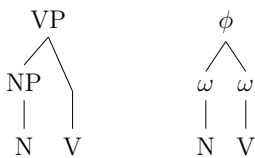
	$[[N]_{NP}\ V]_{VP}$	ARG-ϕ	NONREC	ALIGN-L
a. ☞	$(N\ V)_\phi$			
b.	$((N)_\phi\ V)_\phi$		*!	
c.	$(N)_\phi\ (V)_\phi$	*!		

These constraints create extraposition (31). When the preverbal object has an RC, that RC is underlyingly adjacent to the noun. Prosodic constraints force extraposition because a) the verb wants to phrase with the entire NP (cf. Clemens & Coon 2018), and b) to avoid recursive phrasing. Movement of the RC is violated by a low-ranked STAY constraint. The phonology moves the RC to the right periphery (cf. Göksel et al. 2013; 200). For some unknown syntactic reason, left-dislocation of RCs is unattested in Armenian.

(31) a. STAY: Assign a violation if a word moved from its base position (Grimshaw 1997).
  b. *Generating extraposition from preverbal object*
   Syntax → Prosody
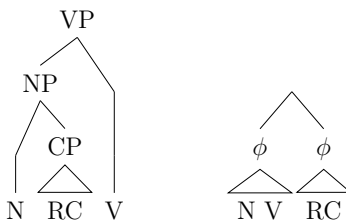
	$[[N\ [RC]_{CP}]_{NP}\ V]_{VP}$	ARG-ϕ	NONREC	ALIGN-L	STAY
a.	$(N\ RC\ V)_\phi$			*!	
b.	$(N\ RC)_\phi\ (V)_\phi$	*!		*!	
c.	$(N)_\phi\ (RC)_\phi\ (V)_\phi$	*!			
d.	$(N)_\phi\ (RC\ V)_\phi$	*!			
e. ☞	$(N\ \_\_\ V)_\phi\ (RC)_\phi$				*

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The constraint ARG-ϕ requires that the verb is phrased with the entire NP like in (N-RC-V), not just a subconstituent like (N)(RC-V). But, if the RC moves to the right and leaves the NP, then the constraint is satisfied in (N-V)(RC) because the NP is now smaller. Thus in practice, this constraint ends up requiring that the verb is phrased with at least the head N of its argument NP. We thank a reviewer for discussion.

6. Expansions and problems. In this section, we go over other cases of extraposition, the absence of semantic effects from extraposition, and cases where our analysis under-generates.

6.1. EXTRAPOSITION ELSEWHERE. This paper focused on relative clause extraposition where the noun and extraposed item are separated by a verb. Because noun-phrases are generally head-final, few syntactic constructions can create post-nominal modifiers.

Besides the verb, another possible intervener is postpositions (32-a). A postposition takes an NP to its left. The postpositional phrase (PP) forms a right-head phonological phrase. The NP can have an RC that is extraposed. A verb can select a PP, which in turn selects a noun with an extraposed RC (32-b).

(32)   a.   (N   **Post**)$_\phi$ (that **RC**   )$_\phi$
             ajt^h namag-i-n   **'k^{h}ov-ə**   [voɾ   gaɾ**'miɾ** eɾ]
             DEM letter-GEN-DEF next-DEF that   red   was
             'next to that letter that was red'
             այդ նամակին քովը որ կարմիր էր
       b.   (N   **Post**   V)$_\phi$ (that **RC**   )$_\phi$
             ajt^h maɾt^h-u-n   **'k^{h}ov-ə**   k^{h}a͡tsi [voɾ   gaɾ**'miɾ** eɾ]
             DEM man-GEN-DEF next-DEF went   that   red   was
             'I went next to that man who was red'
             Այդ մարդուն քովը գացի որ կարմիր էր

Besides RCs, a noun can be modified by an instrumental-marked NP (33). Instrumentals can be post-nominal, are separate phonological phrases, and extrapose over a verb.[2]

(33)   a.   (**N**)$_\phi$ (Adj   **N-ins**)$_\phi$ b.   (**N**   V)$_\phi$ (Adj   **N-ins**)$_\phi$
             na**'mag**-mə gaɾmiɾ neɾ**'g-ov**   na**'mag**-mə uni   gaɾmiɾ neɾ**'g-ov**
             letter-INDF red   paint-INS   letter-INDF have red   paint-INS
             'a letter with red paint'   'He has a letter with red paint'
             նամակ մը կարմիր ներկով   Նամակ մը ունի կարմիր ներկով

Thus, extraposition is insensitive to the category of modifiers. This fact follows from our analysis of extraposition as being driven primarily by prosodic phrasing (the need to phrase the verb and its argument), and not from category-specific syntactic operations. If

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[2] Within the NP, the default ordering is for adjectives to precede nouns. But post-nominal adjectives are attested as a type of discourse-conditioned extraposition, meaning that given information can be de-emphasized by pushing it after the noun (Hodgson 2020; 153).

extraposition was syntactic, then we'd need multiple similar analyses for extraposition of different XPs (RCs, instrumentals) from different XPs (NPs, PPs).

6.2. SYNTACTIC INERTIA OF EXTRAPOSITION. We argued that extraposition is conditioned by phonology and not syntax. We could not find syntactic effects of extraposition. For example, if a noun takes an extraposed RC that contains an anaphor, then that noun binds the anaphor. In (34), the extraposed RC modifies the object. It is not adjacent to either the subject or object, but it is bound only by the object.

(34) $(\mathbf{N})_\phi$ $(\mathbf{N}$ $V)_\phi$ (that $\mathbf{RC}$ $)_\phi$
kʰeˈvoɾkʰ-ə$_i$ **maɾtʰ**-mə$_j$ desav [voɾ iŋkziŋkʰ-ə$_{j/*i}$ gade]
Kevork-DEF$_i$ man-INDF saw   that himself-DEF$_{j/*i}$ hates
'Kevork$_i$ saw a man$_j$ who hates himself$_{j/*i}$'
Գեւորգը մարդ մը տեսաւ որ ինքզինքը կ'ատէ:

The above is a reconstruction effect. The RC is semantically interpreted as if its still in its base position next to the noun. This is a property commonly found in extraposition (Potsdam 2022 citing Büring & Hartmann 1997; de Vries 2002). The above data concerns binding anaphors. For space, we don't discuss other possible reconstruction contexts.

6.3. UNEXPLAINED EXTRAPOSITION. The prosodic account explains a wide range of cases of extraposition. We argue that an RC extraposes so that the noun and verb are phrased together. However, there are cases where a prosodic analysis falls short.

     Consider verb focus in an SOV sentence. The verb is focused, it starts its own phonological phrase with a perceivable left pause, and there's post-focal deaccenting (35-a). Our analysis incorrectly predicts that we won't see extraposition because the object and verb are already phrased separately. But this is false. The object's RC still extraposes (35-b).

(35)   a. $(\mathbf{N})_\phi$ $(\mathbf{V})_\phi$ b. $(\mathbf{N})_\phi$ $(\mathbf{V})_\phi$ (that RC $)_\phi$
         naˈ**mag**-mə uˈ**ni**   naˈ**mag**-mə uˈ**ni** [voɾ gaɾmiɾ e]
         letter-INDF has   letter-INDF has   that red   is
         'He HAS a letter.'   'He HAS a letter that is red.'
         Նամակ մը ունի́ :   Նամակ մը ունի́ որ կարմիր է:

Another issue is definite objects. In Western Armenian, the default is for the definite object to get phrased with the verb (§4.1). But because definite objects are often old information, it is possible to phrase the object separately. We still find extraposition.[3]

(36) $(\mathbf{N})_\phi$ $(\mathbf{V})_\phi$ (that $\mathbf{RC}$ $)_\phi$
    naˈ**mag**-ə uˈ**ni** [voɾ gaɾˈ**miɾ** e]
    letter-DEF has   that red   is
    'He has the letter that is red.'
    Նամակը ունի որ կարմիր է:

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[3] This behavior is more visible in Eastern Armenian which has a stress-sensitive clitic (Kahnemuyipour & Megerdoomian 2011, 2017). Indefinite objects are phrased with the verb and take this clitic (O-CL-V)$_\phi$(RC)$_\phi$, while definite objects are phrased separately and don't take the clitic (O)$_\phi$(V-CL)$_\phi$(RC)$_\phi$. We cannot discuss the Eastern data in depth because of space.

If the verb is a complex periphrastic tense (37), prominence can be heard on either the preverbal object and/or the verb, thus suggesting that phrases are prosodically either $(\mathbf{O})_\phi(\mathbf{V}$ Aux$)_\phi$ or $(\mathbf{O}$ V Aux$)_\phi$. See Nakipoğlu (2009; 1277) for similar effects of complex tenses in Turkish. We still have extraposition regardless of this ambiguity.

(37)   (nɑˈ**mɑg**-mə)$_\phi$ (deˈ**sa͡dz** e)$_\phi$ [voɾ gɑɾˈ**miɾ** e]
       (nɑˈ**mɑg**-mə   desa͡dz   e)$_\phi$ [voɾ gɑɾˈ**miɾ** e]
       letter-INDF   seen   is   that red   is
       'He has seen a letter that is red.'
       Նամակ մը տեսած է որ կարմիր է:

For the above data, our prosodic analysis incorrectly predicts that extraposition is marked while keeping the RC in the base position is the norm. The data contradict the broader generalization that prosodic phrasing is a strong correlate of extraposition.

We can think of two possible solutions to the exceptional data. First, it's possible that these cases mean that the above OV phrases actually form a recursive phonological phrase $(O(V)_\phi)_\phi(RC)_\phi$ instead of a sequence of phrases $(O)_\phi(V)_\phi(RC)_\phi$. Second, perhaps the derivation is more complicated such that first we have an initial prosodic phrasing where the OV is phrased together $(OV)_\phi$, thus triggering extraposition $(OV)_\phi(RC)_\phi$. Then the OV is readjusted because of verb focus or given information $(O)_\phi(V)_\phi(RC)_\phi$. Such an alternative resembles the analysis proposed by Ackema & Neeleman (2003, 2004; 186) where certain allomorphy rules are sensitive to an initial prosodic phrasing.

7. Conclusion. As argued throughout this paper, extraposition in Western Armenian is conditioned by prosodic structure. When a preverbal noun is modified by a relative clause, that relative clause is extraposed from its base position so that the noun and verb are in the same phonological phrase. Of course, pragmatics (topicalization) can affect prosodic phrasing and thus affect extraposition. But the main factor is prosodic phrasing.

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