Greek Nominal Compounding: Through the prism of Allomorphy*

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Abstract

Στην ελληνική ονοματική σύνθεση, η αλλομορφία εμφανίζεται στα περισσότερα ονοματικά θέματα ως πρώτα συνθετικά. Σε αυτό το άρθρο, προτείνουμε ότι η μη εμφάνιση όλων των ονοματικών αλλόμορφων ως πρώτο συνθετικό δεν εξαρτάται από τις διαδικασίες σχηματισμού λέξεων ή από γραμματική κατηγορία της σύνθεσης (ουσιαστικό, επίθετο ή ρήμα). Η επιλογή του μοναδικού αλλόμορφου δεν είναι τυχαία και αυθαίρετη, αλλά φαίνεται να βασίζεται σε μορφο-φωνολογικά κριτήρια. Επιπλέον, η θέση εκτός κεφαλής μπορεί να συμπληρωθεί μόνο από μια επιλεγμένη μορφή που εμποδίζει την εμφάνιση των υπόλοιπων αλλόμορφων για να διατηρήσει την ομοιομορφία των λέξεων με κοινές συμπεριφορές και μοτίβα. Συγκεκριμένα, τα θέματα που έχουν τα ίδια μορφολογικά και φωνολογικά χαρακτηριστικά παρουσιάζουν παρόμοια αλλομορφική συμπεριφορά. Επομένως, αναμένεται ότι τα αλλομορφικά μοτίβα στις ονομαστικές ενώσεις θα ισχύουν καθολικά και χωρίς εξαιρέσεις..

Λέξεις-κλειδιά: αλλομορφία, ονοματικά σύνθετα, δεσμευμένα θέματα, Ελληνική Μορφολογία

1 Introduction

Stem allomorphy is a morphological phenomenon which participates systematically in all word formation processes with specific patterns in complex and morphologically-rich languages. It is considered that allomorphy is one of the core characteristics of nominal and verbal classification in Modern Greek (Ralli 2000, 2005, 2006, Karasimos 2011). Additionally, Karasimos (2011) points out that the allomorphic behavior of the morphemes is almost identical in all the word formation processes in Modern Greek. However, based on the data, not all the allomorphs of a morpheme are fully available in complex nominal formations, depending on the position they appear in. The non-appearance of all nominal allomorphs as a first component does not depend on compounding itself, as this phenomenon also occurs in derivation. The choice of a common allomorph is not so random and arbitrary, but it seems to be based on morpho-phonological criteria. Allomorphic changes apply to both nominal stems and nominal derivational suffixes that appear in nominal compounds. We expect that allomorphic patterns in nominal compounds will apply universally and without exception.

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2 Revising nominal allomorphy

2.1 Stem allomorphy

Research on stem allomorphy has been revisited by Aronoff (1976) and Maiden (1992), whose work has led to new approaches to significant inflectional and derivational phenomena (Booij 1997, Thornton 1998, Pirrelli and Battista 2000a,b, Ralli 2000, Bonami and Boyé 2003). Aronoff's (1994) main position, supported by other morphologists, is that the meaning of a word is not a single phonological representation, but a continuum of interconnected stems, which can be related to each other through a simple phonological change, an arbitrary change or a complete suppletion (Maiden 2004).

2.2 Redefining allomorphy

Expanding Lieber's (1982) definition, we define allomorphy as the study of the different variants of a lexeme, which share lexical information and semantic representation. However, they differ simultaneously in their phonological form unpredictably and arbitrarily due to the application of some diachronic phonological or morphological rule. We argue that it is a process in which the morphological environment and the choice of the appropriate allomorph are characterized by regularity and predictability (Karasimos 2011).

Ralli (2000, 2006) underlines that allomorphy participates in the core morphology and without exception in all word formation processes. She suggests that it is one of the main features of verbal and nominal categorizing into inflectional classes. For example, ποιητη~ποιητ ('poet', 2nd class), καφε~ καφεδ ('coffee', 3rd class) and βημα~ βηματ ('step', 8th class). Following Lieber's (1982) and Ralli's (2000, 2006) theoretical model we do not consider as allomorphs any kind of changes resulting from phonological rules (*phonomorphs*, as γράφ-ω – έ-γραψ-α, 'I write – I wrote'), free variants (δεσπότ-ες vs. δεσποτάδ-ες, 'bishops'), and suppletions (είμαι – υπήρξα, 'I am – I was').

3 From Inflection and Derivation to Compounding: the same bumpy road

3.1 Nominal inflection and allomorphy

According to Ralli (2000, 2006), allomorphy is considered one of the key features of nominal and verbal classifications in clitic classes. Karasimos (2011) points out that the allomorphic behavior of morphemes in Modern Greek is similar in every word formation. Usually the nominal inflection uses all the available allomorphs of a lexeme. However, there are systematic variations that are applicable without exception to all members of an inflectional class. For examples, the neutral nouns of the fifth inflectional class (παιδί-like nouns) do not display allomorphy in inflection. However, allomorphy occurs in derivation and compounding using stems without the final -ι (παιδ-, 'child'), while the μπακάλης-like masculine nouns of the second class have an allomorph with -δ (μπακαλη~ μπακαληδ-, 'grocer'), but they use another allomorph in derivation and compounding (μπακαλ-, μπακάλ-ικο 'grocery', μπακαλ-ό-γατος 'stock boy', cf. Karasimos 2013).

3.2 Nominal derivation and allomorphy

It is a dominant trend in derivation to create new formations of a different (usually) grammatical category from a base since nominal derivatives have the highest rate of generation in most languages (Booij 2005), as well as in Greek (Debrunner 1907, Ralli 2005, Karasimos 2011). According to Booij (2005) the description and analysis of each derivation process depends on the derived bases which contains a set of properties for both import and export process. One of these properties is the uniformity between nominal derivatives with a common base that must be preserved by the appearance of only one base formation (usually the same allomorph type). In particular, the nominal derived bases allow the appearance of a single allomorph due to a restriction that occurs during the input configuration and prevents the appearance of other allomorphs as a basis in a derived word, i.e., the single allomorph constraint (Karasimos 2011, 2013). The derived bases allow the appearance of a single allomorph due to this constraint (1). This restriction applies universally to nominal derivation without exception.

(1)	άνθρωπος	ανθρώπ-ιν(ος)	ανθρωπ-άκι
	'human	$\text{human}_{\text{ADJ}}$	little person
	καφές	καφεδ-άκι	καφεδ-ιά
	coffee	java	java
	δύναμη	δυναμ-ικ(ός)	δυναμ-ισμ(ός)
	power	dynamic	dynamism
	κύμα	κυματ-ίζ(ω)	κυματ-άρα
	wave	wave_{V}	big wave

4 Nominal Compounds and Allomorphy

Comparing the processes of compounding and derivation through the prism of allomorphy, we can observe various tendencies between languages. There are languages, such as German [2], where all the allomorphs of a clitic example participate in their production and synthesis, while in other languages, such as Dutch and Greek (2), the above behavior does not exist.

(2)	Land ~ Länder	Landkarte	Länderspiele
	'country – countries'	'map'	'match between countries'
	Vater ~ Väter	Vaterland	Väteraufbruch
	'father – fathers'	'homeland'	'father leaving'
	Buch ~ Bücher	Buchhandlung	Bücherregal
	'book – books'	'bookstore'	'bookshelf'

(Lieber 1982)

More specifically, analyzing the data from the nominal compounds of Modern Greek, we discover that all the forms of a morpheme are not fully available depending: (a) on the position within the compound as first or second component, as well as (b) in its form as a stem or a word. For example, the noun "κύμα" ('wave') displays two allomorphs *κυμα~ κυματ* in inflection, but only one allomorph appears as the first component (*κυματ-*), e.g., κυματ-ο-μορφή 'waveform', κυματοθραύστης 'wave

breaker', κυματοσυνάντηση 'wave function'. Furthermore, as a second component, the allomorphic pattern changes based on its structure (stem vs. word; see 4.3). The same allomorphic nominal pattern is observed in the derivation. As evidenced in the following subsection, this allomorphic behavior is not random. It is related to the aforementioned constraint and it applies unexceptionally to all nominal compounds.

4.1 Expanding single allomorph selection constraint

The compounding process includes principles and constraints on the type of stems or words that can be combined to create new words, related to inflection and derivation (Ralli 2008). The most common type of input constraint is the morphological base conditions when selected by the compound head component. The data of Modern Greek certify that only one allomorph participates in the derivation. The non-appearance of all allomorphs as a basis in the nominal compounding is directly related to the single allomorph selection constraint.

We suggest that this constraint should apply to the nominal stems either as a first or a second constituent. Therefore, the occurrence of a single allomorph is allowed due to this constraint during the input configuration, which prevents the appearance of the other allomorphs as a stem base. That is why we are expanding the definition of single allomorph selection constraint (3).

(3) *The correlation between derived words with a common base, as well as the correlation between compounds with the same nominal stem (either as first of second constituent) is ensured by the appearance in all words of only one form of the morpheme.*

We consider that the constraint area of effect is located in all nominal complex structures and it is justified by phonological (see 5.2) and morphological conditions (see 5.3). Checking the phonological structure of a nominal derived base, it is observed that the last character is statistically a consonant and not a vowel. Therefore, we always know which nominal allomorph will participate in the compounding process, i.e., the allomorph that does not appear in the singular nominative.

4.2 Nominal allomorphy in the first constituent

In compounds with a nominal first constituent and a second component any possible grammatical category, the data reveal that nouns always participate unexceptionally as a stem and not as a word. At the same time, the systematic allomorphic presence is strongly confirmed, since the majority of nouns (more than 70%) have allomorphs. The regularity in the choice of allomorph depends directly on this limitation, since it ensures the correlation between the stems. This makes the selection process fully predictable (4a). Nevertheless, there is a limited group of nominal compounds, where the compounds include an 'internal inflectional suffix' or 'new' compound allomorphs from a previous language period (4b)[1].

[1] For the individual violations of this constraint, we mentioned that loans have different behavior and often deviate from the rules, principles and constraints of language (FMI. Καρασίμος 2011, 2020, Karasimos 2013).

(4)

a.	ουραν-ο-ξύστης	'skyscraper' (ουραν- 'sky')
	καρδι-ο-κατακτητής	'heartthrob' (καρδια~ καρδι 'heart')
	βηματ-ο-γράφος	'step recorder' (βημα~ βηματ 'step')
	παιδ-ο-ψυχολόγος	'child psychologist' (παιδι~ !παιδ 'child')
	μπακαλ-ό-γατος	'store boy' (μπακάλη-ς~ μπακαληδ~ !μπακαλ 'grocer')
b.	κρέ-ας/ κρέατ-α	('meat' from different language periods)
		κρε-ο-πώλης ('butcher'), κρε-ο-φάγος (meat-eater')
		κρεατ-ο-πωλείο ('butchery'), κρεατ-ό-πιτα ('meat pie')
	αίμ-α/ αίματ-α	('blood' different entries from International Greek)
		αιμ-ο-σφαίριο ('blood cell'), αιμ-ο-ρραγία ('bleeding')
		αιματ-ο-βαμμένος ('bloodstained'), αιματ-ο-κύλισμα ('slaughter')

(Drachmann 2005, Καρασίμος 2011)

4.3 Nominal Allomorphy in the second constituent

On the other hand, the second component in nominal compounds falls into two distinct and separate cases: components as stems or as words. In the first case (as a stem), the nominal bases have identical behavior with the derivation and compounding of nominal first components, while in the second case (as a word), the nouns have identical behavior with their inflection paradigm. At the same time in both cases, there is a systematic regularity in the allomorph selection without exceptions, while there are not historical 'relics' that can cause problems or create 'exceptions' in the compound analysis and the selection of the appropriate allomorph, as in (4b).

4.3.1 Nominal components as stems

The nominal compounds with a second stem component exhibit the same allomorphic behavior that was described and analyzed in section 4.2. The systematic allomorphic presence is again due to the high allomorphic rate of nouns (over 83% of this category, see section 5) and the extended version of the single allomorph selection constraint which is fully and unexceptionally applied.

[5]	εσώψυχ-α	'inner thoughts' (ψυχη~ ψυχ 'soul')
	παλιόχαρτ-ο	'scrap paper' (χαρτί~ !χαρτ 'paper')
	αρχιτέμπελ-ος[2]	'bone lazy (τεμπέλη-ς~ τεμπεληδ~ !τεμπελ 'lazy')

4.3.2 Nominal components as words

The nominal compounds with a second constituent as a word exhibit the same systematic allomorphic behaviour as in the inflection. Actually, since it participates as a word, its behavior is completely independent of the compounding process [6]. Every noun follows its inflectional paradigm and the corresponding inflectional class

[2] There is also αρχιτεμπέλης and αρχιτεμπέλαρος

straightforward (Ralli 2005). Thus, the nominal compounds in these cases present all the 'inflectional' allomorphs without any deviation from their paradigm and without any irregularity. Even in cases where the nominal compounds have a shift of tone (συγχωροχ***άρτι*** 'indulgence', παπαδο***παίδι*** 'altar boy'), the constituent is not a word but a stem according to Nespor and Ralli (1996), the above assumption applies and the inflectional paradigms have no differentiation, while all the allomorphs participate normally.

(6)	αχυράνθρωπος	'straw man' (άνθρωπ-ος 'man')
	μαυροπίνακας	'blackboard' (πίνακα-ς 'board')
	πρωτοθάλασσα	'first sea' (θάλασσα 'sea')
	ξινοτραχανάς	'sour tarhana' (τραχανά-ς 'tarhana')
	συγχωροχάρτι	'indulgence' (χαρτί 'paper')

5 The two faces of the allomorphic "coin": Arbitrariness vs. Regularity

5.1 Th two faces of arbitrariness in allomorphy

Before we substantiate the regularity in the choice of each allomorph, it is necessary to emphasize the arbitrariness property in nominal allomorphy. The allomorphic changes in the form still remain arbitrary and unpredictable, since they are not the result or product of any phonological or morphological rule and they do not affect the meaning of the form. However, based on the extensive data (Karasimos 2011), the question arises as to whether the appearance and selection of allomorphs in the nominal compounding is arbitrary and unpredictable.

5.2 Phonological regularity

The regularity which governs the single allomorph selection in the nominal compounds (σαπιοκάραβο 'rotten ship') is primarily due to phonological reasons. The phonological structure of the nominal first components has the presence of a consonant as a last character (Ralli 2008) which is statistically significant in the majority of nominal stems. This significance confirmed and reinforced by the systematic presence of the linking vowel -o- in nominal compounding. Nouns with two allomorphs always have one with a consonant as a last phoneme and the selected allomorph does not participate in the singular nominative. In fact, the class of neutral *παιδί*-type nouns introduces non-inflectional allomorph to follow the aforementioned regularity, i.e. a stem that ends in a consonant (παιδ- 'child'). Thus, the presence of the linking vowel -o- ensures in almost all cases the optimal syllable structure CV. In the cases of the nominal compounds (with a second constituent as a word), we have for obvious reasons exactly the same pattern of allomorph (or not) participation compared to the nominal inflection. The normal appearance of allomorphs is followed based on Ralli's model (2005) inflectional classification. Additionally, in the cases of nominal compounds with a second constituent as a stem, we have the same conditions as with the nominal first components, since all nominal inflectional suffixes always start with a vowel. Therefore, the optimal syllabic structure is ensured. It should be noted that the optimal syllabic structure is somehow connected with this regularity and it contributes substantially to the predictability of the appropriate allomorph.

The nouns of Modern Greek with allomorphy contain one allomorph with a vowel as the last character and one with a consonant as the last character. On the other hand, the inflectional classes without allomorphy have mostly nominal stems of the form xC with the only systematic exception, the sixth inflectional class ($xV_{[ι]}$). Although it is not an obligatory condition, the 'winner' allomorph is always the one with the consonant as a last character. Comparing the data from the nominal derived words or the derived words with a nominal base stem, this regularity applies in most cases of nominal compounding and derivation, and it is directly related to the aforementioned constraint.

5.3 Morphological regularity

Respectively, in any compound, where a noun participates as a first or second component, the process excludes the appearance of all available allomorphs due to a morphological regularity in their selection. Especially the non-head position (first component) does not have access to all available forms and always the same allomorph/ form is chosen. The only justified deviations are the historical/ diachronic "relics" (Booij 2010) and the pair of compounds with the components αίμα 'blood' and κρέας 'meat' [4b] (Drachmann 2005).

Plag (1999) and Hay and Plag (2004) argue that the basis of a derived word requires a specific allomorph in nominal derived. Respectively, we argued that this fact can be modified in Greek nominal derived (Karasimos 2011. 2013). Nevertheless, in compounding, we cannot claim that the compound head requires a specific allomorph as a first component, but only its grammatical category. In English, there are some constraints on specific groups of morphemes and derivational suffixes, where it appears that the base or compound head can choose forms and allomorphs (Lieber 1982, Booij 2005).

All the Greek compounds with a nominal first component consist of a nominal stem that is in a non-head position. For example, the allomorph κυματ- of the lexeme κύμα 'wave' in a non-head position combined with the word μορφή 'form' in the head position create the compound κυματομορφή 'waveform'. In the non-head forms of a compound that have nominal allomorphy, it is not allowed to display all their available forms in this specific position. Therefore, any allomorph receives this 'position' information from the rules of selecting allomorphs, in order to exclude the possibility of generating ungrammatical words, i.e. **κυμομορφή* ή **κυμαμορφή*.

5.4 Regulating the predictability

Expanding the single allomorph selection constraint to the nominal compounds, we observe that the choice of allomorph for the proper morphological environment in compounding remains fully predictable. In cases of nominal participation as a stem, it is always the nominal allomorph that is not used in the singular nominative (non.NOM.SING). The complete connection of the word formation processes with the allomorphy modifies it as a phenomenon that is rather independent of any formation process.

The nominal compounding has the highest predictability in the participation or not of its morphemes. The advantage provided by the single allomorph selection constraint is the predictability of the appropriate allomorph. The process of allomorphy is arbitrary and unpredictable in terms of the existence and form of the allomorph. Since allomorphs

are unpredictable in their form, they are recorded in the mental lexicon along with the rest of each lexeme information. However, the constraint allows the use of a single allomorph as a component, while simultaneously it predicts the allomorph that will be involved in this process. Furthermore, we can predict the appearance of allomorphs in the compounding and, thus, these environments are embedded in the rules for the use of allomorphs outside the mental lexicon.

The prediction of the allomorphs participation is extremely important for the computational processing of this phenomenon (for more information, see Karasimos and Markopoulos 2020). Allomorphy is a problematic challenge for morphological parsers both at the level of process analysis and generation. The above constraint allows us to computationally automate the registration of allomorphs, as well as the automatic selection of the appropriate allomorph for the generation of nominal compounds, both for those listed in the lexicon and for those created outside of it.

The predictability of the allomorphs selection is represented in the following table 1, where we have three groups: (a.) the morphemes with two allomorphs, the default and the non-default, such as e.g. ψυχη~ ψυχ (soul), λεκε~λεκεδ 'stain, βλημα~ βλημαt 'missile', (b.) morphemes without allomorphy, such as e.g. κεραυν- 'thunder', βαθ- 'depth', τύμπαν- (tympani) and (c.) morphemes that have more than two allomorphs, such as e.g. λεξη~ λεξε~ λεξ 'word', τεμπελη ~ τεμπεληδ ~ τεμπελ 'lazy'. The forms of the first group participate in the compounding and derivation always with the second allomorph, while the non-allomorphy group participates with its only form. Finally, the group with the three allomorphs participates with the third allomorph. Normally, we define as the third allomorph what appears only in the compounding (and derivation), i.e. the allomorphs like τεμπελ~ 'lazy' and λεξ~ 'word' for the nouns of this group. The following table also includes the compounding but only for the nominal components as stems.

	Morpheme	**Allomorph**	**Morpheme**	**Morpheme**	**Allomorph1**	**Allomorph2**
Inflection	√	√	√	√	√	Ø
Derivation	Ø	√	√	Ø	Ø	√
Compounding	Ø	√	√	Ø	Ø	√

Table 1 | Predictability conditions per word formation process

6 Conclusions

Despite the unpredictability and arbitrariness of allomorphy, the participation environment is characterized by regularity and predictability. Particularly, in nominal compounds and compounds with nominal first constituents, we can predict without exception the allomorph that will participate in this process. The single allomorphs selection constraint applies not only to derivation, but also to compounding. It is universally applied in Modern Greek and perhaps in other languages with rich morphology and systematic allomorphy. This constraint refers to a morphological phenomenon (allomorphy) whose changes are arbitrary and unpredictable, but the morphological environment of participation is characterized by predictability and regularity. Based on morphological and phonological conditions, this predictability is fully justified and provides an implementation for computational analysis and processing of allomorphy, which is extremely important.

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