

Analyzing the past augment in Modern Greek: A crossdialectal account

Mina Giannoula,  
University of Chicago, United States

**Abstract**

This paper examines the morphological status of the past augment *e-* in Modern Greek. Under the framework of *Distributed Morphology* (Halle & Marantz 1993; Embick & Noyer 2007; Arregi & Nevins 2012), I explore the morphotactic constraints and the operations that apply for its realization. I claim that the manifestation of the augment *e-* as a T node left-adjacent to the verb stem in Standard Modern Greek is subject to the operation of *Doubling* triggered by the *T-Initiality* morphotactic constraint. I further support my analysis of the past augment *e-* providing data from Cypriot Greek arguing that the *Noninitiality* morphotactic constraint and the *Metathesis* postsyntactic operation are additionally required for the past verbal morphology. The *Doubling* analysis explains the past augment *e-* as a morpheme displacement phenomenon in verbal morphology in Modern Greek cross-dialectally, unifying any dialectal variations.

**Keynotes:** Past, augment, Doubling, Metathesis, morphotactic constraints.

**1. Introduction**

In Standard Modern Greek, the past tense is expressed as an ending in verbal forms. In addition, the prefix *e-*, traditionally called the *augment* in Greek, shows also past tense, and surfaces as left adjacent to verb stems. However, the augment is not always present in the verbal forms:

- (1) a. *é- ftan- e- s*  
PST-arrive-PST-2SG  
'You were arriving'  
b. *\*ftan- e- s*  
arrive-PST-2SG
- (2) a. *djávaz- e- s*  
study- PST-2SG  
'You were studying'  
b. *(\*e-) djávaz- e- s*  
PST-study- PST-2SG

In (1a), the augment obligatorily surfaces left adjacent to the past tense form, where the verb stem has two syllables at most, whereas its absence renders the form ungrammatical in (1b). By contrast, the augment is obligatorily absent in (2a), where the verb stem has more than two syllables and the stress appears at the antepenultimate one.

The phenomenon of augment in Greek has been long debated in the literature either phonologically, morphologically or morpho-phonologically (Triantafillides 1941; Smyth 1956; Jay 1958; Koutsoudas 1962; Householder *et al.* 1964; Philippaki-Warburton 1973; Kaisse 1982; Joseph & Philippaki-Warburton 1987; Joseph & Janda 1988; Xydopoulos 1996; Holton *et al.* 1997; Clairis & Babiniotis 1999; Alexiadou & Anagnostopoulou 2001; Galani 2005; Spyropoulos & Revithiadou 2009; Pavlou 2018; among others). The current

study addresses the morphological status of the augment *e-* as an exponent of the past tense under the derivational framework of *Distributed Morphology* (Halle & Marantz 1993; Embick & Noyer 2007; Arregi & Nevins 2012). More specifically, I present the morphotactic constraints and mechanisms that allow the presence of the augment *e-* away from the past tense endings in verb forms, and provide a unified analysis for past verbal forms in Modern Greek cross-dialectically. The operations and constraints proposed in this paper operate on linear sequences and effect changes in the linear order of morphemes; thus, their structural descriptions do not mention the specific phonological content of terminal nodes and they apply at a stage after *Linearization* and before *Vocabulary Insertion* in the *Linear Operations* module (Arregi & Nevins 2012).

The paper is organized as follows: in Section 2, after examining the verbal morphology in Modern Greek, I argue that Tense and Agreement are realized as separate terminal nodes in verbal forms, claiming that the previous account for the fused T-Agr node is not attainable. In Section 3, I present my analysis for the manifestation of the augment left-adjacent to verb stems in the past as subject to the operation of *Doubling* triggered by the *T-Initiality* constraint providing data from both simple verbs and preverbed verbal complexes. In Section 4, I further support my account turning to the analysis of the augment in Cypriot Greek and arguing that the morphotactic *Noninitiality* constraint and the *Metathesis* operation are additionally needed for the past verbal morphology. Section 5 concludes.

## 2. Agreement and Tense as separate nodes

In this section, I show that, unlike Spyropoulos & Revithiadou (2009) who take Agreement and Tense as a fused terminal node, Agreement and Tense are separate terminal nodes in Modern Greek.

In Tables 1, 2 and 3, I provide the full paradigm for the disyllabic root verb *djava-* ‘to study’ and the monosyllabic root verb *ftá-* ‘to arrive’ in the active voice:

Prs	-past, -perfective, -passive		+past, -perfective, -passive	
1sg	<i>djava-z-o</i>	‘I study’	<i>djava-z-a</i>	‘I was studying’
2sg	<i>djava-z-i-s</i>	‘you study’	<i>djava-z-e-s</i>	‘you were studying’
3sg	<i>djava-z-i</i>	‘he/she/it studies’	<i>djava-z-e</i>	‘he/she/it was studying’
1pl	<i>djava-z-u-me</i>	‘we study’	<i>djava-z-a-me</i>	‘we were studying’
2pl	<i>djava-z-e-te</i>	‘you study’	<i>djava-z-a-te</i>	‘you were studying’
3pl	<i>djava-z-u-n</i>	‘they study’	<i>djava-z-a-n</i>	‘they were studying’

**Table 1:** SMG verbal morphology in Imperfective (disyllabic roots)

Prs	-past, -perfective, -passive		+past, -perfective, -passive	
1sg	<i>fta-n-o</i>	‘I reach’	<i>e-fta-n-a</i>	‘I was reaching’
2sg	<i>fta-n-i-s</i>	‘you reach’	<i>e-fta-n-e-s</i>	‘you were reaching’
3sg	<i>fta-n-i</i>	‘he/she/it reaches’	<i>e-fta-n-e</i>	‘he/she/it was reaching’
1pl	<i>fta-n-u-me</i>	‘we reach’	<i>fta-n-a-me</i>	‘we were reaching’
2pl	<i>fta-n-e-te</i>	‘you reach’	<i>fta-n-a-te</i>	‘you were reaching’
3pl	<i>fta-n-u-n</i>	‘they reach’	<i>e-fta-n-a-n</i>	‘they were reaching’

**Table 2:** SMG verbal morphology in Imperfective (monosyllabic roots)

Prs	+past, +perfective, -passive		+past, +perfective, -passive	
1sg	<i>djava-s-a</i>	'I studied'	<i>e-fta-s-a</i>	'I reached'
2sg	<i>djava-s-e-s</i>	'you studied'	<i>e-fta-s-e-s</i>	'you reached'
3sg	<i>djava-s-e</i>	'he/she/it studied'	<i>e-fta-s-e</i>	'he/she/it reached'
1pl	<i>djava-s-a-me</i>	'we studied'	<i>fta-s-a-me</i>	'we reached'
2pl	<i>djava-s-a-te</i>	'you studied'	<i>fta-s-a-te</i>	'you reached'
3pl	<i>djava-s-a-n</i>	'they studied'	<i>e-fta-s-a-n</i>	'they reached'

**Table 3:** SMG verbal morphology in Perfective

In Spyropoulos & Revithiadou (2009), Tense and Agreement are taken as a fused node, i.e. a single terminal with one exponent that encodes both tense and subject agreement features. In past forms, where T is specified as [+past], the fused node undergoes Fission and results to an addition exponent, which, under certain conditions, is materialized by the prefix *e-*.

Here I claim that Tense and Agreement morphemes are realized in two separate terminals in Modern Greek encoding their own distinct features, following Pavlou (2018). Pavlou argues for Tense and Agreement in Cypriot Greek showing that 'each terminal node is realized by different exponents in the morphological decomposition of the verb' (Pavlou 2018: 6). Evidence for that comes if we take into consideration Tables 1, 2 and 3 above, where the full paradigm of the active verbs is presented. The tables reveal the following pattern for the agreement suffixes in Modern Greek verbs both in the present and the past tense:

Person	Singular	Plural
1 <sup>st</sup>	-∅	- <i>me</i>
2 <sup>nd</sup>	- <i>s</i>	- <i>te</i>
3 <sup>rd</sup>	-∅	- <i>n</i>

**Table 4:** Agreement suffixes in SMG verbs

In Table 4, the suffixes *-s*, *-me*, *-te*, and *-n* are used to show subject agreement in the 2<sup>nd</sup> singular, 1<sup>st</sup> plural, 2<sup>nd</sup> plural, 3<sup>rd</sup> plural persons, respectively. I also assume a null morpheme, i.e. -∅, for the agreement in 1<sup>st</sup> and 3<sup>rd</sup> person singular. As one can observe, a consistent pattern of endings holds in verbal morphology for both [+past] and [-past] forms: *-s*, *-me*, *-te*, and *-n*. Given the systematic alternation between the exponents, I argue for the vocabulary entries in (3) to realize the agreement suffixes following Bobaljik's (2008) binary system. Each vocabulary entry left-adjacent to the T terminal node realizes a subset of morphosyntactic features of the Agr terminal driven by the *Subset Principle* (Halle 1997, Arregi & Nevins 2012). The *Subset Principle* is defined as 'the phonological exponent of a Vocabulary Item inserted into a morpheme... if the item matches all or a subset of the grammatical features specified in the terminal morpheme. Insertion does not take place if the Vocabulary Item contains features not present in the morpheme. Where several Vocabulary Items meet the conditions for insertion, the item matching the greatest number of features specified in the terminal morpheme must be chosen' (Halle 1997: 128).

- (3) *Vocabulary entries for agreement suffixes in Greek*
- a.  $s \leftrightarrow [_{Agr} +singular, -author, +participant]$
  - b.  $te \leftrightarrow [_{Agr} -singular, -author, +participant]$
  - c.  $n \leftrightarrow [_{Agr} -singular, -author, -participant]$
  - d.  $me \leftrightarrow [_{Agr} -singular, +author]$
  - e.  $\emptyset \leftrightarrow [_{Agr} +singular]$

The exponents *-s*, *-te* and *-ne* are specified for number, author and participant features, and accordingly realize the 2<sup>nd</sup> person singular, the 2<sup>nd</sup> person plural and the 3<sup>rd</sup> person plural suffixes, respectively, whereas the 1<sup>st</sup> person plural suffix *-me* is underspecified for the participant feature. Regarding the 1<sup>st</sup> person singular and the 3<sup>rd</sup> person singular suffixes, I argue that they are realized by the null morpheme  $-\emptyset$  as an Elsewhere vocabulary entry at the Agr terminal node.

Since Agreement is not fused with Tense, Tense forms a separate terminal node as well. A careful look at the surface past forms in verbal morphology shows a consistent pattern: the suffix *-e* appears in 2<sup>nd</sup> and 3<sup>rd</sup> person singular, whereas the suffix *-a* appears in 1<sup>st</sup> person and 2<sup>nd</sup> and 3<sup>rd</sup> person plural.

Person	Singular	Plural
1 <sup>st</sup>		
2 <sup>nd</sup>	-e-	-a-
3 <sup>rd</sup>		

**Table 5:** *Past tense morphemes in SMG verbs*

Table 5 shows the pattern of past tense morphemes in Modern Greek. The morpheme *-e-* appears only in the 2<sup>nd</sup> and 3<sup>rd</sup> person in singular. A common property between the 2<sup>nd</sup> and 3<sup>rd</sup> person singular is that *-e-* is associated with the [-author] feature. In all the other persons, the morpheme *-a-* is used. The systematic alternation between the two past exponents can be explained with the following vocabulary entries realizing the T terminal:

- (4) *Vocabulary entries for active past tense in Modern Greek*
- a.  $e \leftrightarrow [_{T} +past] / \text{ \_\_ Agr } [+singular, -author]$
  - b.  $a \leftrightarrow [_{T} +past] / \text{ \_\_ Agr }$

The exponent *-e* is inserted in the morphosyntactic environment specified for the number and author features, whereas the exponent *-a* is inserted as the Elsewhere Vocabulary Item, i.e. a morpheme with no feature specification.

This analysis is a way to account for the distribution of the morphemes in past tense based on the syncretism between persons without assuming that these morphemes are fused with the agreement ones. Thus, a past tense analysis as the result of a Fission process of the fused agreement-tense node cannot be implemented (Spyropoulos & Revithiadou 2009). Therefore, in alignment with previous studies (Philippaki-Warburton 1998; Rivero 1990; Philippaki & Spyropoulos 1999; Galani 2005, Pavlou 2018), I take the morphological structure for non-imperative forms in Modern Greek to be the one in (5):

- (5) *Verb root–v–Aspect–Tense–Agreement*

### 3. The augment *e-* in Standard Modern Greek

The question that arises now is how the past augment *e-* is realized in verbal forms. Unlike Spyropoulos & Revithiadou (2009), I argue that, under the framework of *Distributed Morphology* and Arregi & Nevins's (2012) system, its manifestation as T left-adjacent to the verb stem is subject to the operation of Doubling triggered by the *T-Initiality* morphotactic constraint.

#### 3.1 A previous account

The augment in Standard Modern Greek is an exponent of past tense that has a restricted distribution: it depends on the number of root and suffixes. These restrictions are illustrated in the example of a monosyllabic root in (5) and of a disyllabic root in (6):

- (6) a. *ftan- i- s*  
arrive- PRS-2SG  
'You arrive'  
b. *e- ftan- e- s*  
PST-arrive-PST-2SG  
'You arrived'  
c. *(\*e-) ftan- a- te*  
PST-arrive-PST-2PL  
'You arrived'
- (7) a. *djavaz- i- s*  
study- PRS-2SG  
'You study'  
b. *(\*e-) djavaz- e- s*  
PST-study- PST-2SG  
'You studied'  
c. *(\*e-) djavaz- a- te*  
PST-study- PST-2PL  
'You studied'

In (6b), *-es* is a monosyllabic ending, formed by the tense and the agreement morphemes, that follows the monosyllabic verbal root in past tense. In (6c), *-ate* is a two-syllable item, also formed by the tense and the agreement morphemes, that follows the monosyllabic verbal root. Unlike (7b), the augment surfaces only in (6b), where the root and its ending form a disyllabic item.

Providing a morphophonological analysis, Spyropoulos & Revithiadou (2009) argue that the antepenultimate stress is not itself an exponent of the past, as traditionally has been argued. Rather, the default exponent of past is a segmentally empty prefix that bears lexically encoded accentual properties. Under certain conditions, this empty slot is materialized, 'giving on the surface the impression that the augment and the antepenultimate stress constitute part of a discontinuous past morpheme' (Spyropoulos & Revithiadou 2009: 3), i.e. *é- ... -a/-es/-e/-ame/-ate/-an*'. More specifically, in past active forms, the fused T-Agr node, specified as [+past,  $\alpha$  agreement] (where  $\alpha$  the general feature for agreement), undergoes the

operation of *Fission*. The empty prefix is specified as [+past], releases the agreement specification and is filled with either vocal material from the base or the vowel *e-*.

### 3.2 Realizing the augment

Taking for granted that Tense and Agreement are two separate nodes, as seen in Section 2, I claim that the realization of *e-* is subject to the mechanism of *Doubling*, in order to account for the presence of T to the left of the verb stem in the past tense.

In Arregi & Nevins' (2012) system, *Doubling* is an operation of copying which, along with *Metathesis*, is analyzed through the formalism of the so-called *Generalized Reduplication*, a term covering both *Full* and *Partial Reduplication* (in the sense of Harris & Halle 2005). Arregi & Nevins posit that the application of *Doubling* is an operation in the *Linear Operations* module that occurs before *Vocabulary Insertion*. It is driven by a morphotactic constraint on the possible order of morphemes affecting the linear order of a sequence. Here, I argue *T-Initiality* as the constraint needed to trigger the presence of the T node to a different position, i.e. to the leftmost edge of T-domain. *T-Initiality* belongs to the triggering constraints that 'defines a banned configuration and triggers the application of a repair rule whose structural description matches this configuration' (Arregi & Nevins 2012: 238).

- (8) *T-Initiality*  
Terminal T must be initial within T<sup>0max</sup>.

Being set off by the *T-Initiality* constraint, the *Doubling* operation applies to locate the T node left-adjacent to the verb root. As a first step of the rule, a pair of doubled square brackets '[[ ]]' defines the sequence that undergoes the copying process. In addition, the greater-than symbol '>' is used to define deletion at the left copy and the less-than symbol '<' is used to define deletion at the right sequence. The formalism of *Doubling* and *Metathesis* in Arregi & Nevins (2012) is given below with the abstract linearized sequences:

- (9) a. WXYZ → W[[XY]]Z → W-XY-XY-Z  
(*Full Reduplication*)  
b. WXYZ → W[[X<Y]]Z → W-XY-XY-D → W-Y-XY-Z  
(*Leftward Doubling*)  
c. WXYZ → W[[X>Y]]Z → W-XY-XY-Z → W-XY-X-Z  
(*Rightward Doubling*)  
d. WXYZ → W[[X><Y]]Z → W-XY-XY-Z → W-YX-Z  
(*Metathesis*)

The double square brackets in (9) define XY as the subsequence that incurs the copying process, whereas the subsequences enclosed into the grey boxes indicate the material that undergoes deletion. In (9a), the material is all repeated inside the node sequence resulting in *Full Reduplication*. The copying processes in (9b-d), where part of the sequences in the copies is deleted, result in *Partial Reduplication*. In (9b), the symbol '<' indicates deletion of the material before it in the first copy, showing the doubling of the Y node. In (9c), the symbol '>' indicates deletion of the material after it in the second copy, showing the doubling of the X node. In the presence of both the less-than and greater-than symbols in

(9d), the subsequence is deleted both before the former in the first copy and after the latter in the second copy, resulting to Metathesis and changing the order of nodes.

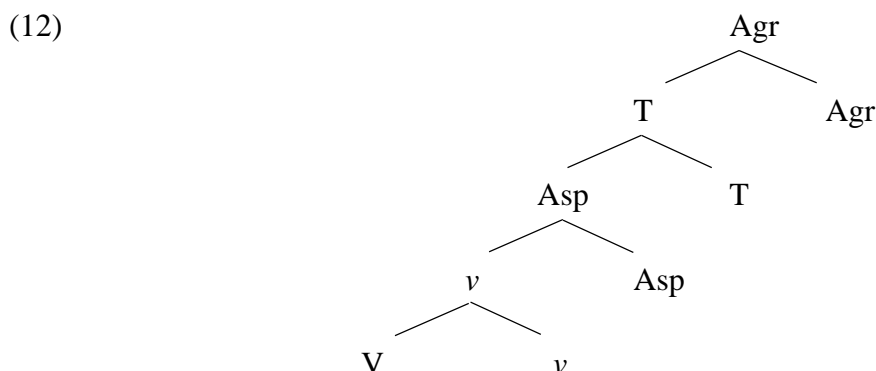
To account for the past augment *e-*, I argue that the *Doubling* rule applies to the complex head, in other words, to the terminals that have already participated in the syntactic operation of *Head Movement* (Koopman 1984; Travis 1984; Baker 1985). I propose the *Leftward Doubling* operation in (10) to account for the presence of T, where the past augment is realized, left-adjacent to the verb stem. The target sequence is the sequence V-*v*-X-T where the rule applies, with X any functional node that participates in the formation of a verbal complex.

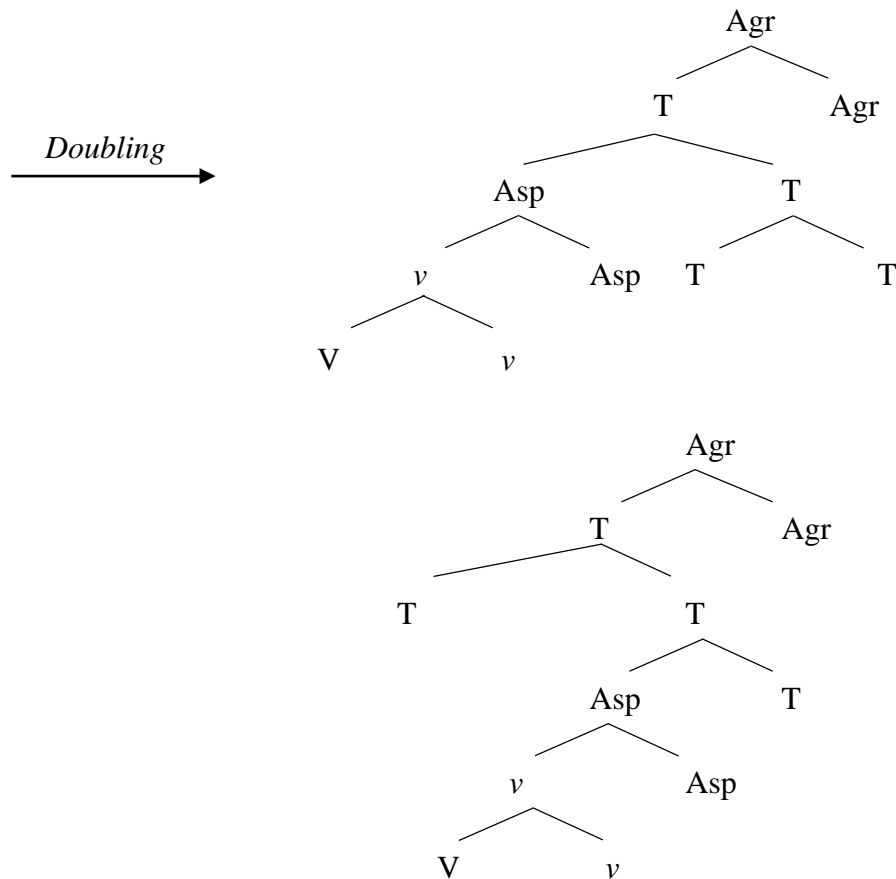
- (10) *Leftward Doubling*
- a. Structural description: V *v* X T Agr
  - b. Structure change:
    - i) Insert  $\llbracket$  to the immediate left of V, and  $\rrbracket$  to the immediate right of T.
    - ii) Insert < to the immediate right of X.

Having argued for the realization of the past augment as subject to Doubling, I present the formation of past verbal forms with the presence of the augment *e-* left-adjacent to the stem. The linear representation of the nodes is given in (11):

- (11) V *v* X T Agr →  
 $\llbracket$ V *v* X T $\rrbracket$  Agr →  
 $\llbracket$ V *v* X < T $\rrbracket$  Agr →  
 V *v* X T - V *v* X T - Agr →  
 T V *v* X T Agr

Given the formalism of the Doubling rule, the first step is to copy the subsequence of V-*v*-X-T terminal nodes of the verb stem including T. Having the two copies, the V-*v*-X material is deleted from the first one, whereas T is preserved in both. The following trees show structurally the application of Doubling of T to the complex head after the syntactic *Head Movement* operation has been applied:





The possibility of Doubling results to two copies of T in two different positions: the original copy is in-situ following the verb root and preceding Agreement, and the second copy is in the displaced position before the verb stem. The exponents of the original T copy are those in (13) (repeated from (4))

- (13) *Vocabulary entries for active past tense in Modern Greek*  
 a.  $e \leftrightarrow [T +past] / \_\_ Agr [+singular, -author]$   
 b.  $\alpha \leftrightarrow [T +past] / \_\_ Agr$

The exponents of T left-adjacent to verb stems are given in (14):

- (14) a.  $e \leftrightarrow [T +past] / [T^{0max} \# \_\_ \sigma\sigma]$   
 b.  $\emptyset \leftrightarrow [T +past] / [T^{0max} \# \_\_]$

In (14a), the past augment *e-*, which in Greek serves to host the antepenultimate stress, is inserted to T only when the verb stem has two or less syllables ( $\sigma$ ). In other words, the result of the mechanism is that T, which materializes the past augment in cases of verb stems with two or less syllables, surfaces left-adjacent to the verb root, as it is the case of the verb *grapo* ‘to write’ in the past:

- (15) T – V    – v – Asp – T – Agr  
*e – grap –  $\emptyset$  – s    – e – s*                      ‘You wrote’



In any other case, i.e. when the verb stem has more than two syllables, a null morpheme realizes T, since the antepenultimate stress is hosted by a syllable of the stem. The application of the rule to the verb *djavazo* ‘to study’ in the past form corresponds to the exponents in (16):

$$(16) \quad \begin{array}{l} T - V \quad \quad - \nu - \text{Asp} - T - \text{Agr} \\ \emptyset - \text{djava} - \emptyset - s \quad \quad - e \quad - s \end{array} \quad \text{‘You studied’}$$

Therefore, the proposed analysis shows that a second copy of T must also be considered to be present in the underlying morphological structure of Modern Greek past tense forms. However, it is its exponents that either allow this position to overtly be occupied or not with the presence of the augment *e-* or a null morpheme, respectively.

### 3.3 The formative *-ik*

Interestingly, the analysis of the past augment *e-* as subject to the application of the postsyntactic Doubling triggers a similar analysis for the appearance of *-ik*. According to Spyropoulos & Revithiadou (2009), *-ik* is a morpheme characterized as [+past, +perf] that appears in past perfective forms in both active and passive voice. It has a complementary distribution with the past augment *e-*, not respecting the stress pattern of the antepenultimate syllable. Consider the verb paradigms below:

Prs	+past, +perfective, -passive		+past, +perfective, -passive	
1sg	<i>b-ik-a</i>	‘I entered’	<i>vr-ik-a</i>	‘I found’
2sg	<i>b-ik-e-s</i>	‘you entered’	<i>vr-ik-e-s</i>	‘you found’
3sg	<i>b-ik-e</i>	‘he/she/it entered’	<i>vr-ik-e</i>	‘he/she/it found’
1pl	<i>b-ik-a-me</i>	‘we entered’	<i>vr-ik-a-me</i>	‘we found’
2pl	<i>b-ik-a-te</i>	‘you entered’	<i>vr-ik-a-te</i>	‘you found’
3pl	<i>b-ik-a-n</i>	‘they entered’	<i>vr-ik-a-n</i>	‘they found’

**Table 4:** The past forms of *béno* ‘to enter’ and *vrísko* ‘to find’ in perfective

In the morphophonological analysis of Spyropoulos & Revithiadou, the morpheme *-ik* is a past tense exponent selected by the perfective aspect and appears in competition with the empty slot where the past augment *e-* is materialized, i.e. it has an allomorphic relation with the augment. I argue that this competition occurs due to the fact that the appearance of the T terminal node is also subject to the copying process of *Doubling*, in the sense of *Full Reduplication* (Harris & Halle 2005). The result of the rule gives us the slot in which the element *-ik-* is materialized.

$$(17) \quad \text{Doubling (Full Reduplication)}$$

$$\begin{array}{l} V \nu T \text{Agr} \rightarrow \\ V \nu \llbracket T \rrbracket \text{Agr} \rightarrow \\ V \nu T T \text{Agr} \end{array}$$

In (17), the double square brackets ‘ $\llbracket$ ’ and ‘ $\rrbracket$ ’ delimit the node T to be doubled. The result of the operation is a doubled T terminal hosting the morpheme *-ik* which surfaces intervening the  $\nu$  node and the original T node. The following example illustrates the rule:

- (18) V – v – T – T – Agr  
b – Ø – ik – e – s  
'You entered'

### 3.4 Preverbed verbal complexes

So far, I have provided examples with simple verbal forms in the past. However, Modern Greek also abounds in preverbed verbal complexes, i.e. verbal forms with preverbs attached to them:

- (19) a. *anti- graf- i- s*  
instead.of-write-PRS-2SG  
'You copy'  
b. *is- val- i- s*  
into-attack-PRS-2SG  
'You invade'  
c. *ant- e- graps-e- s*  
instead.of-PST-write-PST-2SG  
'You copied'  
d. *is- e- val- e- s*  
into-PST-attack-PST-2SG  
'You invaded'
- (20) a. *para-psin- i- s*  
over-cook-PRS-2SG  
'You overcook'  
b. *ksana-graf- i- s*  
again- write-PRS-2SG  
'You write again'  
c. *para-e- psis- e- s*  
over-PST-cook-PST-2SG  
'You overcooked'  
d. *ksana-e- graps-e- s*  
again- PST-write- PST-2SG  
'You wrote again'

The examples above show preverbed verbal complexes in Modern Greek. In (19), the complexes consist of a verbal form and a preverb that has a prepositional origin, namely a *prefix*, whereas in (20), the complexes consist of a verbal form and an *adverbial preverb*<sup>1</sup>. However, in the past, in both cases, the augment intervenes the preverbs and the verbal forms. I claim that this can also be explained under the *Doubling* approach. The structure of the preverbed verbal complexes, after the applications of the syntactic operation of *Head Movement* and the postsyntactic operation of *Merger* (in the sense of Matushansky 2006; Harizanov 2014; Martinović 2019), in which Doubling is applied is given in (21):

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<sup>1</sup> See Giannoula 2020, for a detailed discussion on preverbs in Modern Greek and the formation of preverbed verbal complexes.

(21)  $Pr - V - v - X - T - Agr$

The double appearance of T is again subject to the operation of *Doubling* which is set off by the morphotactic constraint of *T-Initiality* (repeated from (8)):

(22) *T-Initiality*  
Terminal T must be initial within  $T^{0max}$ .

The formalism of Doubling is given in (23):

(23) *Leftward Doubling*  
a. Structural description:  $Pr V v X T Agr$   
b. Structure change:  
i) Insert  $[[$  to the immediate left of V, and  $]]$  to the immediate right of T.  
ii) Insert  $<$  to the immediate right of X.

Since the constraint requires the appearance of the T terminal to the left edge of the T-domain, the rule applies to the V-v-X-T-Agr subsequence to double the T node whose copy precedes the V node but not Pr. The *Doubling* process of the preverbed verbal complexes is given in (24), and the example in (25) illustrates it:

(24)  $Pr V v X T Agr \rightarrow$   
 $Pr [[V v X T]] Agr \rightarrow$   
 $Pr [[V v X < T]] Agr \rightarrow$   
 $Pr - \underline{V} v X T - V v X T - Agr \rightarrow$   
 $Pr T V v X T Agr$

(25)  $ksanagrapses \rightarrow$   
 $ksana[[graps<e]]s \rightarrow$   
 $ksana - \underline{graps}e - \underline{graps}e - s \rightarrow$   
 $ksana - e - \underline{graps}e - s$

However, as seen in Section 3.2, when the verb stem has more than two syllables, the exponent of the doubled copy of T left-adjacent to verb stems is a null morpheme. The following example illustrates it:

(26)  $Pr - T - V - v - X - T - Agr$   
 $ksana - \emptyset - djava - \emptyset - s - e - s$   
'You studied again'

In this section, I have shown how the past augment *e-* appears left-adjacent to verb stems. Separating Tense from Agreement, I have proposed that the T terminal node undergoes the *Doubling* rule triggered by the *T-Initiality* morphotactic constraint. Then, under certain conditions, the T node is materialized by the morpheme *e-*, either in simple or complex verbal forms.

#### 4. The augment cross-dialectically: the case of Cypriot Greek

In this section, I demonstrate that the *Doubling* analysis is the one to unify the dialectal variants of the augment in Modern Greek. On the base of it, I show that the augment as a phenomenon in Modern Greek displays dialectal alternatives that also involve *Metathesis* in addition to *Doubling* driven by *Noninitiality*, as it is the case with Cypriot Greek.

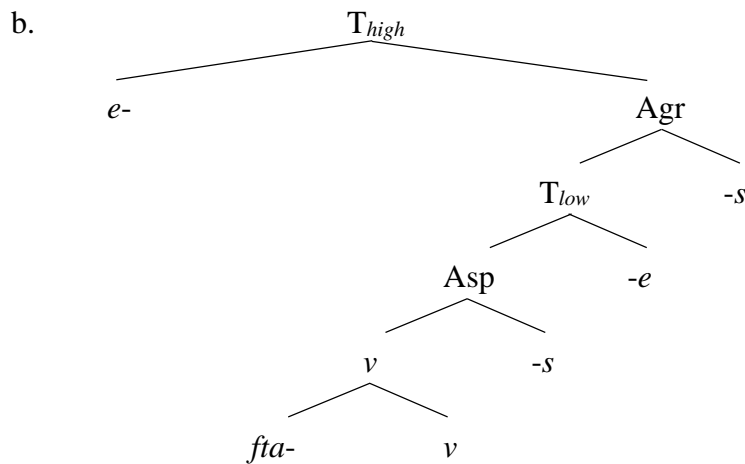
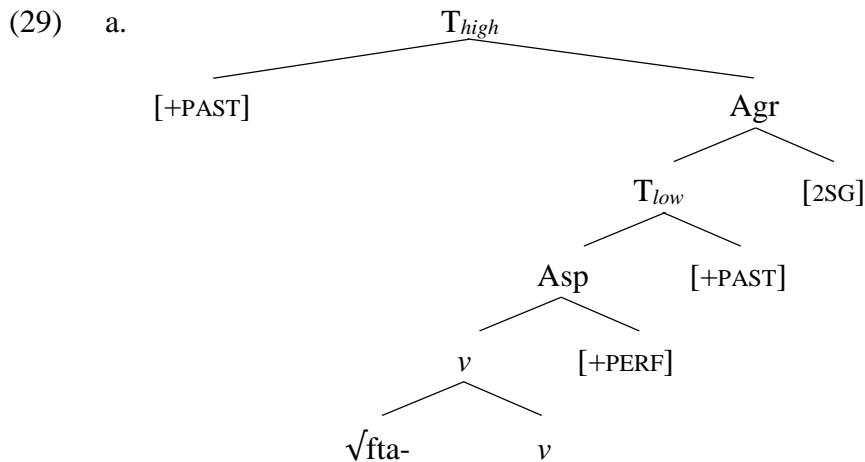
##### 4.1 Simple verb forms in Cypriot Greek

Cypriot Greek is a dialect of the Greek language showing differences with Standard Modern Greek in many aspects. One of these differences shows up in the verbal morphology in the past, where the augment does not serve any stress-related purposes surfacing as left-adjacent to verb stems without putting restrictions on the number of syllables:

- (27) a. *é- psi- s- e- s* (Standard Modern Greek)  
PST-cook-PERF-PST-2SG  
'You cooked'  
b. *djáva-s- e- s*  
study-PERF-PST-2SG  
'You studied'
- (28) a. *é- psi- s- e- s* (Cypriot Greek)  
PST-cook-PERF-PST-2SG  
'You cooked'  
b. *e- θkjáva-s- e- s*  
PST-study- PERF-PST-2SG  
'You studied'

Unlike Standard Modern Greek (27), the augment *e-* surfaces independently of the syllable number of the verbs in Cypriot Greek. In (28a), the augment appears in the two-syllable verbal form *épsises* 'you cooked' holding the antepenultimate stress, as it is predicted. However, the augment surfaces also in the three-syllable verbal form *eθkjavases* 'you studied', where there is no need of hosting the antepenultimate stress, unlike Standard Modern Greek.

According to Pavlou (2018), the appearance of the augment *e-* in Cypriot Greek is illustrated in the following trees.



Given that the augment is an additional tense morpheme, Pavlou (2018), following Ostrove (2015) for the Irish verbal morphology, argues for two T projections existing for the realization of a verb in past tense, labeled as  $T_{low}$  and  $T_{high}$ . For Pavlou, the  $T_{high}$  terminal node is realized as an exponent only in past tense, where the augment is generated.

However, I claim that my analysis of the augment subject to *Doubling* can also explain the appearance of the past augment *e-* in Cypriot Greek. However, I posit that, unlike the two exponents of T left-adjacent to the verb stem in Standard Modern Greek, there is only one exponent of T in Cypriot Greek:

$$(30) \quad e \leftrightarrow [T \text{ +past}] / \# \_ V$$

Thus, as seen, the *Doubling* approach of the realization of the past augment in Modern Greek is the most practical way of unifying different varieties of the language, like Standard Modern Greek and Cypriot Greek, which, on the face of it, show dialectical variations.

## 4.2 Doubling and/or Metathesis

In the previous section, I explained that the augment in Cypriot Greek is subject to the *Doubling* process. In this subsection, I will examine data where the *Metathesis* process is added and alternates with a second application of *Doubling*.

It is noteworthy that the presence of the augment displays double appearance in Cypriot Greek, occurring also word-initially to preverbed verbal complexes, contrary to Standard Modern Greek where the augment appears only once, i.e. intervening the preverb and the verbal form:

- (31) a. *para-e- psi- s- e- s* (Standard Modern Greek)  
over-PST-COOK-PERF-PST-2SG  
‘You overcooked’
- b. *ksana-djava-s- e- s*  
again- study-PERF-PST-2SG  
‘You studied again’
- (32) a. *e- para-(e)- psi- s- e- s* (Cypriot Greek)  
PST-over- PST-COOK-PERF-PST-2SG  
‘You overcooked’
- b. *e- ksana-(e)- θkjáva-s- e- s*  
PST-again- PST- read- PERF-PST-2SG  
‘You studied again’

Comparing the preverbed verbal complexes in (31a-b) with those in (32a-b), we observe that, in Cypriot Greek, the augment appears both left-adjacent to the verb stems, as it is also the case in Standard Modern Greek, and word-initially, i.e. to the immediate left of the adverbial preverbs *para-* ‘over’ and *ksana-* ‘again’. In addition, the parentheses in (32a-b) show that the augment left-adjacent to the verb stem can optionally be omitted. Here I claim that the appearance of the augment preceding the preverb is not due to the presence of the  $T_{high}$  terminal node, as Pavlou (2018) posits. Rather, the distribution of the augment in the Cypriot Greek verbal complexes requires the application of the mechanisms of *Doubling* and *Metathesis*<sup>2</sup> and the application of each operation is the result of morphotactic constraints. In other words, as in Standard Modern Greek, the presence of the augment left-adjacent to the verb stem is subject to the *Leftward Doubling* operation which is triggered by the *T-Initiality* constraint<sup>3</sup>. However, the augment in Cypriot Greek verbal complexes also appears word-initially, unlike Standard Modern Greek. Here I argue that this second occurrence of the augment preceding the preverb is subject to either *Doubling* or *Metathesis*, based on the optionality of the augment intervening the preverb and the verb stem. The operations of *Doubling* and *Metathesis*, ‘formalized as instances of *Generalized Reduplication*, effect

<sup>2</sup> For their abstract formalisms, see Section 3.2 below.

<sup>3</sup> See Section 3.2.

changes in the linear order, often in response to requirements imposed by inviolable constraints' (Arregi & Nevins 2012: 263).

More specifically, I propose that the presence of the augment both word-initially to preverbed verbal complexes and between the preverb and the verb stem is subject to a second *Leftward Doubling* rule triggered by *Noninitiality*. *Noninitiality* is another morphotactic constraint which is related to second position effects (Wackernagel 1892; Halpern & Zwicky 1996; Anderson 2005).

- (33) *Pr-Noninitiality*  
Terminal node Pr cannot be leftmost within  $Pr^{0max}$ .

Here, *Pr-Noninitiality* accounts for the word-second position effect requiring the Pr[everb] category to avoid the leftmost edge of preverbed verbal complexes and have a terminal node to its left. This requirement can be achieved through the second application of *Leftward Doubling* which reorders the sequence of nodes arisen from the process of *Linearization* and the first *Leftward Doubling* rule. The formalism of the operation is given below:

- (34) *Leftward Doubling*  
a. Structural description:  $Pr TV v X T Agr$   
b. Structure change:  
i) Insert  $[[$  to the immediate left of Pr, and  $]]$  to the immediate right of T.  
ii) Insert  $<$  to the immediate right of Pr.
- (35)  $Pr T V v X T Agr \rightarrow$   
 $[[Pr T]] V v X T Agr \rightarrow$   
 $[[Pr < T]] V v X T Agr \rightarrow$   
 $Pr T - Pr T - V v X T Agr \rightarrow$   
 $T - Pr T - V v X T Agr$

The following example illustrates the operation:

- (36) ksanaegrapses  $\rightarrow$   
 $[[ksana<e]]grapses \rightarrow$   
ksanae – ksanae – grapses  $\rightarrow$   
e – ksanae – grapses

So far, I have shown how the second copy of the augment appears word-initially, along with the first one left-adjacent to the verb stem in the preverbed verbal complexes, a phenomenon taking place only in Cypriot Greek but not in Standard Modern Greek. Interestingly though, preverbed verbal complexes in Cypriot Greek show optionality of the presence of the augment. In particular, it is possible that the augment can also appear only word-initially and not left-adjacent to the verb stem, as it was the case so far.

- (37) a. *e- para-e- psi- s- e- s*  
PST-over- PST-cook-PERF-PST-2SG  
'You overcooked'  
b. *e- para-psi- s- e- s*  
PST-over- cook-PERF-PST-2SG

‘You overcooked’

In (37b), the augment appears only once in the preverbed verbal complex, preceding the preverb *para-* ‘over’. To account for it, I claim that this is subject not to *Leftward Doubling*, rather to its alternant, the *Metathesis* rule, which is also triggered by the *Noninitiality* constraint. *Metathesis* is a morphological operation that is ‘demonstrably postsyntactic, operating on a linearized sequence of morphemes’ (Arregi & Nevins 2012: 237). This abstract template is given in (38) (repeated from (9d)):

(38) *Metathesis*  
 $WXYZ \rightarrow W[[X > < Y]]Z \rightarrow W-\underline{XY}-\underline{XY}-Z \rightarrow W-YX-Z$

I argue that the already doubled T copy is metathetically transposed to the left of the preverb in preverbed verbal complexes in order to satisfy the *Noninitiality* requirement. The formalism of the operation is given below:

(39) *Metathesis*  
 a. Structural description:  $Pr\ T\ V\ v\ X\ T\ Agr$   
 b. Structure change:  
     i) Insert  $[[$  to the immediate left of Pr, and  $]]$  to the immediate right of T.  
     ii) Insert  $> <$  to the immediate right of Pr.

(40)  $Pr\ T\ V\ v\ X\ T\ Agr \rightarrow$   
 $[[Pr\ T]]\ V\ v\ X\ T\ Agr \rightarrow$   
 $[[Pr < T]]\ V\ v\ X\ T\ Agr \rightarrow$   
 $\underline{Pr}\ T - Pr\ T - V\ v\ X\ T\ Agr \rightarrow$   
 $T - Pr\ T - V\ v\ X\ T\ Agr$

The example in (41) illustrates the operation of *Metathesis* to the verb *ksanagrafo* ‘to write again’:

(41)  $ksanaegrapses \rightarrow$   
 $[[ksana > < e]]grapses \rightarrow$   
 $\underline{ksanae} - \underline{ksanae} - grapses \rightarrow$   
 $e - ksana - grapses$

Thus, under the already *Doubling* account, the *Noninitiality* morphotactic constraint on linear order can be satisfied by different rules (*Doubling* or *Metathesis*) in different contexts in Cypriot Greek verbal complexes.

I conclude this section summarizing all the syntactic and postsyntactic operations needed for the appearance of the augment in preverbed verbal complexes in Cypriot Greek and presenting their order of application. The syntactic operation relevant in my account is *Head Movement*. The postsyntactic operations are *Merger of Pr*, *Doubling of T*, a second *Doubling of T* or *Metathesis*, and *Vocabulary Insertion*. The operations apply in the following order (where ‘ $\alpha < \beta$ ’ understood as ‘ $\alpha$  precedes  $\beta$ ’)

(42) *Head Movement* < *Merger* < *Linearization* < *Doubling* < *Doubling/Metathesis* < *Vocabulary Insertion*



*Head Movement*, as a syntactic operation, is the first to apply forming the complex head in which all the other (postsyntactic) operations apply. Second, *Merger of Pr* applies to combine the preverb with the verbal complex head. Finally, given that they affect the linear order and the phonetic form of morphological terminals, *Linearization*, *Doubling of T* or *Metathesis* (whether the augment intervenes the preverb and the verb stem or not) and *Vocabulary Insertion* apply in this order at a relatively late postsyntactic stage (Embick & Noyer 2001; Embick 2010; Arregi & Nevins 2012; Arregi & Pietraszko 2019).

## 5. Conclusion

In this paper I showed that the augment *e-* as an exponent of the past tense is a morpheme displacement phenomenon in Modern Greek verbal morphology and the result of the interaction of constraints and rules. Under the derivational framework of *Distributed Morphology* (Halle & Marantz 1993; Embick & Noyer 2007; Arregi & Nevins 2012), I offered an analysis providing the morphotactic constraints and mechanisms that allow the presence of the augment away from the past tense endings in verb forms.

Based on the observations in Modern Greek verbal morphology, I showed that Agreement and Tense are separate terminal nodes. Based on that, I argued that the manifestation of the augment *e-*, either in simple or in complex forms in Standard Modern Greek, is subject to the postsyntactic operation of *Doubling of T*, triggered by the *T-Initiality* morphotactic constraint. Unlike Pavlou (2018) who argues for two different Tense nodes, i.e.  $T_{low}$  and  $T_{high}$ , with the former realizing the exponent of the past augment *e-*, the realization of *e-* in Cypriot Greek is also subject to *Doubling* operation. For this, I provided a unified analysis of past verbal forms in Modern Greek cross-dialectally proposing that the *Doubling* approach of the realization of the past augment in Modern Greek unifies different varieties of the language, like Standard Modern Greek and Cypriot Greek, which, on the face of it, show dialectal variations. I also argued that the *Noninitiality* morphotactic constraint and the *Metathesis* postsyntactic operation are additionally required for the past complex verbal morphology in Cypriot Greek.

The main benefit of the proposed analysis is that it explains the verbal morphology in past tense in Modern Greek cross-dialectally, unifying any dialectal variations, and given that, can be expanded to other Modern Greek dialects, such as Ancient Greek. A number of processes can be best accounted for the Greek past augment determining that the proposed language-particular constraints apply across the Greek dialects, and can be satisfied by different operations in different contexts.

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