Output-conditioned and non-local allomorphy in Armenian theme vowels

Hossep Dolatian

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Abstract

Cross-linguistically, it is difficult to tease apart allomorphy from readjustment rules. But regardless, both tend to respect locality and are sensitive to information that is present in the input, not the output (Embick 2010, 2013, 2017). We document a counter-example to these tendencies from Western Armenian, and we discuss how the data falsifies such restrictive models of allomorphy. The Western Armenian theme vowel -*i*- changes to the theme vowel -*e*- due to two types of triggers. The first type of trigger is phonological: the change happens when the theme vowel is unstressed in the output. This is a type of allomorphy that is conditioned by output phonology (contra Paster 2006). The second type of trigger is morphological: the change happens when the verb is in the past tense. The +PAST morpheme can be either in the verb (adjacent to the theme vowel) or on a separate auxiliary in periphrasis. This amounts to a case of long-distance allomorphy that is conditioned across words, even in suspended affixation (contra Bobaljik 2012). For suspended affixation, I provide semantic and prosodic evidence that suspended affixation is created via base-generation and not via ellipsis. The inability to use ellipsis acts as additional evidence that the allomorphy is long-distance.

keywords: allomorphy, output-conditioned allomorphy, long-distance allomorphy, stress-conditioned allomorphy, inter-word allomorphy

1   Introduction

Cross-linguistically, the choice of exponent for a morpheme (allomorphy) tends to depend on two types of information: local morphophonological context, and morphophonological

information that is present in the input (Bonet & Harbour 2012:227). The issue of locality means that the morphological or phonological trigger must be adjacent or relatively close to the target allomorph (Siegel 1978; Carstairs 1987). The issue of input-based information means that the choice of allomorphy cannot be motivated by the phonological output of allomorphy (Paster 2006; Embick 2010, 2013, 2017). Counter-examples are few and rare (Anderson 2008). In this paper, we present a case of allomorphy from Armenian that violates both tendencies.

Armenian is an Indo-European language that forms its own sub-branch. There are two standard dialects: Western and Eastern Armenian. Our data comes from Western Armenian. As a preview of the data, Armenian verbs are divided into three basic regular classes based on the choice of theme vowel: *-e-, -i-, -a-*. Within their respective conjugation class, the theme vowels *-e-* and *-a-* are constant throughout the paradigm. They are never replaced with other theme vowels. But the *-i-* theme vowel is replaced by *-e-* (in bold) in different paradigm cells. We call this change *i*-neutralization.[1]

Table 1: Illustrating *i*-neutralization in Western Armenian

	'to scratch'	'to speak'	'to read'	
Infinitive	kʰeɾ-é-l	χos-í-l	ɡɑɾtʰ- á-l	√-TH-INF
Subj. Pres. 3PL	kʰeɾ-é-n	χos-í-n	ɡɑɾtʰ-á-n	√-TH-AGR
Causative	kʰeɾ-e-t͡sʰən-é-l	χos-**e**-t͡sʰən-é-l	ɡɑɾtʰ-ɑ-t͡sʰən-é-l	√-TH-CAUS-TH-INF

Throughout the language, the above *-i-* to *-e-* change is restricted to only this single *-i-* morpheme. It is thus a highly morpheme-specific process. We are agnostic over whether *i*-neutralization is a rule of allomorphy or a readjustment rule (Halle & Marantz 1993); both analyses are descriptively equivalent (Haugen 2016). We use the two terms interchangeably in this paper for easier illustration. There are two classes of triggers for *i*-neutralization. One is output-based prosody or stress (a phonological trigger). Another is the presence of the +PAST morpheme (a morphological trigger), which can be non-adjacent to the verb.

The phonological trigger is that the *-i-* theme vowel is replaced by *-e-* when the vowel is unstressed. This is clear when infinitives take nominal inflection. Stress is regularly on the rightmost non-schwa vowel. This stress-based generalization references output prosody. It is cross-linguistically rare but attested for allomorphy to depend on surface output stress, e.g., stress-based stem allomorphy in Rumantsch (Anderson 2011).

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[1]Data is from the author's native Western Armenian judgments, corroborated by paradigm tables (Boyacioglu 2010; Boyacioglu & Dolatian 2020). My gratitude to Peter Guekguezian for early discussions, to the reviewers, and to the various folks in the footnotes. Glosses follow the Leipzig Glossing Rules. We use PST for glosses, while +PAST as a feature. We use CN for Connegative.

Table 2: *i*-neutralization is sensitive to stress

	'to scratch'	'to speak'	'to read'	
Infinitive	kʰeɾ-é-l	χos-í-l	gaɾtʰ-á-l	$\sqrt{}$-TH-INF
Definite-marked	kʰeɾ-é-l-ə	χos-í-l-ə	gaɾtʰ-á-l-ə	$\sqrt{}$-TH-INF-DEF
Instrumental-marked	kʰeɾ-é-l-óv	χos-**e**-l-óv	gaɾtʰ-a-l-óv	$\sqrt{}$-TH-INF-INS

We formalize the prosodic conditioning of *i*-neutralization using parallelist OT constraints that combine phonology and morphological changes. We argue that the above data requires morpheme-specific changes (whether allomorphy or readjustment rules) to be sensitive to surface stress and to the phonology of morphologically 'outwards' morphemes. This is contra more restrictive input-based models like Embick (2010) which undergenerate the Armenian data.

The morphological trigger is that *-i-* theme vowel is replaced by *-e-* when the verb is in the past imperfective tense. Note how stress is exceptionally on the theme vowel here. The trigger is the [+PAST] morpheme (underlined), which can either be overt (Table 3a) or covert (3b). The morpheme can likewise be outside the verb and on an auxiliary (3c). This auxiliary can either be adjacent to the verb; they can even be separated from each other via clitics (3d) or coordination (Section 4.4).

Table 3: *i*-neutralization is sensitive to non-adjacent presence of Past

a.	gə-χos-**é**-j<u>i</u>-n	IND-$\sqrt{}$-**TH**-<u>T</u>-AGR	'they were speaking'
b.	gə-χos-**é**-j∅-ɾ	IND-$\sqrt{}$-**TH**-<u>T</u>-AGR	'he was speaking'
c.	t͡ʃʰ-é-j<u>i</u>-n χos-**è**-ɾ	NEG-AUX-<u>T</u>-AGR $\sqrt{}$-**TH**-CN	'they weren't speaking'
d.	t͡ʃʰ-é-j<u>i</u>-n=al χos-**è**-ɾ	NEG-AUX-<u>T</u>-AGR=CL $\sqrt{}$-**TH**-CN	'they weren't even speaking'

The morphologically-conditioned allomorphy is a case of a word-external trigger (cf. Bobaljik & Harley 2017). We argue that the data requires a morphology component which is enriched with realization rules that can reference non-adjacent triggers across word boundaries. As further evidence for the need for long-distance rules, neutralization likewise applies under suspended suffixation of the auxiliary. In Section 4.4, I provide semantic and prosodic judgments that argue for a base-generation approach to suspended affixation, and against treating the suspended affixation in terms of ellipsis or movement. By not using ellipsis, the data acts as further evidence for the role of long-distance triggers in allomorphy.

In sum, this paper provides data that morpheme-specific morphophonological processes (whether as allomorphy or readjustment rules) must be able to reference output prosody, be outwardly-sensitive, and be conditioned long-distance by triggers that cross word boundaries. Regardless of whether we label this *i*-to-*e* change as a readjustment rule or allomorphy, this is long-distance over segments, over morphemes, and over morpho-

logical constituents. Cross-linguistically, the attestation of such a phenomenon is rare and counter-exemplifies various restrictive models of the phonology-morphology interface (Paster 2006; Embick 2010; Bobaljik 2012).

This paper is organized as follows. We go over the basic conjugation classes in Section 2 and provide the morphological structure of verbs. Section 3 goes through the phonological conditions of *i*-neutralization. We show that it is triggered by the absence of stress. Section 4 goes through the morphological triggers of neutralization. We focus on how the morphological trigger can be non-adjacent to the target thanks to clitics and coordination (suspended affixation). Alternative analyses would utilize ellipsis or word-internal covert triggers to make this process local, but I argue that such alternatives are empirically unsupported. We summarize the data in Section 5 within a general theoretical context of non-locality and output-sensitivity in allomorphy. We conclude in Section 6

2 Theme vowels in Armenian

In citation form, simple regular verbs consist of a root, theme vowel, and an infinitive suffix *-l*. Verbs are assigned to one of 3 conjugation classes based on the choice of theme vowel: *-e-*, *-i-*, *-a-*. We call these classes the E-Class, I-Class, and A-Class. The E-Class is the default class with the most members (Kogian 1949). Stress is generally word-final. We later elaborate on stress assignment.

Table 4: Infinitives and their class

E-Class	I-Class	A-Class	
kʰeɾ-é-l	χos-í-l	gɑɾtʰ-á-l	$\sqrt{}$-TH-INF
'to scratch'	'to speak'	'to read'	

The choice of theme vowel is root-conditioned with some correlations with transitivity (Dolatian & Guekguezian 2021). Morphosyntactically, we assume that the theme vowel is an adjunct on a covert little *v* (Oltra-Massuet 1999b); see Guekguezian & Dolatian (forthcoming) for evidence. The infinitive suffix occupies T. We show the class features of roots as subscripts *E, I, A*.
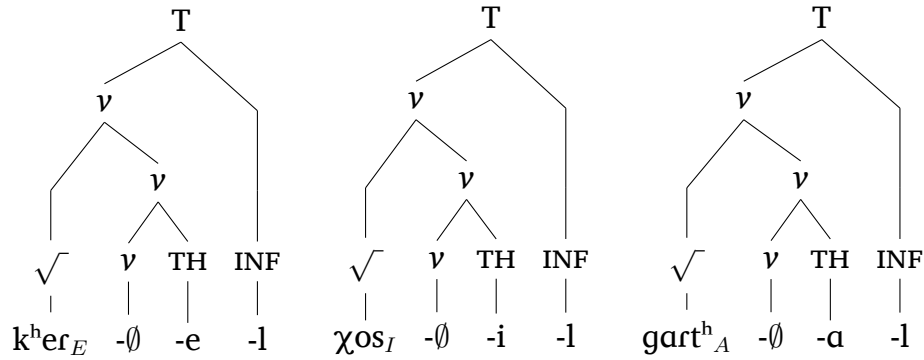
Figure 1: Structure of simple verbs

We assume that the choice of theme vowel is conditioned by class diacritics on the root: *E, A, I*. The following rules handle theme-vowel insertion. Although we assume that class diacritics are on the root, not on little *v*, the rest of the paper does not rely on this.

(1) *Selecting theme vowels after a class marker*

$$\text{TH} \;\rightarrow\; \begin{array}{ll} \textit{-e-} & / \;\sqrt{\textsc{e-class}} \frown v \frown \_ \\ \textit{-i-} & / \;\sqrt{\textsc{i-class}} \frown v \frown \_ \\ \textit{-a-} & / \;\sqrt{\textsc{a-class}} \frown v \frown \_ \end{array}$$

For the E-Class and A-Class, the quality of the theme vowel stays constant throughout the paradigm. However for the I-Class, the *-i-* theme vowel is neutralized to *-e-* in diverse morphological contexts. Before analyzing these factors, we first illustrate what some of these contexts are. One such context is causativization. To turn a simple verb into a causative infinitive, the causative suffix *-t͡sʰən-* is added after the root's theme vowel. The causative then takes its own *-e-* theme vowel. Crucially for the E-Class and A-Class, the post-root theme vowel stays *-e-* and *-a-* respectively. But for the I-Class, the root's *-i-* theme becomes *-e-*. We write the changed theme vowel in **bold**. We call this process *i*-neutralization.

Table 5: *i*-neutralization in causatives

	E-Class	I-Class verb	A-Class
Base verb	kʰeɾ-é-l	χos-í-l	gɑɾtʰ-á-l
	'to scratch'	'to speak'	'to read'
Causative	kʰeɾ-e-t͡sʰən-é-l	χos-**e**-t͡sʰən-é-l	gɑɾtʰ-a-t͡sʰən-é-l
	'to make s.o. scratch'	'to make s.o. speak'	'to make s.o. read'

As we later show, there are two sets of contexts which trigger *i*-neutralization. The first set of contexts trigger *i*-neutralization because of phonological reasons. The second triggers

i-neutralization because of morphological reasons.[2] For causativization, we argue that it is part of the first set of phonologically-conditioned contexts for *i*-neutralization. As we argue in the next section, the phonological trigger is that *unstressed -i-* theme vowels neutralize to *-e-*.

3   Output prosodic conditions in neutralization

The process of *i*-neutralization applies in diverse morphological contexts, beyond just causatives. Most of these contexts can be explained with a simple generalization based on stress (Section 3.1). We formalize this generalization in Section 3.2 as a morpheme-specific, phonologically-conditioned, outwardly-sensitive, and output-based process. This process is concerned solely with changing surface exponents and not with changing any morphosyntactic features (Section 3.3). We go through almost all known cases of *i*-neutralization and show that it is stress-conditioned (Section 3.4). We then argue that this generalization acts as a counter-example to restrictive models of the phonologically-conditioned allomorphy (Section 3.5). Morphological exceptions are discussed in Section 4.

3.1   *i*-neutralization is stress-conditioned

This section shows that for a large set of contexts of *i*-neutralization, a consistent correlation is that the neutralized theme vowel is unstressed. We thus argue that *i*-neutralization is triggered because of a morpheme-specific rule or constraint against unstressed *-i-* theme vowels.

First off, Armenian has regular primary stress on the rightmost non-schwa vowel. If the final syllable has a full vowel, then that vowel takes stress (2a).[3] Suffixation triggers stress shift to the rightmost full vowel (2b). If the final syllable is a schwa, then stress is on the rightmost non-schwa vowel (2c). Usually whenever the final syllable has a schwa, the penultimate syllable will have a non-schwa vowel (2d). But in colloquial speech, there are some words which end in two schwas, and thus stress is on the antepenultimate syllable (2e).

    (2)   a. bɑdɑsχán   'answer'

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[2]Within Indo-European, it is common to find theme vowel changes that are conditioned either by phonological or morphological factors within the same language, e.g. Spanish (Roca 2010). Note that Eastern Armenian does not have a *-i-* theme vowel, so *i*-neutralization is restricted to Western Armenian. It is an open question on whether *i*-neutralization exists in earlier varieties of Armenian, such as Classical or Middle Armenian.

[3]We first focus on just regular stress. For verbs, irregular stress is present in the past imperfective (Section 4) and some negative forms (Section 3.4).

  b. badasχan-óv 'answer-INS'
  c. badasχán-ə 'answer-DEF'
  d. méʁər   'honey'
  e. méʁɾ-ə   'honey-DEF (standard)'
    méʁəɾ-ə   'honey-DEF (colloquial)'

For verbs, we again see the primary stress rule behaving as expected. But once we look at *i*-neutralization in terms of stress, a strong correlation is that unstressed *-i-* theme vowels surface as *-e-*. To illustrate, in infinitives, final stress is on the theme vowel, and there is no neutralization. But in contrast, for the causative of the I-Class, the theme vowel is neutralized and is *unstressed* because it is not the final vowel. We argue that in these cases, *i*-neutralization is cased by the absence of stress.

Table 6: Stress and *i*-neutralization in aorists and causatives

	E-Class	I-Class verb	A-Class
Base verb	kʰeɾ-é-l	χos-í-l	gaɾtʰ-á-l
	'to scratch'	'to speak'	'to read'
Causative	kʰeɾ-e-t͡sʰən-é-l	χos-**e**-t͡sʰən-é-l	gaɾtʰ-a-t͡sʰən-é-l

This stress-based generalization can be captured with the following morphological rule which changes the unstressed theme vowel *-i-* to *-e-*. Within a serialist formalism, the rule has to apply after a phonological cycle of stress assignment. We illustrate later below.

(3) *i-neutralization rule from stress shift*
  Unstressed -*i*-TH neutralization
  *-i-*TH → *-e-*TH / [_, -STRESS]

The role of stress is visible when schwas are added. In the above examples, the final vowel received stress because of the phonological rule of final stress assignment. But, if the final vowel is a schwa, then there is neither stress shift not neutralization. For example, infinitives can be nominalized by adding nominal inflection. These suffixes are determiner suffixes and case markers. The determiner suffixes include the definite and possessive suffixes (Table 7a). These contain a schwa after C-final bases. They don't trigger stress shift or *i*-neutralization: *χos-í-l-ə*. In contrast, the case markers have full vowels, trigger stress shift, and trigger *i*-neutralization: *χos-e-l-óv* (Table 7b).

Table 7: *i*-neutralization in nominalized infinitives is based on stress

		E-Class	I-Class	A-Class
	Infinitive	kʰeɾ-é-l	χos-í-l	gaɾtʰ-á-l
a.	Definite	kʰeɾ-é-l-ə	χos-í-l-ə	gaɾtʰ-á-l-ə
		'the act of scratching'	'the act of speaking'	'the act of reading'
	1SG Possessive	kʰeɾ-é-l-əs	χos-í-l-əs	gaɾtʰ-á-l-əs
	2SG Possessive	kʰeɾ-é-l-ətʰ	χos-í-l-ətʰ	gaɾtʰ-á-l-ətʰ
b.	Instrumental	kʰeɾ-e-l-óv	χos-**e**-l-óv	gaɾtʰ-a-l-óv
	Ablative	kʰeɾ-e-l-é	χos-**e**-l-é	gaɾtʰ-a-l-é
	Dative/Genitive	kʰeɾ-e-l-ú	χos-**e**-l-ú	gaɾtʰ-a-l-ú

For completeness, we provide additional data from plural possessives (Table 8a) and cliticization (Table 8b). The plural possessive suffix *-ni-* takes regular final stress, and thus triggers *i*-neutralization.[4] Clitics syllabify with the base as part of a maximal prosodic word or clitic group (Vaux 1998:42; Dolatian 2021). Clitics don't trigger stress shift, so there is no *i*-neutralization.

Table 8: *i*-neutralization in other inflections of infinitives

		E-Class	I-Class	A-Class
	Infinitive	kʰeɾ-é-l	χos-í-l	gaɾtʰ-á-l
a.	1PL Poss	kʰeɾ-e-l-ní-s	χos-**e**-l-ní-s	gaɾtʰ-a-l-ní-s
		'our act of scratching'	'our act of speaking'	'our act of reading'
	2PL Poss	kʰeɾ-e-l-ní-tʰ	χos-**e**-l-ní-tʰ	gaɾtʰ-a-l-ní-tʰ
	3PL Poss	kʰeɾ-e-l-ní-n	χos-**e**-l-ní-n	gaɾtʰ-a-l-ní-n
b.	Cliticize 'is'	kʰeɾ-é-l=e	χos-í-l=e	gaɾtʰ-á-l=e
		'is act of scratching'	'is act of speaking'	'is act of reading'
	Cliticize 'also'	kʰeɾ-é-l=al	χos-í-l=al	gaɾtʰ-á-l=al
		'also act of scratching'	'also act of speaking'	'also act of reading'

As an alternative analysis that doesn't reference stress, we would need a rule like the following. The rule states that the *-i-* theme vowel is neutralized if it (non-immediately) precedes a non-schwa vowel within the minor prosodic word. It would be a mere coincidence that the distinction between schwas and non-schwas is the basis of Armenian stress. It is likewise a coincidence that the rule references the minor prosodic word boundary in order to exclude clitics.

(4)   *Alternative rule for i-neutralization based on vowel quality*

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[4]Infinitives cannot be easily pluralized with the plural suffix *-ner* in the Lebanese dialect. Glosses for the plural possessives are *-ni-s* -PL.POSS-1.POSS, *-ni-tʰ* -PL.POSS-2.POSS, *-ni-n* -PL.POSS-DEF. See Vaux (2003) and Arregi et al. (2013) for more information.

Prevocalic -*i*-$_{TH}$ neutralization

$$-i\text{-}_{TH} \quad \rightarrow \quad -e\text{-}_{TH} \quad / \quad \_ \ ... \ V \ ... \ )_w$$

where V is a non-schwa vowel in minor PWord

As a caveat though, some clitics induce special intonational contours. For example, the progressive morpheme =*gor* is by default an unstressed clitic (5a) (Donabédian 2001). The subjunctive complementizer morpheme =*ne* tends to create prominence on the pre-ceding syllable (5b). When both morphemes are present, the =*ne* will trigger a level of prominence on the =*gor* that seems stronger than the prominence of the theme vowel. We do not see *i*-neutralization.

(5)   a.   gə-χos-í-s   = goɾ
          IND-speak-TH-2SG.PRS   = PROG

          'You are speaking.'

      b.   jetʰe gə-χos-ì-s   = gór   = ne
          if   IND-speak-TH-1SG.PRS   = PROG   = SUBJ

          'If you are speaking.'

In sum, regardless of whether we define *i*-neutralization in terms of stress or vowel quality, the conditions for *i*-neutralization are phonological and output-sensitive. We illustrate a derivation below. First, the theme vowel is spelled-out by the morphology. Later, the phonology places stress on the rightmost full vowel. After this, the *i*-neutralization rule applies.

Table 9: Stages for application of phonologically-conditioned *i*-neutralization

	'to speak'	'the smoking'	'with smoking'
Input	χos-TH-INF	χos-TH-INF-DEF	χos-TH-INF-INS
Morphology	χos-i-l	χos-i-l-ə	χos-i-l-ov
Phonology: Stress assignment	χos-í-l	χos-í-l-ə	χos-i-l-óv
Morpheme-specific phonology			
(3) Unstressed -*i*-$_{TH}$ neutralization			χos-**e**-l-óv

The above vocalic suffixes are inflectional, and they are clearly added after the theme vowel. Thus, *i*-neutralization is a case of outwardly-sensitive phonologically-conditioned allomorphy. Within a cyclic framework, it would be unfeasible to argue that that the inflectional suffixes were generated temporally before the theme vowel (cf. Kalin 2020).

The above derivation treats stress-assignment as post-cyclic, i.e., that stress is assigned only once at the end of the derivation. But the outwards-sensitivity of *i*-neutralization does not depend on whether we treat stress as cyclic or post-cyclic. If we alternatively treated stress assignment as cyclic, then stress would temporarily be on the theme vowel

in an early point of the derivation. In later cycles, additional suffixes are added which would trigger stress shift and *i*-neutralization.

Table 10: Alternative cyclic application of stress and *i*-neutralization

		'to speak' χos-TH-INF	'the smoking' χos-TH-INF-DEF	'with smoking' χos-TH-INF-INS
Input				
Cycle 1	Morphology	χos-i-l	χos-i-l	χos-i-l
	Stress assignment	χos-í-l	χos-í-l	χos-í-l
	Neutralization			
Cycle 2	Morphology		χos-í-l-ə	χos-í-l-ov
	Stress assignment			χos-i-l-óv
	Neutralization			χos-**e**-l-óv

Thus regardless of whether we treat stress assignment as cyclic or not, *i*-neutralization is still referencing phonological structures (vowels) that come after the theme vowel. This reliance is what causes *i*-neutralization to be outwardly-sensitive. The outward-sensitivity is because the target of the rule (the theme vowel) is triggered by the phonology of later segments (presence of stressed vowels).

As a caveat, although we call *i*-neutralization a rule, the actual process is both morpheme-specific and it targets a single morph. Thus, this rule is descriptively equivalent to a case of phonologically-conditioned suppletive allomorphy (Kiparsky 1996; Kager 2009). For the rest of this paper, we descriptively call it a *process*, but all generalizations would apply if we called it *allomorphy*. In fact, by calling it allomorphy, we can better determine the theoretical consequences of our analysis (Section 5).

In sum, the above analysis treats *i*-neutralization as a morpheme-specific process that is conditioned by output prosody. Whether a theme vowel is stressed or not depends on the presence of subsequent non-schwa vowels. Thus, because stress assignment looks beyond the theme vowel, then the neutralization of the theme vowel is also outwardly-sensitive (Anderson 2008). The next section unpacks and formalizes this generalization.

3.2   *i*-neutralization is morpheme-specific and output-oriented

This generalization is based on making a morpheme-specific rule apply at the end of a phonological derivation. It has three ingredients. First, the rule is morpheme-specific. Second, the rule is conditioned by stress. Third, this rule references stress as the output of phonology after other morphemes are added. We argue that these three sub-generalizations are necessary to account for the data.

First, the use of a late morpheme-specific rule is relatively unconventional (cf. Aronoff 1976), but it is necessary. The rule of *i*-neutralization for theme vowels must be morpheme-

specific because it does not apply to any other unstressed *i* segments in Armenian (6a). Furthermore, Armenian has a process of destressed high vowel reduction whereby destressed high vowels are either deleted or reduced to a schwa (6b) (Dolatian 2021). This reduction process has no synchronic connection to *i*-neutralization. The unstressed theme vowel is never replaced by a schwa or deleted under stress shift (6c).

(6) a. məχitʰáɾ   'comforter'   niháɾ   'thin'
         *məχtáɾ   *nhaɾ
     b. amusín   'husband'   tʰív   'number'
         amusn-utʰjún   'marriage'   tʰəv-agán   'date'
     c. χos-i-l   'to speak'
         χos-**e**-l-óv   'with speaking'   *χos-l-óv, *χos-ə-l-óv

Within the lexical phonology of Armenian, the rule of high vowel reduction is a stem-level process, and it is more generalized than *i*-neutralization. Furthermore, Armenian has a fossilized rule of destressed *e*-to-*i* reduction which applies in the derivatives of a handful of roots (7) (Dolatian 2020:38). This rule is fossilized, applies in more morphemes than *i*-neutralization, but it utilizes the reverse transformation: *e*-to-*i* instead of *i*-to-*e*.

(7)   séɾ   'love'   gés   'half'
         siɾ-elí 'dear'   gis-é-l 'to halve'

Thus, *i*-neutralization must be a grammatical process that is restricted to only the *-i-* theme vowel, and to no other *i* segment in Armenian.

The second generalization is that *i*-neutralization is dependent on stress assignment. In the previous section, we illustrated this generalization in a serial form (Table 9): phonological stress assignment fed *i*-neutralization. The next section provides more cases of this stress-based correlation. For now, we formalize this generalization that the shape of the theme vowel is conditioned by the output prosody of word-level stress. Within a parallelist framework, we can translate the previous serial derivation from Table 9 into a single step. The final two stages can be conflated into a single phonology stage that uses parallelist constraints with morpheme-specific indexed-constraints (Pater 2007). We expand below.

To formalize the general stress system of Armenian, we use the constraint *$\acute{\vartheta}$ to block stress on schwas. This constraint outranks the constraint STR-R which places stress on the rightmost vowel (or grid beat; Gordon 2002). As for neutralization, the morpheme-specific constraint *i_{TH}[-STR] blocks unstressed *-i-* theme vowels. The subscript TH denotes theme vowels. Crucially, this trigger constraint for *i*-neutralization is a markedness constraint that's indexed to theme vowels (Flack 2007). The faithfulness constraint ID is shorthand for constraints on feature-changing.[5] Finally, the constraint PRIORITY (Mascaró 2007)

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[5]More exact instantiations of this faithfulness constraint are possible (cf. Bonet et al. 2007, 2015; Wolf 2008; Bye 2015), but the choice is tangential.

specifies that the preferred theme vowel is *-e-*, and is violated for any other type of theme vowel.

(8) *Constraints for i-neutralization*
     a. *ə́: Assign a violation for a stressed schwa.
     b. STR-R: Assign a violation if stress is not on the rightmost vowel.
     c. *i_{TH}[-STR]: Assign a violation if there is an unstressed *-i-* theme vowel.
     d. ID: Assign a violation if an input segment is changed in the output. We assume that stress loss does not count as a violation.
     e. PRIORITY[e_{TH}>i_{TH},a_{TH}] or PRIORITY: Assign a violation for a theme vowel that's not *-e-*.

(9) *Ranking for i-neutralization*
     *i_{TH}[-STR], *ə́ >> STR-R >> ID >> PRIORITY

We see these constraints work below. In a simple infinitive, stress is on the theme vowel so *i*-neutralization does not apply: *χos-í-l* 'to speak' (10b). We assume that the quality of the root-conditioned theme vowel is determined by the morphology, and that it is present in the input. Higher ranking ID blocks changing the theme vowel to *-e-*: *χos-é-l* (10a).

(10) *No i-neutralization when stressed*

/χos-i_{TH}-l/	*i_{TH}[-STR]	*ə́	STR-R	ID	PRIORITY
a. χosel				*!	
b. ☞ χosíl					*
c. χosɑl				*!	*

Stress does not shift to schwas. Thus, adding a schwa doesn't trigger stress shift or *i*-neutralization: *χos-í-l-ə* 'the speaking'.

(11) *No i-neutralization when stressed before a schwa*

/χos-i_{TH}-l-ə/	*i_{TH}[-STR]	*ə́	STR-R	ID	PRIORITY
a. χosilə́	*!	*			
b. χosélə			*	*!	
c. ☞ χosílə			*		*
d. χosálə			*	*!	*

But when a non-schwa suffix is added, we see stress-shift and *i*-neutralization: *χos-e-l-óv* 'with speaking' (12b). Stress must shift because of high-ranking STR-R: *χos-í-l-ov* (a). The high vowel cannot stay *-i-* because it is unstressed: *χos-i-l-óv* (c). The vowel is neutralized to *-e-* instead of *-a-* because of PRIORITY: *χos-a-l-óv* (d).

(12) *i-neutralization when unstressed*

/χos-i_{TH}-l-ov/	*i_{TH}[-STR]	*ə́	STR-R	ID	PRIORITY
a. χosílov			*!		
b. ☞ χoselóv				*	
c. χosilóv	*!				*
d. χosalóv				*	*!

In contrast, we see no such neutralization for other theme vowels like *gart^h-a-l-óv* 'with reading'.

(13) *No neutralization for other theme vowels*

/gart^h-a_{TH}-l-ov/	*i_{TH}[-STR]	*ə́	STR-R	ID	PRIORITY
a. gart^hálov			*!		
b. gart^helóv				*!	
c. gart^hilóv	*!			*	*
d. ☞ gart^halóv					*

The third generalization is that by referencing stress, *i*-neutralization must reference the output of the phonology after other suffixes are added. This amounts to treating *i*-neutralization as a case of outwardly-sensitive and phonologically-conditioned allomorphy. Such a generalization is theoretically controversial (Paster 2006), but empirically valid (Anderson 2011). This is further elaborated and defended in section Section 3.4, where we go through more cases of phonologically-conditioned *i*-neutralization. But first, we briefly refute an alternative analysis based on morphological features.[6]

3.3 *i*-neutralization does not affect morphology

So far, we have seen that stress shift triggers the change in theme vowels. On the surface, one could argue that the cause of *i*-neutralization is changing the class features of the

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[6]As an alternative to morpheme-specific processes, we can postpone theme-vowel selection to after the phonology has applied, i.e., morphology and phonology apply in parallel (McCarthy & Prince 1993; Wolf 2008; Rolle 2020). This alternative is plausible but has some conceptual and empirical problems (Paster 2006; Yu 2007; Embick 2010; Kalin 2020). Another alternative is to treat the underlying form of the *-i-* theme vowel as the set of allomorphs {-*i*-,-*e*-} (cf. Bermúdez-Otero 2013). The *-e-* vowel is picked because of a low-ranking constraint against unstressed high vowels. A separate PRIORITY constraint is needed to ensure that *-i-* is prioritized over *-e-* so that *-i-* surfaces when it is stressed (cf. Mascaró 2007). But regardless of what theoretical implementation we use, all the above formalizations still treat *i*-neutralization as a case of phonologically-conditioned outwardly-sensitive allomorphy. The choice of a morphological exponent is conditioned by the prosody of the post-cyclic output.

root. That is, one could argue that whenever an *-i-* theme vowel is neutralized to *-e-*, the verb root has lost its I-Class feature and is now an E-Class root. But this is analysis is untenable. Evidence comes from the past perfective.

In the past perfective, the perfective suffix *-t͡sʰ-* is added after the theme vowel. The suffix is followed by a sequence of T + Agr suffixes. Crucially, there are two processes that occur in the past perfective. First, *i*-neutralization predictably applies because of stress shift. Second, the I-Class triggers a special set of T-Agr suffixes, distinct from the suffixes used for the E-Class and A-Class. The main difference is that the T morpheme is *-a* for the I-Class, but *-i* for the E/A-Class

<p align="center">Table 11: Past perfective of simple verbs</p>

	E-Class	I-Class	A-Class	Template
INF	kʰeɾ-e-l	χos-i-l	gɑɾtʰ-ɑ-l	√-TH-INF
	'to scratch'	'to speak'	'to read'	
1SG	kʰeɾ-e-t͡sʰ-í	χos-**e**-t͡sʰ-ɑ́	gɑɾtʰ-ɑ-t͡sʰ-í	√-TH-ASP-T-AGR
	'I scratched'	'I spoke'	'I read'	
1SG	kʰeɾ-e-t͡sʰ-í-ɾ	χos-**e**-t͡sʰ-ɑ́-ɾ	gɑɾtʰ-ɑ-t͡sʰ-í-ɾ	
1SG	kʰeɾ-é-t͡sʰ	χos-**e**-t͡sʰ-ɑ́-v	gɑɾtʰ-ɑ́-t͡sʰ	
1SG	kʰeɾ-e-t͡sʰ-í-ŋkʰ	χos-**e**-t͡sʰ-ɑ́-ŋkʰ	gɑɾtʰ-ɑ-t͡sʰ-í-ŋkʰ	
1SG	kʰeɾ-e-t͡sʰ-í-kʰ	χos-**e**-t͡sʰ-ɑ́-kʰ	gɑɾtʰ-ɑ-t͡sʰ-í-kʰ	
1SG	kʰeɾ-e-t͡sʰ-í-n	χos-**e**-t͡sʰ-ɑ́-n	gɑɾtʰ-ɑ-t͡sʰ-í-n	

For the T-Agr suffixes on the I-Class, the choice of suffixes is morphologically-conditioned allomorphy. These are conditioned by the I-Class feature of the root. Thus, I-Class roots in this context trigger allomorphy but also take an *-e-* class theme vowel. Even though the theme vowel is *-e-*, the root must still have its I-Class feature. Otherwise, the roots would not have been able to trigger T-Agr allomorphy. We do not provide rules for this allomorphy nor discuss it in depth. For that, see Dolatian and Guekguezian (2021) and Karakaş et al. (2021).

More explicitly, if *i*-neutralization deleted the class-features of the root, it would not be able to trigger the correct T-Agr allomorphy. In bottom-up spell-out (Bobaljik 2000), the theme vowel must be inserted before the perfective. Once the perfective morpheme is inserted, it would form the context for *i*-neutralization and delete class features. These deleted features would be missing by the time the T-Agr is spelled out, preventing the choice of T-Agr allomorphy. Thus this alternative analysis is incorrect.

In sum, *i*-neutralization is not a matter of changing morphosyntactic features on roots. It is a process that directly affects the theme vowel exponent, without affecting the class membership of the root. Having set this concern aside, we now go through more contexts for phonologically-conditioned *i*-neutralization. We see that the overarching generaliza-

tion is stress-based.

3.4   Stress and *i*-neutralization in other contexts

The analysis above treats *i*-neutralization as stress-conditioned. This section provides more evidence for the role of stress based on other morphological constructions which trigger *i*-neutralization.

Like any other free-standing word, infinitives can take derivational suffixes or form compounds. Compounds are formed by concatenating stems with the linking vowel *-a-*. Both derivation and compounding trigger stress shift. The theme vowels *-e-, -a-* stay intact, while the *-i-* vowel is neutralized to *-e-*: *nəst-**e**-l-íkʰ*.

Table 12: *i*-neutralization in words derived from infinitives

	Derivatives		Compounds	
E-Class verbs	χəm-é-l	'to drink'	kʰoɾd͡z-é-l + géɾb	'to work + manner'
	χəm-e-l-íkʰ	'beverage'	kʰoɾd͡z-e-l-a-géɾb	'tactic'
I-Class verbs	nəst-í-l	'to sit'	abɾ-í-l + t͡ʃʰév	'to live + manner'
	nəst-**e**-l-íkʰ	'sittable'	abɾ-**e**-l-a-t͡sʰév	'lifestyle'
A-Class verbs	χəntʰ-á-l	'to laugh'	əsk-á-l + bés	'to feel + manner'
	χənt-a-l-íkʰ	'funny'	əsk-a-l-a-bés	'sensibly'

Imperatives likewise show the dependence of *i*-neutralization on stress-shift. The theme vowel is stressed in the imperative 2SG, but not in the imperative 2PL.[7] We find neutralization in only the latter.

Table 13: *i*-neutralization in imperative 2PL but not 2SG

	E-Class	I-Class	A-Class
Infinitive	kʰeɾ-é-l	χos-í-l	gaɾtʰ-á-l
Imp 2SG	kʰeɾ-é	χos-í-ɾ	gaɾtʰ-á
Imp 2PL	kʰeɾ-e-t͡sʰ-ékʰ	χos-**e**-t͡sʰ-ékʰ	gaɾtʰ-a-t͡sʰ-ékʰ
	'to scratch'	'to speak'	'to read'

Neutralization does not distinguish between primary stress and secondary stress. In the

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[7]In some more archaic dialects, the imperative 2SG of the I-Class is marked by the suffix *-e*: *χos-é* 'speak!'. We can treat this *-e-* either as idiosyncratic *i*-neutralization or as a separate imperative morpheme; note the contrast for these archaic lects between *χos-í* 'he speaks' vs. *χos-é* 'speak!'. The imperative 2PL utilizes a meaningless perfective suffix *-t͡sʰ-* between the theme vowel and T/Agr suffix. This meaningless affix is part of a morphomic distribution of the traditional aorist stem (Kogian 1949; Fairbanks 1948).

prohibitive 2SG and 2PL, primary stress is on a proclitic, while secondary stress is on the theme vowel. There is no neutralization.[8]

Table 14: No *i*-neutralization in prohibitives due to secondary stress

	E-Class	I-Class	A-Class
Infinitive	kʰeɾ-é-l	χos-í-l	gaɾtʰ-á-l
Proh 2SG	mí kʰeɾ-è-ɾ	mí χos-ì-ɾ	mí gaɾtʰ-á-ɾ
Proh 2PL	mí kʰeɾ-è-kʰ	mí χos-ì-kʰ	mí gaɾtʰ-à-kʰ
	'to scratch'	'to speak'	'to read'

Similarly, in the subjunctive present, stress is final on the theme vowel in the positive. The negative is formed by adding the negative prefix *t͡ʃʰ(ə)-* with schwa epenthesis before consonants. Stress is idiosyncratically on the first syllable, while the theme vowel takes secondary stress. There is no neutralization. We only show the I-Class below.

Table 15: No *i*-neutralization in negative subjunctive present due to secondary stress

	Positive	Negative	Positive	Negative
Infinitive	abɾ-í-l		χos-í-l	
	'to live'		'to speak'	
Pres 1SG	abɾ-í-m	t͡ʃʰ-ábr-ì-m	χos-í-m	t͡ʃʰə́-χos-ì-m
Pres 2SG	abɾ-í-s	t͡ʃʰ-ábr-ì-s	χos-í-s	t͡ʃʰə́-χos-ì-s
Pres 3SG	abɾ-í	t͡ʃʰ-ábr-ì	χos-í	t͡ʃʰə́-χos-ì
Pres 1PL	abɾ-í-ŋkʰ	t͡ʃʰ-ábr-ì-ŋkʰ	χos-í-ŋkʰ	t͡ʃʰə́-χos-ì-ŋkʰ
Pres 2PL	abɾ-í-kʰ	t͡ʃʰ-ábr-ì-kʰ	χos-í-kʰ	t͡ʃʰə́-χos-ì-kʰ
Pres 3PL	abɾ-í-n	t͡ʃʰ-ábr-ì-n	χos-í-n	t͡ʃʰə́-χos-ì-n

Instead of secondary stress, we can instead argue that the above constructions are evidence that the trigger for *i*-neutralization is the presence of a following non-schwa vowel. Both analyses are again descriptively equivalent with equivalent theoretical ramifications.

Furthermore, it is not the case that the mere presence of these morphological constructions causes neutralization. In contrast, the theme vowel must be unstressed in order to then undergo neutralization. For example, in Table 12, we showed that when an infinitive undergoes compounding, it will lose stress and undergo neutralization. However, it is not the mere presence of compounding which triggers neutralization. When a compound is a noun or adjective, it can get verbalized by adding a theme vowel: *her-a-t͡sʰajn-é-l*. In general, compound verbs follow the E-Class. When these verbs are passivized, they become I-Class verbs and take the *-i-* theme vowel: *her-a-t͡sʰajnə-v-í-l*. The theme vowel

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is not neutralized to *-e-* despite the presence of compounding.[9] Neutralization is blocked because the theme vowel is stressed.

Table 16: Blocking *i*-neutralization in verbalized compounds

N + N	heɾu + t͡sʰɑjn	'far + voice'	tʰɑs + gɑɾkʰ	'class + order'
N-ɑ-N	heɾ-ɑ-t͡sʰɑ́jn	'telephone'	tʰɑs-ɑ-gɑ́ɾk	'class, category'
N-ɑ-N-TH-INF	heɾ-ɑ-t͡sʰɑjn-é-l	'to telephone'	tʰɑs-ɑ-gɑɾkʰ-é-l	'to classify'
N-ɑ-N-PASS-TH-INF	heɾ-ɑ-t͡sʰɑjnə-v-í-l	'to be telephoned'	tʰɑs-ɑ-gɑɾkʰə-v-í-l	'to be classified'
	*heɾ-ɑ-t͡sʰɑjnə-v-**é**-l		*tʰɑs-ɑ-gɑɾkʰə-v-**é**-l	

Thus, the consistent generalization so far is that unstressed *-i-* theme vowels change to *-e-* in diverse morphological contexts.

3.5 Interim summary

So far, we have surveyed 7 constructions which trigger neutralization: causatives, past perfectives, derivation, compounding, imperative 2PL, case-marking, and plural possessives. The common factor across all these constructions is that they trigger stress shift away from the theme vowel. In all these constructions, the vowel lacks either primary or secondary stress. Thus, the morpheme-specific process of neutralization must apply after the phonology places final stress.

If we were to analyze these factors in terms of the morphology, then there wouldn't be a clear and simple trigger for neutralization. We would have to argue that all derivational suffixes and compounding constructions would have some arbitrary morphological feature that triggered neutralization (cf. similar problems in Harley & Tubino Blanco 2013).

In fact, the Armenian data is partially analogous to the case of stress-conditioned stem allomorphy in Swiss Rumantsch (Anderson 2008) and stress-conditioned dipthongization in Spanish (Bermúdez-Otero 2006, 2013). The main differences are that the stress-conditioned allomorphy in Armenian is simpler in its scope and its complications. The allomorphy is restricted to a single morph (the theme vowel) and not to an open class of roots. The Armenian case likewise doesn't present any reflexes of cyclicity, opacity, or stratal paradoxes.

As elaborated in Anderson (2011), stress-conditioned allomorphy like Rumantsch and Armenian are counter-examples to two cross-linguistic tendencies in allomorphy (Paster 2009). First, the allomorphy (*i*-neutralization) is conditioned by an output-based property

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[9]The additional schwa in the passive forms is due to a morpheme-specific rule of pre-passive epenthesis (Vaux 1998; Dolatian in reviewb).

(stress), and not a property that can be elegantly captured by just analysing the input. Second, the allomorphy is based on the phonological properties of morphemes that are derivationally 'outward' or added later, e.g., nominal inflection.

Stress-conditioned *i*-neutralization is thus one of the few attested cases of outwardly-sensitive and phonologically-conditioned allomorphy (Rubach & Booij 2001; Kikuchi 2006; Hannahs & Tallerman 2006; Svenonius 2012; Bermúdez-Otero 2016; McCarvel 2016; Deal & Wolf 2017; Sande 2018; Brinkerhoff 2019; Herce 2020; Kiparsky 2021; Rolle & Bickmore 2021).[10] Such types of allomorphy are difficult to capture in restrictive input-based models of allomorphy that limit the amount of cross-modular information between morphology and phonology (Embick 2010; Scheer 2011; Embick & Shwayder 2018)

In sum, for the constructions above, the simplest generalization is that *i*-neutralization applies whenever the theme vowel is unstressed. However, there are still some corners of the grammar which resist the above stress-based generalization. We discuss those next.

4   Word-external conditions in neutralization

In the previous section, we went through a large set of contexts which trigger *i*-neutralization. We argued that the trigger for neutralization was a morpheme-specific phonological rule that targeted the unstressed *-i-* theme vowel. In this section, we go through two contexts where *i*-neutralization applies without any stress shift: past imperfectives (Section 4.1) and negated past imperfectives (Section 4.2). We argue that the trigger for neutralization in these contexts is not phonological or morpheme-specific phonology. Instead, the trigger is morphological. The trigger is the past morpheme which can be either after the theme vowel (Section 4.1) or on a separate auxiliary (Section 4.2). Such allomorphy is long-distantly triggered across morphological words (Section 4.4).

4.1   Local neutralization in past imperfectives

Before we get to these morphologically-conditioned neutralization contexts, we first consider a context where there is predictably no neutralization. For example, verbs can be inflected for present tense. Here, the theme vowel takes predictable final stress, and is not neutralized. The post-theme elements are replaced with the appropriate Tense (T) and Agreement (Agr) morphemes. T and Agr are fused in the present.

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[10]Some cases of outwardly-sensitive allomorphy have been reanalyzed as due to latent segments (Zimmermann 2019; Lindsey 2019; Ulfsbjorninn 2020). It's not clear to me how latent or ghost vowels can be used for the Armenian case.

Table 17: Present tense for simple verbs

	E-Class	I-Class	A-Class	Template
INF	kʰeɾ-é-l	χos-í-l	gɑɾtʰ-ɑ́-l	√-TH-ÍNF
	'to scratch'	'to speak'	'to read'	
1SG	kʰeɾ-é-m	χos-í-m	gɑɾtʰ-ɑ́-m	√-TH-T/AGR
	'I scratch'	'I speak'	'I read'	
2SG	kʰeɾ-é-s	χos-í-s	gɑɾtʰ-ɑ́-s	
3SG	kʰeɾ-é-	χos-í-	gɑɾtʰ-ɑ́-	
1PL	kʰeɾ-é-ŋkʰ	χos-í-ŋkʰ	gɑɾtʰ-ɑ́-ŋkʰ	
2PL	kʰeɾ-é-kʰ	χos-í-kʰ	gɑɾtʰ-ɑ́-kʰ	
3PL	kʰeɾ-é-n	χos-í-n	gɑɾtʰ-ɑ́-n	

These verbs are interpreted as present subjunctive. To make them indicative, the prefix *g(ə)-* is added. See Bezrukov and Dolatian (2020) on the morphotactics of the indicative prefix across Western dialects.

In contrast in the past imperfective, we find *i*-neutralization, but stress stays on the theme vowel. To clarify its structure, we compare it with the past perfective. The main difference between them is that the past perfective contains an overt Asp suffix *-t͡sʰ-* after the root, while the past imperfective has no overt Asp. The verb ends in separate T and Agr morphs. We only show the E-Class and I-Class. The I-Class shows *i*-neutralization in both. We underline the past suffix in the past imperfective. Note that vowel hiatus between the theme vowel and the past suffix /-i/ is repaired by glide epenthesis.

Table 18: Past imperfectives and perfectives of simple verbs

	E-Class		I-Class	
Inf.	kʰeɾ-é-l	'to scratch'	χos-í-l	'to speak'
	Past impf.	Past perf.	Past impf.	Past perf.
1SG	kʰeɾ-é-ji	kʰeɾ-e-t͡sʰ-í	χos-**é**-ji̲	χos-**e**-t͡sʰ-ɑ́
2SG	kʰeɾ-é-ji-ɾ	kʰeɾ-e-t͡sʰ-í-ɾ	χos-**é**-ji-ɾ	χos-**e**-t͡sʰ-ɑ́-ɾ
3SG	kʰeɾ-é-∅̲-ɾ	kʰeɾ-é-t͡sʰ	χos-**é** ∅̲-ɾ	χos-**e**-t͡sʰ-ɑ́-v
1PL	kʰeɾ-é-ji-ŋkʰ	kʰeɾ-e-t͡sʰ-í-ŋkʰ	χos-**é**-ji-ŋkʰ	χos-**e**-t͡sʰ-ɑ́-ŋkʰ
2PL	kʰeɾ-é-ji-kʰ	kʰeɾ-e-t͡sʰ-í-kʰ	χos-**é**-ji-kʰ	χos-**e**-t͡sʰ-ɑ́-kʰ
3PL	kʰeɾ-é-ji-n	kʰeɾ-e-t͡sʰ-í-n	χos-**é**-ji̲-n	χos-**e**-t͡sʰ-ɑ́-n
	√-TH-T-AGR	√-TH-ASP-T-AGR	√-**TH**-T̲-AGR	√-**TH**-ASP-T-AGR

As with present tense verbs, past imperfectives are interpreted as subjunctive. They become indicative with the prefix *g(ə)-*.

Setting aside the 3SG, for both past tenses, the theme vowel is followed by a full-vowel.

Thus we incorrectly expect final stress in both contexts. We only find it in the past perfective.

In the past perfective, stress is predictably on the final vowel because it is the rightmost vowel. Here, *i*-neutralization is predictable because the theme vowel is unstressed: *χos-e-t͡sʰ-á* 'I spoke'.[11] But in the past imperfective, stress is idiosyncratically placed on the theme vowel, yet we still find *i*-neutralization: *χos-é-ji* '(If) I were speaking'. In the Lebanese sub-dialect of Standard Western Armenian, the imperfective suffixes don't trigger stress shift. I have found similar judgments from young speakers in Istanbul and the USA.[12]

Based on the above paradigm, one could think of two hypothetical phonological reasons as to why *i*-neutralization applies: vowel hiatus or dissimilation. We argue against both of these. First, we cannot argue that *i*-neutralization is triggered by vowel hiatus. Underlyingly in the past imperfective, the theme vowel precedes the past marker *-i* for most T-Agr combinations. But, this vowel hiatus is repaired by glide *j*-epenthesis: /χos-é-i/ → [χos-é-[j]-i] '(If) I were speaking'.

Second, we cannot argue that neutralization is caused by the dissimilation of the theme vowel *-i-* before *i*-initial T/Agr suffixes (**χos-í-ji*). This is because in the past imperfective 3SG, the T node is covert while the Agr node is *-r*. There is thus no post-theme vowel but we still see neutralization: *χos-é-r*. Furthermore, elsewhere in Armenian, there is no evidence of underlying /i + i/ sequences getting repaired via dissimilation, only by glide epenthesis: /kʰini-i/→[ʰkini-ji] 'wine-GEN'.

As a reviewer points out, it is possible that the modern system of irregular stress in the past imperfective diachronically descends from a system with regular final stress. *i*-neutralization would then transparently apply in some constructions like a regularized 2SG *χos-e-jí-r* 'you were speaking'. Analogy would cause *i*-neutralization to spread to the 3SG cell where there is stress on the theme vowel: 3SG *χos-é-r* 'he was speaking'. Such an analogy model is viable as a diachronic mechanism (cf. with Optimal Paradigms, McCarthy 2005). But synchronically, imperfectives *idiosyncratically* trigger neutralization without any phonological motivation. Instead, *i*-neutralization in the past imperfective requires the following morphological rule.

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[11]The perfective and imperfective have largely the same T-Agr exponents. They mainly differ in the 3SG. In the past imperfective 3SG, the T + Agr slots fuse into a portmanteau *-r*. In the past perfective, the T + Agr for the 3SG can be zero or a separate suffix, depending on class. We set this aside because it's tangential. And for the I-Class, the I-Class roots trigger special T-Agr allomorphs in the past perfective. See Karakaş et al. (2021) for an analysis.

[12]A reviewer reports that older generations of speakers in the USA have regular final stress in the past imperfective. Anaid Donabédian reports similar judgments for the community in France. But regardless of the use of regular stress for these communities or generations, their paradigms still show *i*-neutralization in past imperfective contexts where stress is on the theme vowel, specifically the 3SG and the negative forms (Section 4.2). Thus regardless of variation in stress, the + PAST morpheme is still the primary trigger of neutralization in the past imperfective. Furthermore, in Eastern Armenian, these suffixes do trigger stress shift (Մարգարյան 1997:77). The Eastern dialect however doesn't have the *-i-* theme vowel at all.

(14) *i-neutralization for past* (To be revised)
   Neutralization in Past
   $-i\text{-}_{TH}$ → $-e\text{-}_{TH}$ / _ + PAST

The rule specifies that the *-i-* theme vowel is neutralized to *-e-* when there is a +PAST marker. In the past imperfective, this marker is covert in 3SG, but an overt *-i* vowel elsewhere. The past morpheme will correctly cause neutralization in past imperfectives, where there is no stress shift. The rule will likewise vacuously apply in past perfectives, where we find both stress shift and neutralization: $\chi os\text{-}e\text{-}\widehat{ts^h}\text{-}\acute{a}\text{-}\eta k^h$ 'we spoke'.

The rule says that the theme vowel *-i-* is replaced by *-e-* in the past. This rule can apply in the Morphology component either a) after theme-vowels are selected, or b) in parallel with theme-vowel selection. We are ultimately agnostic about the choice of timing; for illustration, we assume neutralization applies after theme-selection.

Table 19: Stages for application of morphologically-conditioned *i*-neutralization

	Infinitive 'to speak' χos-TH-INF	Past perfective 'We spoke' χos-TH-ASP-T-1PL	Past imperfective 'We were speaking' χos-TH-T-1PL
Input			
Morphology	χos-i-l	χos-i-t͡sʰ-a-ŋkʰ	χos-i-i-ŋkʰ
(14) Neutralization in Past		χos-**e**-t͡sʰ-a-ŋkʰ	χos-**e**-i-ŋkʰ
(Morpho-)Phonology			
Stress assignment	χos-í-l	χos-**e**-t͡sʰ-á-ŋkʰ	χos-**é**-i-ŋkʰ
Glide epenthesis			χos-**é**-ji-ŋkʰ
Output	χos-í-l	χos-**e**-t͡sʰ-á-ŋkʰ	χos-**é**-ji-ŋkʰ

The above rule requires that the theme vowel and past suffix are adjacent. But in the next section, we revise this rule to incorporate long-distance triggers in past constructions.

4.2 Non-local neutralization in periphrasis

The previous section showed that past imperfectives trigger neutralization, such that the target theme vowel and the trigger past suffix are adjacent. In this section, we discuss long-distance neutralization in the negated past imperfective. Here, the trigger past morpheme is on a separate auxiliary within a periphrastic construction. We still have neutralization apply. Linear adjacency is not crucial.

In the indicative mood, present and past imperfective verbs are negated in a complicated manner. We illustrate first with the negated present indicative. The verb uses a participle form, the *connegative,* that does not bear any T/Agr markers. The T/AGR slot is replaced

by a connegative suffix *-r*. Negation, tense, and agreement are marked periphrastically by adding a negated auxiliary before the verb: *t͡ʃʰ-é-m kʰeɾ-è-ɾ* 'I do not scratch'. The auxiliary carries all T/Agr marking.[13]

Table 20: Negated present indicative of simple verbs

	E-Class 'to scratch'		I-Class 'to speak'		A-Class 'to read'	
INF		kʰeɾ-e-l		χos-i-l		ɡaɾtʰ-a-l
1SG	t͡ʃʰ-é-m	kʰeɾ-è-ɾ	t͡ʃʰ-é-m	χos-ì-ɾ	t͡ʃʰ-é-m	ɡaɾtʰ-à-ɾ
	'I don't scratch'		'I don't speak'		'I don't read'	
2SG	t͡ʃʰ-é-s	kʰeɾ-è-ɾ	t͡ʃʰ-é-s	χos-ì-ɾ	t͡ʃʰ-é-s	ɡaɾtʰ-à-ɾ
3SG	t͡ʃʰ-i	kʰeɾ-è-ɾ	t͡ʃʰ-i	χos-ì-ɾ	t͡ʃʰ-i	ɡaɾtʰ-à-ɾ
1PL	t͡ʃʰ-é-ŋkʰ	kʰeɾ-è-ɾ	t͡ʃʰ-é-ŋkʰ	χos-ì-ɾ	t͡ʃʰ-é-ŋkʰ	ɡaɾtʰ-à-ɾ
2PL	t͡ʃʰ-é-kʰ	kʰeɾ-è-ɾ	t͡ʃʰ-é-kʰ	χos-ì-ɾ	t͡ʃʰ-é-kʰ	ɡaɾtʰ-à-ɾ
3PL	t͡ʃʰ-é-n	kʰeɾ-è-ɾ	t͡ʃʰ-é-n	χos-ì-ɾ	t͡ʃʰ-é-n	ɡaɾtʰ-à-ɾ
Template:	NEG-AUX-T/AGR $\sqrt{\ }$-TH-CN					

In both the positive and negative present, we find no neutralization: *χos-i-m* 'I speak' vs. *t͡ʃʰ-é-m χos-ì-ɾ* 'I don't speak'. Prosodically in the negative form, the auxiliary and the connegative participle form a prosodically coherent constituent. The auxiliary has primary stress while the verbal participle has secondary stress. As with prohibitives, secondary stress blocks phonologically-conditioned *i*-neutralization: **t͡ʃʰ-é-m χos-è-ɾ* 'I do not speak'. We can treat the two items as separate prosodic words that combine to form a single larger constituent, whether as a recursive prosodic word (Selkirk 1996; Ito & Mester 2009), a clitic group (Nespor & Vogel 1986; Kabak & Vogel 2001), a composite group (Vogel 2009, 2016), or some PWord group (Vigário 2010).

For the negated present tense, the verb takes the connegative suffix *-r* without any *i*-neutralization. But in the negated past imperfective, the verb takes the suffix *-r* and undergoes *i*-neutralization: *t͡ʃʰ-é-ji̱ χos-è-ɾ* 'I wasn't speaking'. The trigger for neutralization is thus the past T morpheme on the auxiliary, not phonology. The segmental environment of the *-i-* theme vowel is the same between the negated present (Table 20) and negated imperfective (Table 21). The underlined past morpheme is linearly before the root and theme vowel.

---

[13]This auxiliary *-e-* is the same auxiliary that's used as the copula in Armenian: *uɾaχ e-m* 'I am happy' [happy AUX-1sg]. For 3SG, the negated auxiliary uses a portmanteau: *t͡ʃʰ-i*. Before a vowel-initial verb, this 3SG negated auxiliary is reduced to a prefix: *abɾ-i̱-l* 'to live' [$\sqrt{\ }$-TH-INF] vs. *t͡ʃʰ-ábɾ-ì-ɾ* 'he does not live' [NEG-$\sqrt{\ }$-TH-CN].

Table 21: Long-distance neutralization in the negated past imperfective of simple verbs

	E-Class		I-Class		A-Class	
INF		kʰeɾ-é-l		χos-í-l		gaɾtʰ-á-l
1sg	t͡ʃʰ-é-ji	kʰeɾ-è-ɾ	t͡ʃʰ-é-ji̱	χos-è-ɾ	t͡ʃʰ-é-ji	gaɾtʰ-à-ɾ
	'I wasn't scratching'		'I wasn't speaking'		'I wasn't reading'	
2sg	t͡ʃʰ-é-ji-ɾ	kʰeɾ-è-ɾ	t͡ʃʰ-é-ji-ɾ	χos-è-ɾ	t͡ʃʰ-é-ji-ɾ	gaɾtʰ-à-ɾ
3sg	t͡ʃʰ-é-∅-r	kʰeɾ-è-ɾ	t͡ʃʰ-é-∅-ɾ	χos-è-ɾ	t͡ʃʰ-é-∅-r	gaɾtʰ-à-ɾ
1pl	t͡ʃʰ-é-ji-ŋkʰ	kʰeɾ-è-ɾ	t͡ʃʰ-é-ji̱-ŋkʰ	χos-è-ɾ	t͡ʃʰ-é-ji-ŋkʰ	gaɾtʰ-à-ɾ
2pl	t͡ʃʰ-é-ji-kʰ	kʰeɾ-è-ɾ	t͡ʃʰ-é-ji-kʰ	χos-è-ɾ	t͡ʃʰ-é-ji-kʰ	gaɾtʰ-à-ɾ
3pl	t͡ʃʰ-é-ji-n	kʰeɾ-è-ɾ	t͡ʃʰ-é-ji̱-n	χos-è-ɾ	t͡ʃʰ-é-ji-n	gaɾtʰ-à-ɾ
Template:	NEG-AUX-<u>T</u>-AGR		√-**TH**-**CN**			

Just as in the case of stress-conditioned neutralization, the above case of morphologically-conditioned neutralization is outwardly-sensitive. It is conditioned by the presence of the T morpheme on a separate prosodic word and morphological word: the auxiliary. We thus have a case of allomorphy occurring due to a trigger (T) that is not confined within the same morphological word of the target (the theme vowel). Such cases of word-external or inter-word allomorphy are cross-linguistically rare, but attested (Ackema & Neeleman 2003, 2004; Toosarvandani 2016; Bobaljik & Harley 2017; Harley et al. 2017; Duncan 2019; Weisser 2019; Lomashvili 2019). Furthermore, morphophonological dependencies between verbs and their auxiliaries are likewise attested (Elordieta 1997).[14]

In the above paradigm, the theme vowel and the trigger T morpheme are linearly separated by only one morpheme, the root. However, passives show that there is no principled limit on how many morphemes or segments can linearly separate the T morpheme and the theme vowel. Passive verbs are I-Class, and they are formed by adding the suffix *-v-* after the root. The passive suffix selects the *-i-* theme vowel. Passive verbs undergo *i*-neutralization in the same contexts as simple I-Class verbs.

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[14]A reviewer suggests if it's possible that there is a covert T affix or feature present on the connegative for past imperfectives, such that it triggers neutralization in the case of the negated past imperfective, but not the negated present. This T in the connegative would be covert, but it would copy the tense features of the T on the auxiliary, such as via some type of agreement relationship. Such reanalyses have been suggested for other cases of inter-word allomorphy (Thornton 2019) and long-distance allomorphy (Bonet & Harbour 2012:232). But the problem with this analysis is that there is no non-circular or independent evidence for this covert affix or for this agreement relationship. For the E-Class and A-Class, the connegative participle is identical in both tenses: *kʰeɾ-e-ɾ* 'scratch-TH-CN' and *gaɾtʰ-a-ɾ* 'read-TH-CN'; the only overt cue for tense is on the auxiliary. Between the two tenses, the connegative differs only for the I-Class because of *i*-neutralization: *χos-i-ɾ* (present) and *χos-e-ɾ* (past) for 'speak-TH-CN'.

Table 22: Long-distance neutralization in the negated imperfective of passives

Active verb:	χos-í-l	'to speak'
	$\sqrt{}$-TH-INF	
Passivized	χos-v-í-l	'to be spoken'
	$\sqrt{}$-PASS-TH-INF	
Neg Impf 3PL	tʃʰ-é-j<u>i</u>-n χos-v-**è**-ɾ	'they were not spoken'
	NEG-AUX-<u>T</u>-AGR $\sqrt{}$-PASS-**TH**-CN	

In the above passive example, we can see that the trigger T morph and the target TH morph are linearly non-adjacent, separated by multiple segments and morphemes. We see even longer dependencies in passivized causatives. Here, the T and TH nodes are separated by not only the root and passive morphemes, but also an additional causative suffix. [15]

Table 23: Long-distance neutralization in the negated imperfective of passivized causative

Active verb:	jeɾ-á-l	'to boil (intransitive)'
	$\sqrt{}$-TH-INF	
Causativized:	jeɾ-á-t͡sʰən-e-l	'to boil (transitive)'
	$\sqrt{}$-TH-CAUS-TH-INF	
Passivized	jeɾ-a-t͡sʰ-v-i-l	'to be boiled'
	$\sqrt{}$-TH-CAUS-PASS-TH-INF	
Neg Impf 3PL	tʃʰ-é-j<u>i</u>-n jeɾ-a-t͡sʰ-v-**è**-ɾ	'they were not boiled'
	NEG-AUX-<u>T</u>-AGR $\sqrt{}$-CAUS-PASS-**TH**-CN	

Thus, the trigger for neutralization is the past affix, whether inside the verb or on a separate auxiliary. Linearly, the past morpheme can either follow the theme vowel (in positive past imperfectives) or precede it (in negated past imperfectives). Structurally, these two environments are unified in terms of the presence of +PAST. We assume the periphrastic form is a single constituent called X; its label is tangential.[16]

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[15]Causative infinitvals are formed by adding the affix *-t͡sʰən-* after theme vowels. When a causative verb is passivized, the causative affix has the allomorph *-t͡sʰ-*.

[16]For the negative indicative, it's possible that X is T, and that Agr is adjoined to T. This would cause the past T to c-command or scope over the theme vowel, while still being on a separate morphological word.
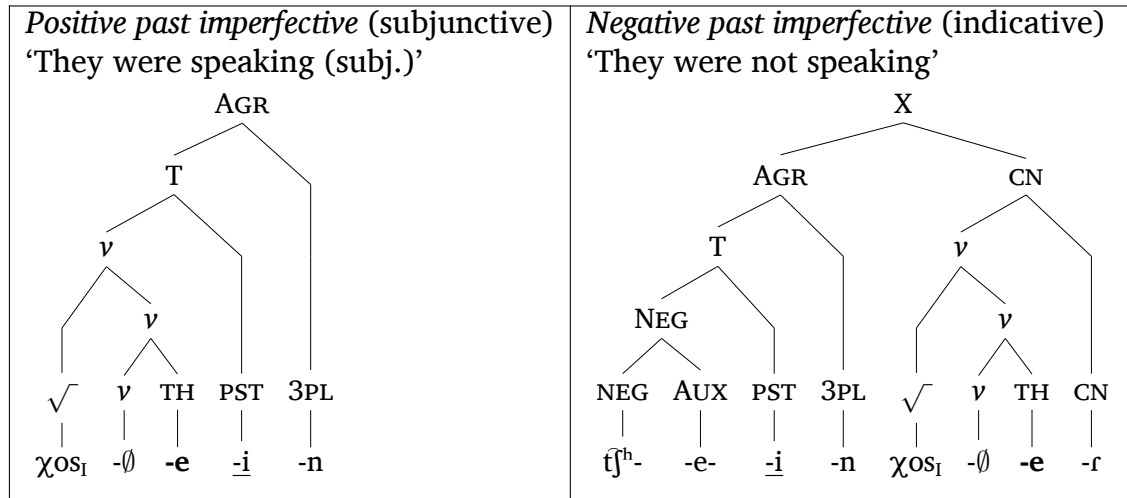
Figure 2: Structure of positive and negative past imperfectives

We argue that the past affix triggers neutralization because both are present within the verbal complex X. Linear order does not matter.

(15)   *i-neutralization for past* (Final)
     Neutralization in Past
     -i-$_{TH}$ → *-e-$_{TH}$* / [... _ ... + PAST]$_X$ *or* [+ PAST ... _ ...]$_X$

The above rule shows that *i*-neutralization can be conditioned long-distance by the + PAST morpheme, and across word boundaries. The next section briefly overviews the morphology of negation in Armenian, in order to further clarify the structure of these periphrastic constructions.

4.3   Structure of negation morphology

Verbal negation in Armenian is expressed either synthetically or periphrastically. The choice of construction depends on the mood and aspect of the verb. Based on this variation, we argue that negation structurally intervenes between the theme vowel and tense. This structure reinforces the long-distance dependency between tense and *i*-neutralization.

In the positive polarity, Western Armenian utilizes three basic synthetic tense-aspect constructions: the present, past imperfective, and past perfective. We only show the 3PL forms below. The past perfective has a covert indicative mood, and is limited to indicative contexts. The present and past imperfectives are by default subjunctive; they become indicative by adding the prefix *g(ə)-*.

Table 24: Synthetic verb forms in the positive

	2PL of 'speak'	
Present (subj.)	χos-í-n	√-TH-3PL
Past imperfective (subj.)	χos-**é**-ji̱-n	√-**TH**-<u>PST</u>-3PL
Past perfective	χos-**e**-t͡sʰ-á-n	√-TH-ASP-PST-3PL
Present (ind.)	gə-χos-í-n	IND-√-TH-3PL
Past imperfective (ind.)	gə-χos-**é**-ji̱-n	IND-√-**TH**-<u>PST</u>-3PL

In terms of stress, we see regular final stress in all but the past imperfectives. We see *i*-neutralization in the past perfective because stress is not on the theme vowel (Section 3.3). There is *i*-neutralization in the past imperfective because of the +PAST morpheme.

As for negation, the negative form of the subjunctives and the past perfective is formed by just adding the prefix *t͡ʃʰ(ə)-*. Except for the subj. past imperfective, primary stress shifts to the prefix while secondary stress is on the final syllable. In contrast, the indicative present and past imperfective are instead formed periphrastically with a negative auxiliary that carries T-Agr.

Table 25: Synthetic and periphrastic verb forms in the negative

	2PL of 'speak'	
Present (subj.)	t͡ʃʰə́-χos-ì-n	NEG-√-TH-3PL
Past imperfective (subj.)	t͡ʃʰə-χos-**é**-ji̱-n	NEG-√-**TH**-<u>PST</u>-3PL
Past perfective	t͡ʃʰə́-χos-**e**-t͡sʰ-à-n	√-TH-ASP-PST-3PL
Present (ind.)	t͡ʃʰ-é-n χos- i-ɾ	NEG-AUX-3PL √-TH-CN
Past imperfective (ind.)	t͡ʃʰ-é-ji̱-n χos-**è**-ɾ	NEG-AUX-<u>PST</u>-3PL √-**TH**-CN

The positive and negative forms show identical patterns of *i*-neutralization. The past perfective shows *i*-neutralization because the theme vowel is unstressed in both the positive and negative. In the present, the theme vowel avoids neutralization because it has either primary or secondary stress, regardless of polarity and regardless of mood. The past imperfective is neutralized in all contexts because because of the +PAST morpheme.

It is beyond the scope of this paper to formalize why some constructions utilize a synthetic negative while others utilize a periphrastic negative. That goal is likewise tangential. What matters is determining the morphological structure of the periphrastic negative of the indicative past imperfective: *t͡ʃʰ-é-ji̱-n χos-é-ɾ* 'they were not speaking'.

Cross-linguistically, it is relatively uncommon to find languages that utilize a negative auxiliary like in Armenian (Dryer 2013). One well-studied case comes from Finno-Ugric languages (Mitchell 2006; Georgieva et al. 2021). Within this language family, some

languages use a negative auxiliary that carries Tense and Agr. Others use a negative auxiliary that only carries Agr, while T is on the verb. I use glossing from Mitchell (2006)

(16)   *Finno-Ugric languages where...*
   a. Negative auxiliary carries T-Agr: Komi (Zyrian) (Mitchell 2006:233)

o-n	mun	e-n	mun
NEG-2SG	go	NEG/PAST-2SG	go
'you don't go		'you didn't go	

   b. Negative auxiliary carries Agr: Finnish (Mitchell 2006:235)

e-n	lue	e-n	luke-nut
NEG-1SG	read	NEG-1SG	read-PASTPART
'I don't read'		'I don't read'	

To capture this distinction, Mitchell (2006) argues that languages of the first group place NegP below TP, while the second group has NegP above TP, below AgrP. Bottom-up head-movement would then generate the correct placement of either T or T-Agr on the negative auxiliary. In Armenian, the negative auxiliary carries T-Agr so I assume that TP dominates NegP in the base syntax. Head-movement would eventually generate the T node as a suffix onto the negative morpheme. I set aside the issue of linearizing negation as a prefix before tense (Neg-T), instead of as a suffix to tense (T-Neg).

(17)   *Derivation of negative past imperfective 2PL – up until head movement*
   a. Base syntax   b. Structure after head-movement
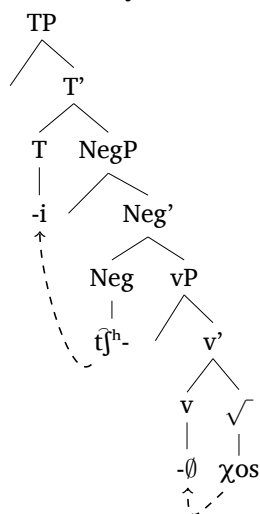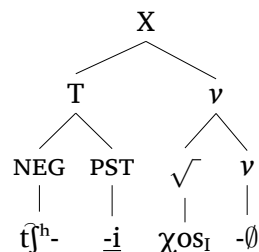
After head-movement, node-sprouting (Choi & Harley 2019) would generate the theme vowel, connegative, auxiliary, and Agr morphs. The +PAST morpheme would then trigger *i*-neutralization on the root's theme vowel.

(18) *Derivation of negative past imperfective 2PL – after head movement*
      a. Structure after node-sprouting   b. Structure after *i*-neutralization

a. Structure after node-sprouting:

```
                    X
          ┌─────────┴─────────┐
         AGR                  CN
       ┌──┴──┐             ┌───┴───┐
       T     │             v       │
     ┌─┴─┐   │          ┌──┴──┐     │
    NEG  │   │          │     v     │
   ┌─┴─┐ │   │          │   ┌─┴─┐   │
  NEG AUX PST 3PL        √   v  TH  CN
   │   │   │   │         │   │   │   │
  tʃʰ- -e- -i- -n      χosᵢ -∅  -i  -ɾ
```

b. Structure after *i*-neutralization:

```
                    X
          ┌─────────┴─────────┐
         AGR                  CN
       ┌──┴──┐             ┌───┴───┐
       T     │             v       │
     ┌─┴─┐   │          ┌──┴──┐     │
    NEG  │   │          │     v     │
   ┌─┴─┐ │   │          │   ┌─┴─┐   │
  NEG AUX PST 3PL        √   v  TH  CN
   │   │   │   │         │   │   │   │
  tʃʰ- -e- -i- -n      χosᵢ -∅  -e  -ɾ
```
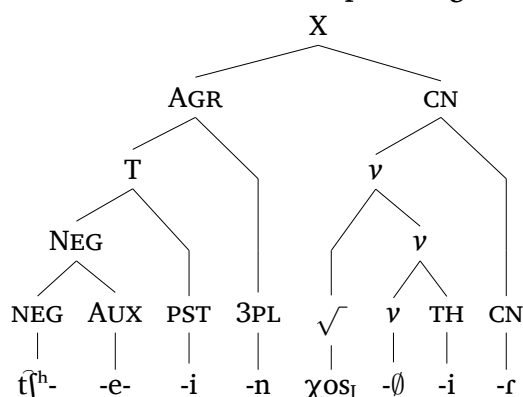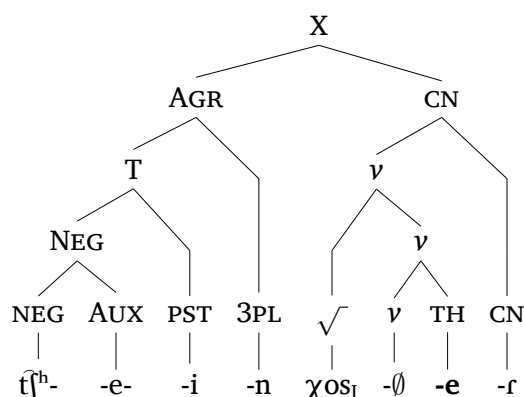
Note how *i*-neutralization applies late in the derivation. It must apply late because theme vowels (as adjuncts) are added late in the derivation (Oltra-Massuet 1999a).[17]

Even in a highly articulated structure for negative verbs as above, the theme vowel and past morpheme are not adjacent, whether linearly or structurally. This reinforces the long-distance nature of *i*-neutralization. The next section provides evidence from cliticization and suspended affixation, whereby entire words can intervene between the trigger T morpheme and the target theme vowel.

4.4   Interveners and suspended affixation

Further evidence for long-distance comes from the insertion of interveners. The auxiliary and the connegative participle can be separated by other words, indicating that each is a separate morphosyntactic word (cf. similar effects in Turkish and Japanese in Fenger 2020). We consider two types of constructions: cliticization and coordination. Crucially, *i*-neutralization applies even in suspended affixation.

For cliticization, Armenian has a focus-operator clitic =*al* 'also' or 'even' (19c). It can be added between the auxiliary and the connegative. Another clitic is the colloquial question particle =*mə* (19d). It can also intervene between the auxiliary and the connegative. In all these cases, the past auxiliary triggers *i*-neutralization on the connegative, even though

---

[17]A reviewer suggest an alternative analysis, whereby i) NegP dominates TP, ii) T raises to Neg, iii) the connegative suffix *-r* is the trace of T, and iv) *i*-neutralization is triggered by this connegative trace of T. This analysis is problematic. First, there isn't positive evidence for points (i)-(ii); such an account would contradict the typology of negative auxiliaries in Mitchell (2006). For point (iii), I do not know of any analyses which allow traces to be exponed. As for point (iv), even if we treated the connegative suffix *-r* as the trace of T, this suffix would not carry any [+PAST] or [-PAST] features because it is a trace. Thus it would be unclear as to how the theme vowel would neutralize before this trace in the past imperfective, but not the present.

the two are not adjacent.[18]

  (19) a. gə-χos-**é**-j<u>i</u>-n   =goɾ
              I-speak-TH-Ps-3 =PR

          'They were speaking.'

      b. t͡ʃʰ-é-j<u>i</u>-n χos-**è**-ɾ   =goɾ
              N-A-Ps-3 speak-TH-CN =PR

          'They were not speaking.'

      c. t͡ʃʰ-é-j<u>i</u>-n =al   χos-**è**-ɾ   =goɾ
              N-A-Ps-3 =even speak-TH-CN =PR

          'They were not even speaking.'

      d. t͡ʃʰ-é-j<u>i</u>-n =mə χos-**è**-ɾ   =goɾ
              N-A-Ps-3 =Q speak-TH-CN =PR

          'Were they not speaking?'

      e. t͡ʃʰ-é-j<u>i</u>-n =al   =mə χos-**è**-ɾ   =goɾ
               N-A-Ps-3 =even =Q speak-TH-CN =PR

          'Were they not even speaking?'

We likewise find long-distance neutralization in coordination contexts that trigger suspended 'affixation'. To illustrate this, consider the A-Class verb *gartʰ-a-l* 'to read' and the I-Class verb *χos-i-l* 'to speak' (20a). When coordinated with the conjunction *gam* 'or', both verbs have their own T-Agr marking in the positive past imperfective (20b). The I-Class verb likewise shows *i*-neutralization. The verbs use the indicative prefix *gə-* to mark mood in the positive. When negated, the negated auxiliary takes all T-Agr marking (20c). It appears before the first verb. The second verb still undergoes *i*-neutralization, and the past trigger is substantially far from the target theme vowel.[19]

  (20) a. gartʰ-á-l,   χos-í-l
           read-TH-INF speak-TH-INF

          'To read, to speak'

      b. jeɾpʰ voɾ uɾaχ e-j<u>i</u>-n,   gə-gartʰ-á-<u>i</u>-n gam gə-χos-**é**-j<u>i</u>-n   meɾ
          when that happy A-Ps-3 I-ɾead-TH-Ps-3 or   I-speak-**TH**-<u>Ps</u>-3 our
          hed-ə
          with-DEF

---

[18]The gloss is abbreviated with I (indicative), N (negation), A (auxiliary), PR (progressive) Ps (past), 3 (3pl), CN (connegative).

[19]The word *het͡ʃʰ* is an NPI that can be mean 'never' or 'at all' (Khanjian 2013). The Turkish-influenced NPI is restricted to colloquial speech. In standard speech, this colloquial element must be substituted with the native NPI *pʰənav*. Our gratitude to Sabine Laszakovits, Nazila Shafiei, and Mai Ha Vu for help with elicitations, to Nikita Bezrukov, Samuel Chakmakjian, Hrayr Khanjian, and Tabita Toparlak for judgments, and to Nicholas Rolle for discussion.

'When they were happy, they would read (with us) or speak with us'

c. jeɾpʰ voɾ neʁvadz e-ji-n, hetʃʰ tʃʰ-é-ji̱-n gaɾtʰ-à-r gam χos-**è**-ɾ
   when that upset A-Ps-3, NPI N-A-P̲s̲-3 read-TH-CN or speak-**TH**-CN
   meɾ hed-ə
   our with-DEF

'When they were upset, they would never read or speak with us.'

For illustration, we repeat the second clause of (20c) with additional notation.

(21) *Suspended affixation and i-neutralization*

NPI	Aux	V1	Coor	V2	PP
hetʃʰ	tʃʰ-é-ji-n	gaɾtʰ-à-r	gam	χos-**è**-ɾ	meɾ hed-ə
NPI	N-A-P̲s̲-3	read-TH-CN	or	speak-**TH**-CN	our with-DEF

'... they would never read or speak with us.'

For the above coordination case, there are two possible analyses for *i*-neutralization. One is that the T-marking on the auxiliary *tʃʰ-é-ji̱-n* triggers the neutralization on *χos-e-r*, even though they are not adjacent. That is the analysis that we entertain.

An alternative analysis is that the coordination involves ellipsis. That is, the input underlyingly has two identical auxiliaries, each adjacent to a verb. The second auxiliary would trigger neutralization, and then undergo a later rule of ellipsis.

(22) *Ellipsis-based analysis*

	NPI	Aux	V1	Coor	(Aux)	V2	PP
...,	hetʃʰ	tʃʰ-é-ji-n	gaɾtʰ-à-r	gam	tʃʰ-é-ji̱-n	χos-**è**-ɾ	meɾ hed-ə
...,	NPI	N-A-Ps-3	read-TH-CN	or	N-A-P̲s̲-3	speak-**TH**-CN	our with-DEF

Intended:'..., they would never read or speak with us.'
Actual meaning: '..., they would never read or they wouldn't speak with us.'

Because the negated auxiliary forms its own morphological word and prosodic word, an ellipsis-based analysis does at first seem plausible.[20] Cross-linguistically, there isn't a consensus on whether suspended affixation is actually ellipsis (Despić 2017; Guseva & Weisser 2018; Erschler 2018), prosodic-word deletion (Booij 1985), base-generation (Orgun 1996, 1999; Kabak 2007; Broadwell 2008; Gong 2021), or some type of raising process (Kornfilt 2012). So if we assumed that the above suspended affixation is truly ellipsis, then this alternative would have ramifications for the derivational ordering of ellipsis and morphological operations (Saab & Lipták 2016; Banerjee 2020, 2021b; Sailor 2022). For allomorphy, some argue that elided material can trigger allomorphy if the elided material (the negated auxiliary) is structurally higher than the allomorph (the theme vowel) (Erschler

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[20]Our gratitude to Neil Banerjee and Tom Meadows for discussion.

2018; Banerjee 2021a:16). But for readjustment rules, some argue argue suspended affixation (as ellipsis) precedes readjustment rules (Guseva & Weisser 2018; Erschler 2018), while others provide data that perhaps morphophonological rules can block suspended affixation (Turkish: Kornfilt 2012:185; Hungarian: Kenesei 2007:282).[21]

But this ellipsis-based analysis is not tenable. The sentences with one (21) vs. two auxiliaries (22) are neither semantically nor prosodically identical. First, the use of two auxiliaries (22) can create a sense of an exclusive-or reading. To illustrate, consider the disambiguation sentence in (23). This sentence can felicitously follow the sentence with the two auxiliaries (22) but not the sentence with only one auxiliary (21) .

(23) pʰɑit͡sʰ t͡ʃʰ-e-m   kʰid-e-ɾ   tʰe voɾmeg-ə t͡ʃʰ-ər-i-n
      but   NEG-AUX-PRES1SG know-TH-CN   that which-DEF NEG-do-PST-3PL
      'But I don't know which of the two actions they didn't do.'

Second, if the second auxiliary is present (22), then it is harder to make the subsequent post-positional phrase *mer hed-ə* 'with us' modify the first verb. It is likewise hard to make the preceding NPI *het͡ʃʰ* modify the second verb. Third, there is a stronger prosodic boundary after the coordination *gam* if the second auxiliary is present.

In sum, the semantic and prosodic data provide arguments that suspended affixation with one auxiliary (21) is not formed via ellipsis, but via base-generation. Cross-linguistically, it is common to find phonological and semantic differences between coordination structures that utilize suspended affixation or not (Takano 2004; Artstein 2005; Yoon 2017; Zuraw 2015). The Western Armenian data presents a case where suspended affixation is connected with long-distance allomorphy. Coincidentally, Iranian Armenian likewise displays such long-distance processes in another type of morphophonological process (Dolatian et al. prep).[22]

Thus, coordination and cliticization can create linear interveners between the auxiliary and the connegative. We have not been able to find other possible interveners. In our judgments, it's ungrammatical to separate the two with a pronoun, noun, or adverb. To remove the confound of *i*-neutralization, we use an E-Class verb *kʰer-e-l* 'to scratch'. The colloquial progressive marker is optional.

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[21]A third under-explored option (Banerjee 2021a:82) is to let post-syntactic processes like allomorphy cyclically precede a syntactic process like ellipsis (cf. similar argumentation for post-syntactic lowering feeding syntactic raising Martinović 2019).

[22]A reviewer suggests that perhaps the constructions with one auxiliary (21) is derived via ellipsis from the constructions with two auxiliaries (22), but that some independent factors causes the two types of constructions to have non-identical readings. The problem with this alternative is that there is no positive evidence to treat the 1-aux vs 2-aux constructions as structurally the same. If these constructions differ in terms of their semantic uses and prosody, then I do not see why the learner would entertain an ellipsis analysis for the 1-aux constructions.

(24)   a.   t͡ʃʰ-é-ji̠-n   kʰeɾ-è-ɾ   (=goɾ)
            N-A-Ps-3   scratch-TH-CN =PR
            'They were not scratching.'

       b.   *t͡ʃʰ-é-ji̠-n ind͡zi   kʰeɾ-è-ɾ   (=goɾ)
            N-A-Ps-3 me.DAT scratch-TH-CN =PR
            Intended: 'They were not scratching me.'

       c.   *t͡ʃʰ-é-ji̠-n veɾkʰ   kʰeɾ-è-ɾ   (=goɾ)
            N-A-Ps-3 wound   scratch-TH-CN =PR
            Intended: 'They were not scratching wounds.'

       d.   *t͡ʃʰ-é-ji̠-n aɾɑkʰ   kʰeɾ-è-ɾ   (=goɾ)
            N-A-Ps-3 fast   scratch-TH-CN =PR
            Intended: 'They were not scratching fast.'

It is beyond the scope of this paper to determine why only clitics and coordination can act as interveners. My suspicion is that the auxiliary and connegative form a tight morphosyntactic constituent via some type of feature-chain between *v* and T (Elordieta 1997). This feature chain cannot be disrupted except via phonologically-light adjuncts (clitics) and coordination, the latter because of the effects of coordination in maintaining the identity of features. One way to encode this idea is to replace the head-movement of Neg to T with the lowering of T to Neg to *v*, as in Georgieva et al. (2021). Such an alternative analysis would not change the generalization on long-distance triggers in *i*-neutralization.

To sum up, neutralization has two classes of triggers: phonological and morphological. The phonological triggers involve a morpheme-specific phonological rule which changes unstressed theme vowel *-i-* to *-e-*. This rule applies after stress is assigned. In contrast, the morphological trigger is the presence of the past suffix which replaces the *-i-* theme vowel *-e-*. This past suffix can either be adjacent to the theme vowel on the verb, or it can be on a non-adjacent auxiliary within the verbal complex.

5   Distance and directionality

This section summarizes the data and analysis within a larger theoretical context. The Armenian facts present various counter-examples to common cross-linguistic tendencies in allomorphy. We present these tendencies below and discuss their theoretical significance.

For phonologically-conditioned allomorphy, two cross-linguistic tendencies are the following (Paster 2006, 2009). First, the target of allomorphy is usually conditioned by the phonological structure of inward triggers, not outward targets. Second, the relevant phonological structure of the trigger is present in the input, not necessarily the output. Both tendencies are displayed in the Turkish third person possessive suffix (data from Paster 2009:26, for more see Inkelas 2014:270ff).

(25) a. bedel-i   'its price'
      b. deri-si   'its skin'
      c. bebek   'baby'
          bebe-i   'its baby'
          *bebek-i, *bebek-si

In general, the Turkish suffix surfaces as *-i* after C-final bases (25a), and as *-si* elsewhere (25b). However, after a *k* final base, the *-i* form is used (25c). But a later process of velar weakening removes the final *k*. If the allomorphy were output-based, then the *-si* form should've been used.

Both of these tendencies are violated by phonologically-conditioned *i*-neutralization in Armenian. The theme vowel *-i-* is replaced by *-e-* if it is unstressed. This stress information is determined by examining the entire output string and by seeing if there is a subsequent non-schwa vowel.[23]

(26) a. χos-í-l $\sqrt{}$-TH-INF   'to speak'
      b. χos-í-l-ə $\sqrt{}$-TH-INF-DEF   'the act of speaking'
      c. χos-**e**-l-óv $\sqrt{}$-TH-INF-INS   'with the act of speaking'

For morphologically-conditioned allomorphy, there are likewise two cross-linguistic tendencies that are violated by morphologically-conditioned *i*-neutralization. First, the trigger and target of morphologically-conditioned allomorphy tend to be adjacent to each other, whether linear or structurally (Siegel 1974, 1978; Allen 1979), though not always (Bobaljik 2000). Second, allomorphy tends to be limited to inside the morphosyntactic word, and is blocked by word-boundaries or by maximal projections (Embick 2010; Bobaljik 2012). This means that periphrasis generally blocks any allomorphy. Both of these tendencies are manifested in comparative formation in Georgian (data taken from Bobaljik 2012:70).

(27) a. **k'arg**-i   'good'
      b. u-**k'et**-es-i   'better'
      c. upro **k'arg**-i   'better'

In Georgian, the root for good (in bold) surfaces as *k'arg* in the positive form. The root can form either a synthetic or periphrastic comparative. In the synthetic form, the comparative suffix *-es* triggers root suppletion to *k'et*. In the periphrastic form, no suppletion is found and the root surfaces as *k'arg*.

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[23]Curiously, Armenian lects display many more possible cases of outwardly-sensitive phonologically-conditioned allomorphy, e.g., in the plural possessive (Wolf 2013; Arregi et al. 2013; Bezrukov 2016), mobile affixation (Bezrukov & Dolatian 2020), and the allomorphy of the definite article (Dum-Tragut 2009; Dolatian in reviewa). It's unclear to me why this is so.

Again, these two tendencies are violated by morphologically-conditioned *i*-neutralization. The theme vowel *-i-* faithfully surfaces as *-i-* when it has either primary stress in the indicative present (28a), or secondary stress in the corresponding negative (28b). But in the past imperfective, the underlined +PAST morpheme triggers *i*-neutralization to *-e-*. In the positive (28c), the target (theme vowel) and trigger (past) are adjacent. But in the negative, the two are non-adjacent (28d). They are in two different morphosyntactic words within a periphrastic construction.

(28) a. gə-χos-í-n   IND-√-TH-3PL
            'they speak'

       b. t͡ʃʰ-é-n χos-ì-ɾ   NEG-AUX-3PL √-TH-CN
            'they don't speak'

       c. gə-χos-**é**-j<u>i</u>-n   IND-√-**TH**-<u>PST</u>-3PL
            'they were speaking'

       d. t͡ʃʰ-é-j<u>i</u>-n χos-**è**-ɾ NEG-AUX-<u>PST</u>-3PL √-**TH**-CN
            'they weren't speak'

For the negative past imperfective (28d), the trigger of *i*-neutralization is on a separate auxiliary within the periphrastic construction. The auxiliary and the verb can be separated by other elements such as clitics and coordination. This amounts to having long-distance allomorphy across word boundaries. Thus *i*-neutralization applies regardless of the number of intervening segments or morphemes. This means that *i*-neutralization is not a local readjustment rule (cf. local readjustment rules in Embick & Shwayder 2018).

Cross-linguistically, it is common to find that periphrastic constructions block allomorphy. It is in contrast rare to find cases where allomorphy is permitted even in periphrastic constructions, like in Armenian. The closest example that came to our attention is suppletion within serial verb constructions in Yoruba (Stahlke 1970:80ff, Carstens 2002:12, Nicholas Rolle, p.c.). Another analogous case is root suppletion triggered by argument number (Toosarvandani 2016), but some of these cases can be reanalyzed as word-internally triggered (Thornton 2019).

Regardless of its rarity, such long-distance allomorphy across word-boundaries is attested. I do not know of any models of allomorphy which explicitly allow or control the use of inter-word allomorphy. Any morphological model that bans inter-word allomorphy under-generates the Armenian data. Furthermore, it is difficult to know on what types of inter-word allomorphy are cross-linguistically possible or impossible. Speculating from the Armenian data, it is possible that inter-word allomorphy is restricted between verbs and their corresponding inflectional morphemes. More typological data is needed

6 Conclusion

This paper documents a morpheme-specific alternation that contradicts cross-linguistic tendencies in locality and input-sensitivity. The theme vowel *-i-* in Armenian alternates with the vowel *-e-* across the verbal paradigm. The change from *-i-* to *-e-* is equivalently due to either allomorphy or morpheme-specific readjustment rules. What matters is that this change has two classes of triggers: phonological and morphological.

The phonological trigger is that the theme vowel is unstressed. This amounts to a case of outwardly-sensitive, phonologically-conditioned, and output-based allomorphy. The morphological trigger is the presence of the Past morpheme, anywhere within the verbal complex. The trigger can be adjacent to the theme vowel, or found on a separate auxiliary. The auxiliary can be adjacent or non-adjacent to the verb. This amounts to a cross-linguistically rare case of allomorphy or readjustment that is conditioned across words. In sum, *i*-neutralization is output-sensitive and long-distantly triggered.

In terms of the theoretical value of this data, the Armenian data falsifies various restrictive models of the morphology-phonology interface. Cross-linguistically, it is overwhelmingly common for phonologically-conditioned allomorphy to be sensitive to input phonology and be inwardly-sensitive (Paster 2006). Further, it is the cross-linguistic norm that morphologically-conditioned allomorphy is not triggered by word-external morphemes (Bobaljik 2012). Because of these typological asymmetries, the most restrictive model is to argue that outwardly-sensitive phonologically-conditioned allomorphy does not exist, and that word-external morphemes can't trigger morphologically-conditioned allomorphy. The Armenian data falsifies both restrictive positions. The data likewise provide evidence for base-generation approaches to suspended affixation.

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