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Greek Allomorphy: an Optimality Account

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ABSTRACT:
Η κατανομή των αλλομόρφων των παραγωγικών επιθημάτων στα Ελληνικά εξαρτάται απο προσωδιακές ιδιότητες υου θέματος όπως ο αριθμός των συλλαβών και ο τονισμός. Η επιλογή τους ακολουθεί προσωδιακά σχήματα γνωστά και από άλλες γλώσσες. Η ανάλυση γίνεται με τη θεωρία του Βέλτιστου.

1. INTRODUCTION

There is abundant evidence that prosody may determine morphology. Some evidence involves reduplication, infixation, and root-and-pattern morphology in languages with non-concatenative morphology. But even mainly concatenative languages provide clear cases of stress-dependent affixation. Thus, certain suffixes select stems that end in a stressed syllable, e.g. English deverbal -al, in prop'os-al but *dev'elop-al.

This paper discusses cases of allomorphy in suffixation involving nominalising suffixes, deverbal agent nominals, and certain vocatives in Standard Modern Greek. All involve allomorphs whose distribution depends upon prosodic properties of the base - its syllable number or its stress pattern. Allomorphic preferences are largely predictable on the basis of the shape of the stem+affix-allomorph concatenation, which conspires towards prosodic output targets, e.g. certain preferred stress patterns, the coincidence of morphological and prosodic edges, and 'faithfulness' to lexical stress requirements. We claim that patterns of allomorphy are best understood by assuming that universal constraints will always be in interaction, in the end case in conflict; this speaks strongly for an approach within Optimality Theory (Prince & Smolensky 1993), where such interaction is assumed in principle. The central idea is that where the lexicon provides two allomorphs of one affix, the effect of both is evaluated in a set of candidate outputs. Of these, the 'optimal allomorph' is selected, i.e. the stem-plus-affix-allomorph concatenation that allows for the minimal violation of constraints, for a given ranking of those constraints (Mester 1994, Kager 1995). The paper[1] concentrates on providing such an account.

2. THE PROBLEM

The data falls into three types, viz. action nominals, derived adjectives, and vocatives. With deverbal action nominals, two suffix allomorphs occur, /-simo/ ~ /-ma/, differing both segmentally and in syllable number. Monosyllabic stems take /-simo/ (1a), polysyllabic stems /-ma/ (1b).

In turn, denominal 'material' adjectives employ two allomorphs: /-ino/ ~ /-'enjo/, both disyllabic. Unstressed /-ino/ adjoins to monosyllabic stems (2a); stressed /-'enjo/ to polysyllabic stems (with no inherent stress) (2b).

On the other hand the allomorphs of the vocative of masculine proper names differ only in vowel quality. But again, allomorphs are sensitive to the number of syllables and stress pattern of the stem; here, with /-o/ after monosyllabic stems and stems with final stress (3a-b), but /-e/ after polysyllabic stems with no final stress (3c).

(1)	a.	pyas- 'to grab'	>	py'as-simo 'grabbing'	
	b.	skupis- 'to sweep'	>	sk'upiz-ma 'sweeping'	
(2)	a.	p'etr-a 'stone'	>	p'etr-ino 'of stone'	
	b.	m'oliv-os 'lead'	>	moliv-'enjo	'lead-en'
(3)	a.	n'ik-os	>	n'ik-o	'Nicholas'
	b.	al'ek-os	>	al'ek-o	'Alex'
	c.	f'ilip-os	>	f'ilip-e	'Philip'

For all three cases, we ask why we should find precisely this allomorphic distribution, and not (say) the reverse.

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[1] This topic was first discussed in Malikouti-Drachman & Drachman (1994), in a circumscription framework, contrasting licit output forms across possible concatenations of stems with affix-allomorphs. Here we substitute alignment for circumscription, and formalise the constraints.

3. AN OPTIMALITY THEORETIC APPROACH TO ALLOMORPHY

We now show that the distribution of these allomorphs results from the resolution of conflicting constraints and is thus well captured formally within Optimality Theory. But first a brief outline of the relevant parts of that theory (Prince & Smolensky 1993). We assume an 'Input', whose identity must be preserved, in a sense to be clarified below. Suppose this is a set of lexical/morphological items targetting a single semantic representation. 'Generate' (Gen) maps the Input to prosodic representation, providing us with a set of candidate structures in which all the possible prosodic descriptions are assigned to each concatenation of stem and relevant affix-allomorphs. The members of this set are submitted in parallel to a constraint system, 'Evaluate' (Eval), consisting of a universal set of constraints ranked in a language-specific way. The set of universal we will need for Modern Greek (MG) is given in (4). As indicated, all constraints are independently motivated in languages other than MG:

(4) a. *Phonotactic constraints*:

i. FT-BINARITY Feet are disyllabic (and in fact trochaic for MG).

ii PARSE-2 One of two adjacent syllables must be parsed by a foot.

(the 'trisyllabic window', cf. Kager 1994 on Estonian)

iii. NONFINALITY The head foot of the PrWd may not be final.

(cf. Prince & Smolensky 1993 on Latin).

b. *Morpho-prosodic alignment*:

i. STEM=PRWD Stem is a PrWd (properly includes a foot).

(cf. McCarthy & Prince 1993 on Axininca Campa).

c. *Prosodic faithfulness constraints*:

i. HEAD-MAX Input (dictionary-specified) stress must be realised.

(Alderete 1995, cf. Parse-Ft in Inkelas 1994 on Turkish).

ii.HEAD-DEP Output stress must be a realisation of some input stress.

(cf. Alderete 1995 on Mohawk).

Constraints are unordered; they do not affect prosodic structure successively. But they may be related by dominance or ranking. A given constraint may be undominated (absolutely, or language-specifically), or dominated by other constraints.

'Optimal form' now means the candidate form best satisfying the constraints, taking their ranking into account. First the entire candidate set is evaluated by the highest-ranking constraint; all forms that violate it are removed from the candidate set. The subset remaining is then submitted to the next-highest ranked constraint, and so on, until only one candidate survives. Observe that although this surviving form may violate low-ranked constraints that other (less optimal) forms honour, it is 'optimal' as long as it is better in terms of higher-ranked constraints.

4. ACTION NOMINALS

We now illustrate the workings of 'Gen' and 'Eval' step-by-step. 'Gen' sets up all possible concatenations of stem and allomorphs, thus:

(5) a. pyas-simo and pyas-ma
    b. skupiz-simo and skupiz-ma

To each of these it assigns a variety of possible prosodic structures, as in the tableaux (7-8) below. We first observe that both optimal forms py'asimo and sk'upizma have antepenultimate stress, known to be the favored stress position in MG for all lexical categories. Notice that if the allomorph /-ma/ had been selected, producing py'as-ma, antepenultimate stress could not have been realised, this form being one syllable short. In turn, sk'upiz-ma is better than skup'iz-simo since its morphological composition is perfectly signalled by its stress pattern: a trochee coincides with both edges of the stem. Morpho-prosodic alignment (of stem and foot edges) is a strong cross-linguistic tendency (McCarthy & Prince 1993, Kager 1995), and we assume its relevance for MG. In fact, we will assume that stem-foot alignment is even satisfied by feet having no main stress, but only secondary stress, e.g. [(m,oliv)-('enjo)] (cf. section 5).

Formalising, we assume that for MG, 'Eval' contains the parallel filter function of at least the following ranked subset of phonotactic and morpho-prosodic alignment constraints. (Eval also contains the Faithfulness constraints HDMAX and HDDEP (cf. Section 5).

(5) FTBIN, PARSE2 >> STEM=PRWD >> NONFIN

We evaluate candidate outputs, all prosodified combinations of stem-plus-allomorph, in (7). Note that no candidate based on a monosyllabic stem such as /pyas-/ can satisfy all relevant constraints. In fact, FTBIN and STEM=PRWD will always be in conflict here since satisfaction of STEM=PRWD would require a monosyllabic PrWd, implying a monosyllabic foot. Scanning the tableau from left to right, top to bottom: constraint violations are starred, whereby the 'optimal' stress configuration for each concatenation is automatically selected by elimination.

(7) Input: /pyas-,{-ma, -simo}/

	FTBIN	PARSE2	STEM=PRWD	NONFIN
a. (pyas)-(m'a)	*!*			
b. (py'as)-ma	*			
c. (py'as)-simo	*	*		
d. (py'as-ma)			*	*!
e. pyas-(s'imo)			*	*!
f.$ (py'as-si)mo			*	

Thus, (7a-c) violate top-ranking constraint FTBIN, and (7a) does so twice. (7c) also violates PARSE2, its final syllable-sequence being unfooted. We set aside (7a-c), since other forms (7d-f) are still available that satisfy both FTBIN and PARSE2. But these forms can only honour FTBIN by violating STEM= PRWD, which requires a perfect match of stem edges and prosodic word edges. Hence the choice between allomorphs {/ma/, /-simo/} is decided by the next lower-ranking constraint, NONFIN, which favours of a form with a non-final foot, i.e. the one with the disyllabic allomorph /-simo/.

Take now disyllabic stems as in (8) below. In this case (as opposed to tableau 7) forms can satisfy STEM=PRWD without needing to violate FTBIN (as 8a does), or PARSE2 (as 8b does). Candidates (8c-d) violate Stem=PrW. Of the two remaining candidates (8e-f) that satisfy STEM=PRWD, (8e) has a final foot in violation of NONFIN. The allomorph /-ma/ of (8f) is thus 'optimal' with disyllabic stems, as it allows the satisfaction of all four relevant constraints.

(8) Input: /skupiz-,{-ma, -simo}/

	FTBIN	PARSE2	STEM=PRWD	NONFIN
a. (skupiz)-(m'a)	*!	*		
b. (sk'upiz)-simo		*!		
c. sku(p'iz-ma)			*!	*
d. sku(p'iz-si)mo			*!	
e. (skupiz)-(s'imo)				*!
f. $ (sk'upiz)-ma				

5. DENOMINAL MATERIAL ADJECTIVES

For this derivation, unstressed /-ino/ adjoins to monosyllabic stems (cf. 2a), while stressed /-'enjo/ attaches to polysyllabic stems (cf. 2b). But the fact that both allomorphs are disyllabic does not weaken our claim that allomorphic distribution depends on prosody of the stem-allomorph concatenation. For prosody is not limited to syllable number. There happens to be a salient difference in stress between the allomorphs; /-'enjo/ is always stressed, while /-ino/ never is.

Accordingly let us assume that the allomorphs are prosodically distinct: /-ino/ has no inherent stress properties, but /-'enjo/ is lexically endowed with a foot. Lexically marked stress is surely a language-specific option under OT as any other theory. We may now conceive of the complementary distribution of /-'enjo/ and /-ino/ as an interaction between 'faithfulness' constraints (which enforce lexical stress requirements) and universal prosodic constraints. Of the former kind, two constraints are visibly active. High-ranking HDMAX (4ci, cf. Inkelas 1994) penalises any output containing unstressed realisations of lexically stressed morphemes, such as unstressed /-enjo/. Lower-ranking HDDEP makes the (logically complementary) assertion that any foot that appears in the output must be a realisation of some input foot (4cii, cf. Alderete 1995). It penalises any output that has a stress on a syllable that is not lexically specified, such as stressed /-ino/. The main candidate collocations are:

(9) a. *mo(l'iv-i)no vs. (moliv)-('enjo)
    b. (p'etr-i)no vs. *petr-('enjo)

Observe that the inherently stressed allomorph /-'enjo/ prefers polysyllabic stems, while its unstressed counterpart /-ino/ prefers monosyllabic stems. This is because output forms are not only required to be (maximally) faithful to lexical stress properties, but also to (maximally) obey pure prosodic output constraints. While (9b) again shows the preference for antepenultimate stress, (9a) shows that morpho-prosodic alignment is even more highly valued. All this is in fact already encoded in our constraint ranking.

First consider tableau (10) for the evaluation of forms based on a monosyllabic stem /petr-/. As for monosyllabic stems seen earlier, STEM=PRWD cannot be satisfied due to top-ranking FTBIN. Of the four candidates (10c-f) that survive FTBIN, (10c), a candidate 'unfaithful' to the input prosodic requirements of /-'enjo/, is excluded by HDMAX, while (10d-e) violate NONFIN. So (10f) is the optimal candidate:

(10) Input:/petr,{-ino,-'enjo}/

	FTBIN	PARSE2	HDMAX	STEM=PRWD	NONFIN	HDDEP
a. (petr)-('ino)	*!				*	
b. (petr)-('enjo)	*!				*	
c. (p'etr-en)jo			*!	*		
d. petr-('enjo)				*	*!	
e. petr-('ino)				*	*!	*
f.$(p'etr-i)no				*		*

Compare (10d) and (10f) to see that NONFIN must dominate HDDEP.

Turning to tableau (11) below for a polysyllabic stem /moliv-/, we see HDDEP come into play ("output stress must be the realisation of input-specified stress"). Four candidates (11c-f) survive FTBIN and PARSE2. One of these (11c) is rejected by HDMAX, since it is unfaithful to lexical stress on /-'enjo/, and another (11d) by STEM=PRWD. Both of the remaining two forms (11e-f) violate NONFIN. Evaluation is passed on to HDDEP, which excludes (11e) since it has a stressed syllable that is not lexically stressed. Hence the optimal form must be (11f).

(11)Input: /moliv-,{-ino,-'enjo}/

	FTBIN	PARSE2	HDMAX	STEM=PRWD	NONFIN	HDDEP
a.(m'oliv)-enjo		*!	*			*
b.(m'oliv)-ino		*!				*
c.mo(l'iv-en)jo			*!	*		*
d.mo(l'iv-i)no				*!		
e.(moliv)-('ino)					*	*!
f.$(moliv)-('enjo)					*	

This tableau motivates a ranking STEM=PRWD >> NONFIN, since the reverse ranking would result in success for *mo(l'iv-i)no as in (11d).

In sum, our analysis explains the selectional preferences of both allomorphs for stems of a certain prosodic type (that is, /-ino/ preferring monosyllabic stems, but stressed /-'enjo/ polysyllabic stems). Distribution of allomorphs is due to an interaction of purely prosodic constraints (FTBIN, PARSE2, NONFIN) with morpho-prosodic alignment (STEM=PRWD) and stress faithfulness constraints (HDMAX, HDDEP). Importantly, our analysis requires no language-specific constraints on the distribution of allomorphs, consistent with a basic assumption of OT.

Derivational models might have postulated stressed vs. unstressed allomorphs, their selectional environments being monosyllabic vs. polysyllabic stems. But this would have been arbitrary since allomorphic requirements might just as well have been reverse, e.g. stressed /-'enjo/ selecting monosyllabic stems, and unstressed /-ino/ polysyllabic stems.

6. VOCATIVE OF MASCULINE PROPER NAMES.

We revert to allomorphy of the Vocative for masculine proper names, as in f'ilip-e 'Philip!' vs. Al'ek-o 'Alex'! Generalising, a masculine proper name takes the allomorph /-o/ if its stem is monosyllabic or is lexically stressed on the second syllable, but /-e/ if its stem is polysyllabic and not lexically stressed. Both allomorphs being monosyllabic, their distribution cannot rest on a difference in syllable number. But as in the case of /-ino/ ~ /-'enjo/, the allomorphs appear in metrically distinct contexts: /-o/ always in post-stress position, /-e/ in outputs with antepenultimate stress (the 'unmarked' pattern). Accordingly, we assume that /-e/ is metrically unspecified, while /-o/ is lexically specified as pre-accented (that is, occurring in a weak position of a foot, cf. Inkelas 1994 on Turkish). HDMAX enforces the lexical requirement of /-o/, favouring outputs that contain /-o/ in post-stress position over those containing /-o/ in a different prosodic context. Take disyllabic unaccented stems (12), e.g. /filip-/:

(12) Input: /filip-, {'-o, -e}/

	FTBIN	PARSE2	HDMAX	STEM=PRWD	NONFIN	HDDEP
a. (f'ilip)-o			*!			*
b. fi(l'ip-e)				*!	*	*
c. fi(l'ip-o)				*!	*	
d.$(f'ilip)-e						*

HDMAX rules out (12a), where suffix requirements are ignored, while STEM=PRWD excludes (12b-c). Thus HDDEP is necessarily violated in the optimal candidate (12d), due to higher-ranking STEM=PRWD. But in monosyllabic or lexically-final stressed stems (13), STEM=PRWD is necessarily violated due to undominated FTBIN, so HDDEP can apply.

(13) Input: /al'ek-, {-o, -e}/

	FTBIN	PARSE2	HDMAX	STEM=PRWD	NONFIN	HDDEP
a. ('alek)-o			*!*			*
b. ('alek)-e			*!			*
c. a (l'ek-e)				*	*	*!
d.$ a (l'ek-o)				*	*	

For stems like /al'ek-/, the optimal candidate is stressed on the lexically accented syllable, due to high- ranking HDMAX. Furthermore, the choice of allomorph (al'ek-o being preferred over al'ek-e) is due to HDDEP, which favours the candidate whose stress realises both stem and suffix requirements (al'ek-o), rather than of stem requirements alone (al'ek-e).

7. CONCLUSION

We have shown that, rather than listing allomorphs and their environments, we can model several allomorphy types in Greek in an explanatory way, using an Optimality theoretic model of selecting the 'prosodically-optimal allomorph'. We found evidence for some purely prosodic constraints familiar from the literature, i.e. FTBIN, PARSE2 and NONFIN, for a morpho-prosodic alignment constraint STEM=PRWD, and for the faithfulness constraints HDMAX and HDDEP. Our analysis used no language-specific constraints, and is thereby consistent with a basic assumption of OT, that language-specific grammars arise (solely) from re-ranking of universal constraints.

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