Agglutination underlies superficial fusion in Western Armenian verbal inflection

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Abstract.
Verbs in Western Armenian (Indo-European) inflect for both subject agreement and tense. Subject and tense marking is often fused, which makes segmentation difficult. We show that, despite surface fusion, verbal inflection in Western Armenian is fundamentally agglutinative. By segmenting subject and tense suffixes across the verbal paradigm, we capture syncretic patterns and other interactions between inflectional slots that a fusional account does not. Our analysis requires limited but systematic use of zero morphs. Our agglutinative model of Western Armenian verbs reveals that inwardly-sensitive morphologically-conditioned allomorphy has priority over its outwardly-sensitive counterpart.

Keywords. Distributed morphology; verbal inflection; agglutinaton; morpheme segmentation; Armenian; allomorphy; zero exponence; zero morph; directionality in allomorphy

1. Introduction. Western Armenian is an understudied Indo-European language that has undergone almost a millennium of contact with speakers of Turkish. Reflecting its history, Western Armenian verbal morphology combines an Indo-European fusional structure with elements of Turkic agglutinative patterns (Adjarian 1909; Donabédian 2018). Verbs are marked by suffixes indicating tense, aspect, and subject agreement. Among the three main synthetic verbal constructions—present, past imperfective, and past perfective—only the perfective displays overt Aspect marking. Among the several descriptive and theoretical treatments of Armenian verbs, there is no clear consensus on how to segment tense and agreement morphs (Fairbanks 1948; Baronian 2006; Khanjian 2013).[1] Using the conventions of Distributive Morphology (DM), we propose a segmentation of tense and agreement in Western Armenian which highlights an underlying agglutinative morphology – one that is able to capture syncretic patterns and other interactions between inflectional slots.

In the process of doing so, however, several decisions need to be made about what a desirable segmentation looks like. Ideally, a beautiful segmentation captures generalizations that are motivated cross-linguistically, while minimizing the size of the rules that enable these generalizations. In segmenting the paradigms of Western Armenian verbs, we use two seemingly contradictory heuristics. On the one hand, we develop an analysis which freely uses zero morphs in order to maximize agglutinative structure (cf. Hockett 1942; Embick 2015). On the other hand, we develop an alternative analysis which eschews zero morphs, with any such apparent zeros getting replaced by Fusion or Impoverishment (Trommer 2012). We show that an analysis with zero morphs captures syncretism and other generalizations in the Armenian paradigm. In contrast, an analysis without zero morphs is clumsy and does not capture regularities. This latter analysis uses a min-

[1] Segmentation issues in Western Armenian likewise extend to Eastern Armenian (Kozintseva 1995; Dum-Tragut 2009).

imal set of Vocabulary items at the high cost of being highly language- and item-specific and not capturing the ideal generalizations.

A brief outline of the paper is as follows: Section §2 provides an overview of concepts in Distributed Morphology (DM) that are relevant to the discussion of zero-exponence in this paper. Section §3 briefly outlines the structure of infinitival forms of simple verbs in Western Armenian. Section §4 presents our decomposition of tense and agreement based on present tense conjugations. We perform the same segmentation with the past imperfective in §5 and the past perfective in §6. We discuss the implications in §7.

Data comes from the native judgements of the second author, and they match available paradigms from teaching grammars (Gulian 1902; Hagopian 2005). For more complete paradigms, see Boyacioglu (2010) and Boyacioglu & Dolatian (2020). For a theoretical treatment of conjugation classes and allomorphy, see Dolatian & Guekguezian (prep).[2]

2. Zero exponence. When designing a morphological segmentation, one can entertain multiple goals or heuristics. For example, some common goals include the following:

(1)   *Goals in morpheme segmentation*

   1.   Minimize number of exponents
   2.   Minimize number of operations
   3.   Capture syncretism if non-accidental
   4.   Capture typological tendencies
   5.   Capture "elsewhere" behavior

In surface forms of Armenian verbs, Tense and Agreement do not always have clearly separable morphs. To illustrate, we contrast two separate analyses based on the choice of zero morphs:

(2)   *Analytical options*

   a.   **NoZero**: Does not use explicit zero morphs. Non-marking of T and Agr is due to fusion, impoverishment, or elsewhere zeros (Trommer 2012).
   b.   **YesZero**: Uses explicit zero morphs.

The NOZERO analysis essentially treats the Armenian paradigm as fusional, while the YESZERO analysis treats it as agglutinative. Both models work, but the YESZERO analysis better captures generalizations about Armenian. We go through the role of zero morphology in §2.1, elaborating on these two analyses in §2.2.

2.1. EXPLICIT ZEROS VS. ELSEWHERE ZEROS. Distributive Morphology hypothesizes that **morphemes** are abstract syntactic terminal nodes with no phonological content of their own (Halle & Marantz 1993). The phonological expression of a morpheme is given by **Vocabulary Items** (VI), which map the syntactico-semantic (synsem) features of these terminal nodes into phonological exponents. This process, called **Vocabulary Insertion**, occurs at the output of the syntactic derivation and before any phonological processes apply.

However, these phonological exponents are not always overt. **Zero-exponence** is often used to justify cases where all but one cell of a paradigm is an overtly expressed morph (Baker 2006). Yet,

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[2] In terms of transcription, we do not mark aspiration on consonants, and we transcribe the segments /ɑ,ɛ,ɔ,ɾ,χ,ʁ,ɾ/ as *a,e,o,r,x,ɣ,ṙ*.

the theoretical treatment of zero-exponence is not straightforward. There are several assumptions that contribute towards an account of zero-exponence or $\varnothing$-exponence. Different configurations of assumptions may yield an different results – some of which are incompatible.

Trommer (2012) offers an outline of varieties of zero-exponence in DM, which we repeat here in Table 1.

Table 1. Varieties of zeros from Trommer (2012)

	$\varnothing$-Exponence of	Locus	Status
a. Underspecification of Vocabulary item	single features	at insertion	indirect
b. Non-insertion of a Vocabulary item	entire head	at insertion	indirect
c. Absence of features in the input to morphology	entire head	before insertion	indirect
d. Fusion of Heads	entire head	before insertion	indirect
e. Impoverishment before insertion	single features or entire head	before insertion	direct
f. $\varnothing$-Vocabulary items	entire head	at insertion	direct
g. Deletion of a Vocabulary item (Readjustment)	entire head	at insertion	direct

Trommer distinguishes varieties of $\varnothing$-exponence according to three major criteria:

(3)   *Criteria for zero-exponence*

   a.   Whether $\varnothing$-exponence impacts an entire head or only its features.
   b.   The timing (locus) of $\varnothing$-exponence being triggered.
   c.   Whether $\varnothing$-exponence is the direct consequence of grammatical devices (such as insertion of $\varnothing$-VIs), or the result of conspiratory interactions.

Trommer (2012) posits that there is an implicit assumption in DM that every head in the morphology must be filled by at least one VI. Whenever an inflectional distinction is covert, this assumption requires VIs that explicitly map morphemes to a zero exponent. But this assumption is not a necessary one. In DM, the insertion of the phonological exponent of a VI into its associated terminal occurs when the features of the VI matches all or a subset of those specified by the terminal (Halle 1997). Insertion will not occur if the VI contains features that are not present in the morpheme itself. The **Subset Principle** sets up an environment for competition among Vocabulary items for potential sites of insertion – VIs have the ability to apply to terminals with a superset of the features contained in the VI. This means that an **underspecified** VI would be able to apply the same exponent to more than one morpheme, paving a path for syncretisms and elsewhere conditions.

As such, in order to express covert affixes, an alternative to the insertion of a $\varnothing$-VI is what Trommer calls **"Wu Wei $\varnothing$-Exponence"**. For Wu Wei (i.e. "Do Nothing"/no-insertion) zero-exponence, zeroes are reserved as elsewhere morphs. If there is a no realization rule for some morpheme, then the morpheme is exponed via an elsewhere zero.[3]

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[3] There are some situations where it is necessary to specify VIs for zero markings. For instance, for irregular forms of English verbs, e.g. *hit, quit, etc.*, $\varnothing$ is not an elsewhere VI – it is defined specifically for $T_{[+past]}$ in the context of certain roots. Another example is with exocentric compounds, such as *sabretooth* → **sabreteeth*, where a covert category-defining head is needed to block irregular feature percolation in the compound (cf. Steddy 2019; Dolatian 2021).

Furthermore, alternatives to explicit zeros include **fusion** and a host of deletion operations like **impoverishment**, **obliteration**, **pruning**, and **readjustment rules** (Siddiqi 2009; Arregi & Nevins 2012). Fusion of morphosyntactic heads occurs prior to Vocabulary insertion. Only a highly specific VI that is specified for the features of both morphemes will be able to apply to a complex head that results from fusion. This is due to subset principle or elsewhere condition (Kiparsky 1982, 1993; Halle & Marantz 1993). **Impoverishment** deletes one or more feature(s) on a morpheme before insertion. **Obliteration**, also sometimes referred to radical impoverishment, deletes the morpheme entirely, also before insertion (Arregi & Nevins 2007). **Pruning** specifically deletes morphemes that are assigned a $\varnothing$-exponent at Vocabulary insertion (and thus necessarily requires the assumption of $\varnothing$-VIs). Pruning can be thought of as a specialized case of obliteration.[4] Another form of deletion involves **readjustment rules**, which readjust the expression of a VI to account for phonological irregularities in morphosyntactic contexts, e.g., a readjustment rule is needed to account for the vowel change in *tell* in the context of [+past]. In the case of deletion, a readjustment rule could be triggered in the presence of a morpheme that changes an exponent into $\varnothing$ (cf. compare truncation operations Aronoff 1976).

2.2. CHOICE OF ANALYSIS. With a clearer picture of zero-exponence and its main governing principles, we can focus on which elements are included in the development of our analyses.

We entertain two competing analyses: the YESZERO analysis and the NOZERO analysis. The YESZERO analysis freely utilizes zero exponents or $\varnothing$-VIs. In terms of heuristics, YESZERO prefers an agglutinative structure over minimizing the number of covert or overt morphs. In contrast, the NOZERO analysis avoids explicit $\varnothing$-VIs in order to prioritize economy. The NOZERO analysis relies on the notion of Wu Wei or no-insertion $\varnothing$-exponence, treating null phonology as an implicit elsewhere condition. The NOZERO analysis also requires Fusion and Impoverishment, while the YESZERO is free to use them, but does not need to.

Both analyses can describe the same data, but they do not capture the same generalizations. We argue that the NOZERO analysis does not capture syncretism or the elsewhere status of allomorphs in Armenian verbs. The resulting grammar devolves into a system of highly specified VIs that cannot yield any sort of meaningful typological generalization. In contrast, the YESZERO analysis retains a cross-linguistically valid structure that does yield such generalizations.

The next section fleshes out infinitivals and the badic conjugation classes.

3. Infinitivals in Western Armenian. Western Armenian has three basic conjugation classes for simple regular verbs. These classes are distinguished by their theme vowels: *-e-* (E-Class), *-i-* (I-Class), and *-a-* (A-Class). The E-Class is default (Fairbanks 1948).

(4) *Classes of simple regular verbs*

E-Class	I-Class	A-Class
ker-e-l	*xos-i-l*	*gart-a-l*
'to scratch'	'to speak'	'to read'

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[4] The conceptualization of pruning is still rather flexible. For instance, pruning might occur immediately after morphemes are assigned their $\varnothing$ at insertion, which results in their removal from concatenation statements. For a pair of syntactic terminals X, Z which would otherwise be separated by a covert category-defining head Y, pruning of Y causes X, Z to become adjacent. Alternatively, pruning might occur as the deletion of the particular form of node prior to insertion, such as a deletion rule $T_{[\text{-past}]} \rightarrow \varnothing$ in Latin, because present tense Latin verbs do not show any such overt realization of tense (Arregi & Nevins 2007).

The data in 4 show the infinitival forms of a verb from each class. They overtly display a root, a theme vowel, and infinitival suffix *-l* that is identical across the three classes. Roots are arbitrarily assigned to one of the three classes, though there are some subregularities in class assignment. Here, roots of a certain class will be notated as $\sqrt{\text{ROOT}_{\{E,I,A\}}}$, where vowel subscripts refer to their respective conjugation class. The infinitival suffix can be an exponent of T, with the feature -FIN. We treat the theme vowel as an adjunct to little *v* (Oltra-Massuet 1999). The following VIs and rules are sufficient for generating infinitivals:

(5) a. *Vocabulary Items for infinitival verbs:*

  i. $\text{T}_{[\text{-FIN}]} \leftrightarrow$ -l
  ii. $\text{TH} \leftrightarrow$ -e / $\sqrt{\text{ROOT}_E} \frown v$ __
  iii. $\text{TH} \leftrightarrow$ -i / $\sqrt{\text{ROOT}_I} \frown v$ __
  iv. $\text{TH} \leftrightarrow$ -a / $\sqrt{\text{ROOT}_A} \frown v$ __

  b. *Structure of E-Class* 'to scratch'
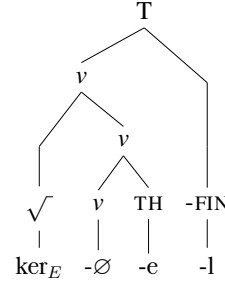
The assumption that theme vowel realization is based on the conjugation class of a root is drawn from Dolatian & Guekguezian (prep), to which we refer the reader for details and complications. We now move on to present tense verbs.

4. Present Tense. Similar to infinitivals, present tense verbs can be overtly demarcated into three units: root, theme vowel, and a third position where number, person, and tense are collectively marked.[5] We show the paradigms in (6).

(6) *Present tense verbs*

	E-Class	I-Class	A-Class	Exponents of T/Agr
1SG	*ker-e-m*	*xos-i-m*	*gart-a-m*	*-m*
	'I scratch'	'I speak'	'I read'	
2SG	*ker-e-s*	*xos-i-s*	*gart-a-s*	*-s*
3SG	*ker-e*	*xos-i*	*gart-a*	$-\emptyset$
1PL	*ker-e-nk*	*xos-i-nk*	*gart-a-nk*	*-nk*
2PL	*ker-e-k*	*xos-i-k*	*gart-a-k*	*-k*
3PL	*ker-e-n*	*xos-i-n*	*gart-a-n*	*-n*

As visible in 6, this post-theme exponent has 6 possible realizations, where the 3rd person singular is unpronounced. The same markings are used across the 3 classes. In the present, there are no separate exponents for T and Agr. Instead, they are consistently marked through a single exponent. We show these exponents in the last column in (6). We thus analyze the present paradigm as using fusion of T and AGR, i.e. T/AGR.

(7) **Fusion rule for present tense T/AGR:**
  $\text{T}_{[\text{-past}]} \frown \text{AGR} \rightarrow \text{T/AGR}_{[\text{-past}]}$

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[5] When used in an indicative clause, present tense verbs need the prefix *gə-*. Otherwise, they are subjunctive (Vaux 1995; Bezrukov & Dolatian 2020).

The ⌢ operator used in 7 encodes **concatenation** (Embick 2015). The concatenation statement in 7 essentially states that when a T morpheme with a [-past] feature immediately precedes an Agr morpheme, the two fuse together into a single terminal item that contains the features of both morphemes. With fusion, we can infer the following VIs for this paradigm. We use binary features to represent person features.

(8)   *Vocabulary Items for agreement morphology in present tense verbs:*

    a.   [+1, -pl, -past] ↔ -m

    b.   [+2, -pl, -past] ↔ -s

    c.   [+1, +pl] ↔ -nk

    d.   [+2, +pl] ↔ -k

    e.   [-1, -2, +pl] ↔ -n

At first glance, one might wonder why the plural VIs (8c, 8d, and 8e) are not specified for tense features. We later show that the same set of plural Agr suffixes are used throughout the Armenian paradigm. We show the structure of a 3PL verb *ker-e-n* below. We show the structure before and after fusion.

(9)   *Structure of present 3PL verb before and after fusion*
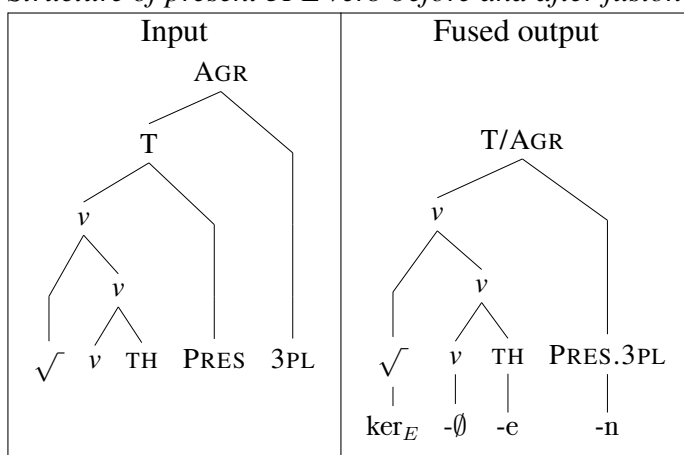
For these VIs, another point of clarification is that the 3SG in 6 does not display a T/AGR exponent. It surfaces as a zero morpheme, yet there is no VI that defines this behavior. The use of elsewhere zeros is allowed under either the NOZERO or YESZERO approach.

5. Past Imperfective and syncretism. In the past imperfective, the post-theme segments are again replaced by a new set of segments. We argue that these these segments expone a sequence of Tense-Agr slots. All three classes share the same exponents for these slots.[6]

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[6] Like present tense verbs, the above verbs are interpreted as subjunctive verbs. They form indicative verbs with the prefix *gə-*.

(10) *Past imperfective verbs*

	E-Class	I-Class	A-Class	Exponents of T-Agr
1SG	*ker-e-i*	*xos-e-i*	*gart-a-i*	*-i-∅*
	'I was scratched'	'I was speaking'	'I was reading'	
2SG	*ker-e-ir*	*xos-e-ir*	*gart-a-ir*	*-i-r*
3SG	*ker-e-r*	*xos-e-r*	*gart-a-r*	*-∅-r*
1PL	*ker-e-ink*	*xos-e-ink*	*gart-a-ink*	*-i-nk*
2PL	*ker-e-ik*	*xos-e-ik*	*gart-a-ik*	*-i-k*
3PL	*ker-e-in*	*xos-e-in*	*gart-a-in*	*-i-n*

In the above vowel-vowel sequences, the vowel hiatus is resolved by glide epenthesis (not shown): *ker-e-[j]i* '(If) I were scratching'. In the I-Class conjugation, the *-i-* theme vowel is replaced by *-e-*, which is part of a general morphophonological process in Armenian.[7] We set this aside and focus on the post-theme exponents.

The post-theme segments seem to be explicitly divisible into two separate morphemes. These two morphemes or nodes are exponents of Tense and Agr. We show this decomposition in the last column in (5). Five out of the six person-number combinations start with the segment *-i*. We treat *-i* as the exponent of $T_{[+past]}$. This is formalized by the VI in 11. This assumption was also made in Fairbanks (1948), where *-i-* is referenced as a "past marker."

(11) **Vocabulary Item for past tense:**

$T_{[+past]} \leftrightarrow$ -i

One issue is the role of Aspect. These past verbs are interpreted as imperfectives. One could argue that *-i* is an exponent of imperfective Aspect, rather than Tense. However, as we later show, the segment *-i* is likewise used in past perfectives. Thus, it cannot be an aspect marker. We assume a covert Aspect node. This node surfaces as zero. Within a NoZero analysis, this can be done with an elsewhere zero. As for a YesZero analysis, we can likewise use an elsewhere zero, or even use a dedicated zero exponent. We use an elsewhere zero for illustration. We show the structure of a past imperfective 3PL verb *ker-e-i-n* below.

(12) *Structure of past imperfective 3PL verb*: ker-e-i-n 'they were scratching'

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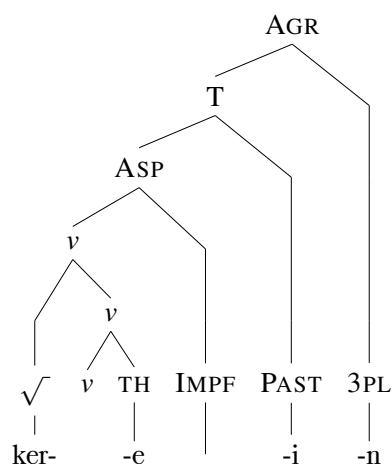
[7] Essentially, the *-i-* theme vowel is replaced by *-e-* when it is unstressed or when it is in the past imperfective. We omit stress markings in this paper because they're irrelevant for segmentation.

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Aspect (ASP) is not represented as a separate overt morpheme in past imperfective forms. We assume that perfectivity is a binary feature in Armenian, that an imperfective simply has a negative perfective feature on its Aspect node, and that imperfectivity is unmarked.

For Agr, it is straightforward to capture most of the paradigm cells. The main problem area is the 3SG. First off, the plural forms use the same exponents as those in the plural present verbs: *-nk, -k, -n*. The VIs (8c-8e) defined in Section 4 predict the correct forms for imperfective plurals. However, 1SG and 2SG of the present tense and past imperfective use different exponents. The present tense verbs exhibit *-m* and *-s*, respectively, whereas the imperfective is zero in 1SG, and *-r* in 2SG. The 1SG zero can be captured by using an elsewhere zero. The 2SG is given its own exponent via the following rule. We later revise this rule.

(13) **Vocabulary Item for past imperfective 2SG:** (To be revised)
$\text{Agr}_{[+2, \text{-pl}]} \leftrightarrow$ -r / $\text{T}_{[+\text{past}]}$ __

Imperfectivity is excluded from the 2SG VI. We later show that the same exponent is also used in past perfective verbs.

For the 3SG, the NOZERO and YESZERO analyses start to distinguish themselves. The past imperfective 3SG presents the following issues involving partial syncretism and mutual licensing. First off, the 2SG and 3SG are partially syncretic because they utilize the *-r* exponent. But, this syncretism is partial because the 2SG utilizes an overt *-i* for T, whereas the 3SG lacks an overt T morph. This creates an opaque inter-dependency. In the 3SG, the Agr morpheme *-r* licenses the omission of a T morph. But simultaneously, the covert T node licenses the use of an overt Agr node *-r*. This inter-dependence is clearer when we contrast the exponents of the 1SG, 2SG, and 3SG in the past imperfective.

(14) *Dependencies in the 3SG past imperfective vs. in 1SG and 2SG*

	Past Imperfective	
	T	AGR
1SG	*-i*	
2SG	*-i*	*-r*
3SG		*-r*

The YESZERO analysis easily captures both the syncretism and the opaque interaction of T and Agr. First, we need a rule of exponing T as a zero morph in the past 3SG. Second, the suffix *-r* references past T. It expones 2SG and 3SG via under-specification. The rule (15b) for *-r* replaces the formulation from 13.

(15) *Past imperfective 3SG for the* YESZERO *analysis*

a. **Vocabulary Item for covert T in the past imperfective 3SG**
$\text{T}_{[+\text{past}]} \leftrightarrow \varnothing$ / __ $\text{AGR}_{[\text{-1,-2,-pl}]}$

b. **Vocabulary Item for 3SG in the past imperfective**
$\text{AGR}_{[\text{-1,-pl}]} \leftrightarrow$ -r / $\text{T}_{[+\text{past}]}$ __

We could not have captured this interdependence with a NOZERO analysis using Impoverishment. To illustrate, assume that we treated *-r* as an exponent of [-1,-pl] that is licensed by past T, as done above. This would treat *-r* as the specified exponent of both past 2SG and 3SG. In order to block an overt T, we could not use an impoverishment rule that deletes [-past] from T. If we did, then we wouldn't be able to license the 2SG or 3SG forms.

(16)   *Failed derivation of past imperfective 3SG via impoverishment*

    a. **Impoverishment of T in past imperfective 3SG**

        $T_{[+past]} \rightarrow T$ / $ASP_{[-perf]}$ __ $AGR_{[-1,-2,-pl]}$

    b. *Failed derivation for 3SG past imperfective* ker-e-r *as* *ker-e

Input	$\sqrt{}$ker-	TH	T[-past]	Agr[-1,-2,-pl]
Impoverishmentment	$\sqrt{}$	TH	T	Agr[-1,-2,-pl]
Spell-out	ker-	-e	∅	∅

Thus, while the YESZERO analysis easily captures both syncretism and interdependence, the NOZERO analysis cannot capture both. To capture the interdependence, Impoverishment would be the most direct route. But as we have shown, if we impoverish [-past] on T in the 3SG, then we cannot license the Agr form *-r* in the 3SG. A less direct approach would posit a specialized VI *-r* as the fused exponent of [-past] and 3SG. This exponent is accidentally homophonous with the 2SG.

(17)   *Past imperfective 3SG for the* NOZERO *analysis*

    a. **Fusion of past T and 3SG Agr inp ast imperfective**

        $T_{[+past]} \frown AGR_{[-1,-2,\,-pl]} \rightarrow T/AGR_{[-1,\,-2,\,-pl,\,+past]}$ / $ASP_{[-perf]} \frown$ _

    b. **Vocabulary item for fused past imperfective 3SG**

        $T/AGR_{[-1,\,-2,\,-pl,\,+past]} \leftrightarrow$ -r

While NOZERO can be made to work, i.e., to describe the surface patterns, it does not capture the syncretism in the past imperfective. Therefore, the NOZERO analysis misses an important generalization in Western Armenian.

6. Past perfective. Past perfective verbs look quite similar to the imperfective verbs, but they display a division of five overt morphemes rather than four: root, theme vowel, perfective aspect, past tense, and agreement ($\sqrt{}$-TH-ASP-T-AGR).[8]

(18)   *Past perfective verbs*

	E-Class	I-Class	A-Class
1SG	ker-e-t͡s-i	xos-e-t͡s-a	gart-a-t͡s-i
	'I scratched'	'I spoke'	'I read'
2SG	ker-e-t͡s-i-r	xos-e-t͡s-a-r	gart-a-t͡s-i-r
3SG	ker-e-t͡s-	xos-e-t͡s-a-v	gart-a-t͡s
1PL	ker-e-t͡s-i-nk	xos-e-t͡s-a-nk	gart-a-t͡s-i-nk
2PL	ker-e-t͡s-i-k	xos-e-t͡s-a-k	gart-a-t͡s-i-k
3PL	ker-e-t͡s-i-n	xos-e-t͡s-a-n	gart-a-t͡s-i-n

As shown in 18, what appears to be the perfective morpheme -t͡s- is inserted after the theme vowel. We presume that -t͡s- is the exponent of perfective Aspect, using the following VI:

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[8] The simple past in Armenian is also called preterite, perfective, or aorist in many descriptive grammars, and is used to describe actions completed in the past (Donabédian 2016). Throughout the paper, we try to keep consistent with referring to the simple past as perfective or past perfective to retain the Aspectual contrast with the imperfective forms introduced in the previous section.

(19) **Vocabulary Item for perfective marker:**
ASP$_{[+perf]}$ ↔ -t͡s

Note that the same *-i-* to *-e-* change that occurs in the past imperfective also occurs here in the past perfective, and we will continue to set it aside.

After the Aspect morpheme, the remaining sequence of segments realizes T and Agr. The T-Agr sequence follows the theme vowel in the past imperfective, while it follows the perfect suffix in the past perfective. Between the past imperfective and perfective, the T-Agr sequences are nearly identical except for two main differences. One difference is due to class-conditioned allomorphy on T. The other difference is the variation in how 3SG is formed. We give the contrast below.

(20) (ASP-)-T-AGR *in past imperfective and perfective verbs:*

	Past imperfective		Past perfective					
			E-, A-Class			I-Class		
	T	Agr	Asp	T	Agr	Asp	T	Agr
1SG	*-i*		-t͡s	*-i*		-t͡s	*-a*	
2SG	*-i*	*-r*	-t͡s	*-i*	*-r*	-t͡s	*-a*	*-r*
3SG		*-r*	-t͡s			-t͡s	*-a*	*-v*
1PL	*-i*	*-nk*	-t͡s	*-i*	*-nk*	-t͡s	*-a*	*-nk*
2PL	*-i*	*-k*	-t͡s	*-i*	*-k*	-t͡s	*-a*	*-k*
3PL	*-i*	*-n*	-t͡s	*-i*	*-n*	-t͡s	*-a*	*-n*

The first difference between the paradigms is that T is *-i* in the past imperfective, while it is either *-i* or *-a* in the perfective. The T morph is *-a-* for the I-Class, while it is *-i-* in the E-Class and A-Class. The second difference is that, in the perfective, the 3SG marker is not identical among the three verb classes. The T-3SG is *-a-v* for the I-Class, while both T and 3SG are zero for the other classes. This is a form of class-conditioned allomorphy, whereby the allomorphy on T (and 3SG Agr) is conditioned by the class features of the root.

Capturing the allomorphy on T is straightforward. T is *-a-* when the root is I-Class and when Asp is perfective. We call *-a* the marked allomorph of T, while *-i* is the elsewhere allomorph of T, since the latter appears in more contexts. As detailed in Dolatian & Guekguezian (prep), this root-conditioned allomorphy is long-distance, which we show with an ellipsis. In other words, the T$_{[+past]}$ morpheme generally surfaces as *-i*, but as *-a* only for the perfective forms of I-Class roots.

(21) **Vocabulary Items for past tense allomorphy:** (To be revised)
   a. T$_{[+past]}$ ↔ -a / $\sqrt{\text{ROOT}_I}$ ⋯ ASP$_{[+perf]}$ __
   b. T$_{[+past]}$ ↔ -i / elsewhere

For the I-Class, the segments marking T-Agr for the 3SG are *-a-v*. The suffix *-v* is part of the marked allomorphs for the past perfective of the I-Class. The VI below restricts the realization of the exponent *-v* to apply only for the past perfective 3SG for an I-Class verb. Within the YESZERO analysis, the use of *-v* beats the use of *-r* (15b) for the past perfective 3SG because it is more specified.

(22) **Vocabulary item for past perfective 3SG of I-Class**
AGR$_{[-1,-2, -pl]}$ ↔ -v / $\sqrt{\text{ROOT}_I}$ ⋯ ASP$_{[+perf]}$ ⌢ T$_{[+past]}$ __

We set aside the issue of the long-distant dependency, which Dolatian & Guekguezian (prep) analyze in terms of both phase-based locality (Embick 2010) and tier-based locality (Aksënova et al. 2016).

For the E-Class and A-Class 3SG, the YESZERO and NOZERO analyses again diverge. Here, we find three interacting phenomena: blocking syncretism, licensing zeros, and treating the E-Class as the elsewhere class. The I-Class past perfective displays marked allomorphs, while the other classes show elsewhere allomorphs. We illustrate these phenomena below. These generalizations are easier to capture with the YESZERO analysis than with the NOZERO analysis.

(23) *Distribution of T and Agr in past 2SG and 3SG*

	Past IMPERF			Elsewhere PERF			Marked PERF		
	IMPF	T	AGR	PERF	T	AGR	PERF	T	AGR
2SG		*-i*	*-r*	*-t͡s*	*-i*	*-r*	*-t͡s*	*-a*	*-r*
3SG			*-r*	*-t͡s*			*-t͡s*	*-a*	*-v*

The E-Class is default. Thus, an informative analysis should treat its 3SG realization as *elsewhere* behavior. The T-Agr sequence (past + 3SG) is *-r* in the past imperfective, *-a-v* for the I-Class past perfective, and zero for the elsewhere past perfective. For the elsewhere past perfective, the PERF feature on Asp licenses the deletion of T-Agr. But this deletion is blocked in the I-Class. Similarly, 2SG and 3SG are partially syncretic with *-r* for the Agr node in the past imperfective, while this syncretism does not exist in the past perfective.

The YESZERO analysis can capture these insights. For the Agr node, we use a special zero morph restricted to the 3SG of the past perfective. This $\varnothing$ VI is less specified than the *-v* used for the I-Class (rule 22). It thus 'surfaces' in the E/A-Class but not in the I-Class by the elsewhere principle.

(24) YESZERO: **Vocabulary item for 3SG node in the elsewhere past perfective**

$\text{AGR}_{[-1,-2,-\text{pl}]} \leftrightarrow \text{-}\varnothing \ / \ \text{Asp}_{[+\text{perf}]} \frown \text{T}_{[+\text{past}]} \underline{\quad}$

T is zero in the 3SG past of both the past imperfective and past perfective. It is *-a* for the 3SG past perfective of the I-Class. The YESZERO analysis can capture these dependencies with the following realization rules. We need to assume that class-conditioned allomorphy precedes Agr-conditioned allomorphy. This can be captured with a cyclic system whereby inwardly-sensitive allomorphy beats outwardly-sensitive allomorphy (Bobaljik 2000).

(25) YESZERO: **Vocabulary items for the past tense allomorphy**

a. $\text{T}_{[+\text{past}]} \leftrightarrow \text{-a} \ / \ \sqrt{\text{ROOT}_I} \cdots \text{ASP}_{[+\text{perf}]} \underline{\quad}$

b. $\text{T}_{[+\text{past}]} \leftrightarrow \varnothing \ / \ \underline{\quad} \text{AGR}_{[-1,-2,-\text{pl}]}$

c. $\text{T}_{[+\text{past}]} \leftrightarrow \text{-i} \ / \ \text{elsewhere}$

The above rules correctly block the syncretism, license the zeros, and capture the elsewhere status of the E-Class past perfective. This is all thanks to the use of zero morphs. In contrast, the NOZERO analysis struggles to capture all the insights. To license the use of a zero in the E-Class past perfective 3SG, the NOZERO analysis must delete the T and Agr nodes just for the elsewhere class–not for the I-Class. But if NOZERO uses impoverishment, then we have to reference the class features of the root. This makes the elsewhere behavior of the 3SG zero no longer elsewhere.

(26)   NOZERO: **Impoverishment for the 'elsewhere' past perfective 3SG**
$$T_{[+past]} \rightarrow T / \sqrt{ROOT_{E,A}} \cdots ASP_{[+perf]} \_\_ AGR_{[-1,-2,-pl]}$$

7. Discussion. Based on the Armenian data, we have contrasted two similar but non-identical analyses: YESZERO and NOZERO. The analyses differ based on a single premise: whether we allow zero morphs in our realization rules. While both analyses derive the same surface facts, we have demonstrated that the YESZERO analysis is cleaner and captures more generalizations in the Armenian data. Specifically, we have found the following:

(27)   *Generalizations from segmentation*
   a.   We need zeros to do syncretism.
   b.   We need zeros to capture the elsewhere status of the E-Class.
   c.   We need inwardly-sensitive allomorphy to beat outwardly-sensitive allomorphy. Specifically on the T node, long-distance class-conditioned allomorphy precedes local Agr-conditioned allomorphy.

The use of zero morphs and abstract agglutinative structure with Asp-T-Agr are crucial in order to capture the above generalizations. In contrast, a NOZERO analysis is baroque and cannot capture syncretism and elsewhere generalizations.

8. Conclusion. In Western Armenian, the combination of aspect, tense, and agreement creates complex paradigms. Many of these paradigm cells do not have clearly separably morphs for these three categories, such that the surface inflection seems fusional. Despite the appearance of fusional morphology, we have proposed an analysis of Western Armenian verbal inflection with separate Asp-T-Agr nodes that sometimes fuse, sometimes surface as zero morphs, and sometimes are cleanly segmentable. The end result is that the superficially fusional nature of Armenian inflection is underlyingly an agglutinative system.

This analysis emerges based on the decision to use or avoid explicit zero morphs. Using zero morphs enables us to capture syncretism and elsewhere status and minimize the number of morphological operations needed to express the inflectional paradigms. Using zero morphs also reveals directionality tendencies in morphologically-conditioned allomorphy. More specifically, inwardly-sensitive class-based allomorphy takes precedence over outwardly-sensitive agreement-based allomorphy on the T node.

Avoiding zero morphs, however, requires highly specific fusion and impoverishment rules. A morphological analysis that breaks up a word into increasingly specialized components tends to be one that is more deeply entrenched in the specifics of its theoretical assumptions. Thus, an analysis that eschews zero morphs is unlikely to generalize well – but impoverishment rules already have a tendency to be very specific and often occur in highly marked environments. We anticipate that assuming impoverishment and fusion in place of explicit zero will lead more generally to an abundantly complicated set of VIs. Our experiment in segmenting Tense and Agreement in Western Armenian has exemplified that restricting one element of the analysis does not guarantee a more efficient approach. Future work is needed to compare other combinations of heuristics with those here and to see which heuristics lead to the best coverage of data – not only within other paradigms of Western Armenian, but cross-linguistically as well.

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