A (Brief) Review of Cypriot Phonetics and Phonology

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1. Introduction

In this brief review I endeavor to present an up to date summary of the research on the phonetics and phonology of Cypriot Greek. Although this body of research is unfortunately rather small, it is still impossible to completely cover it here. Rather, I limit myself to a presentation of the vocalic and consonantal system of Cypriot Greek and focus in particular on the phonetics and phonology of Cypriot geminates. The geminates of Cypriot Greek are one of the three topics of Cypriot phonetics and phonology that have been examined at some length. The other two, the analysis of which interacts with the phonological representation of the geminates, are the phonotactics of Cypriot and the issue of opacity due to the so-called "glide hardening" of Cypriot (i.e., the fact that in some instances the vowel /i/ alternates with a palatal or velar stop, as in [kluvi] "cage" ~ [klufca] "cages" or [kulːurin] "roll" ~ [kulːurka] "rolls").[1] These two topics will be briefly touched upon to the extent that they pertain to the analysis of Cypriot gemination, since they are discussed at length in Coutsougera (this volume) and Drachman (this volume).

2. The Cypriot vowel system

Cypriot Greek has a typical vowel system of five vowels: /i e a o u/. In Arvaniti (1999a) I phonetically transcribe the vowels as [i ɛ a ɔ u] and place them on the vowel quadrilateral as shown in Figure 1. However, it is important to note that the position of the vowels shown in Figure 1 is based on impressionistic data only. So far we have no

[1] "Glide hardening" is only one of the possible analysis of the phenomenon in question. For example, Newton (1972: 52-53) assumes that Cypriot includes a glide [j], which replaces /i/ before vowels and is in turn deleted, or replaced by /k/ or /c/ depending on the preceding consonant. A similar analysis is adopted in Kaisse (1992, 1993) who accounts for the change of [j] into a consonant by means of spreading of the feature [consonantal]. Alternatively, Drachman & Malikouti-Drachman (1997) and Malikouti-Drachman (2003) analyze the phenomenon as "the output of consonantalization and occlusivisation of a high front segment /I/ (unspecified for consonantality/vocalicity [...]) (Malikouti-Drachman 2003: 71). Harris (1996), on the other hand, argues that glide hardening is due to syllabification constraints. A full blown discussion of this phenomenon is beyond the scope of the present paper, but see Drarchman & Malikouti-Drachman (1997), Malikouti-Drachman (2001b, 2001c) and Drachman (this volume).

acoustic studies of the Cypriot vowels that confirm or refute this description. Such studies are necessary, as work in related varieties, such as Standard Greek, has shown that even simple five-vowel systems can show substantial variation that is related to both sociolinguistic factors (such as regional variability and possibly speaker gender) and linguistic context (such as stress, the quality of the surrounding segments, and the position of the vowel in the prosodic structure; for a review see Arvaniti 2007).

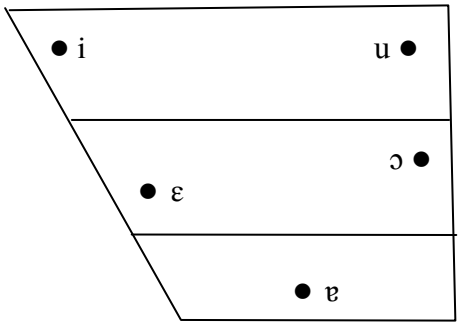


Figure 1: The position of the Cypriot vowels on the vowel quadrilateral after Arvaniti (1999a).

The only acoustic study of Cypriot vowels so far is that of Eftychiou (2007) which examines the degree and type of reduction affecting the high vowels [i] and [u] when they are preceded by [t] and are found at the very end of an utterance; e.g. [emfanisi tu] "his appearance", where the relevant vowel is underlined. Eftychiou shows that approximately half of the vowels she examined show some degree of reduction in this context: reduction can range from the loss of higher formants (5% of all vowels in her sample; Eftychiou calls these *F1 vowels*), to fricated vowels (40%) and elided vowels (5%) for which there was "no visual evidence in the acoustic record" (Eftychiou 2007: 518). Interestingly, Eftychiou also found that the reduction of the vowel appears to be in complementary distribution with the reduction of the preceding [t], so that a fully realized [t] was more likely to be followed by an elided vowel, while a reduced [t] was more likely to be followed by a fully realized vowel.

This particular feature of reduction in Cypriot Greek could well be related to general timing patterns. These patterns also indicate that there may be timing differences between

Standard Greek and Cypriot (since similar complementarity has not been reported for Standard Greek). Differences in timing between the two varieties have also been reported in Arvaniti (2001a), a study that examined segmental durations in Cypriot and Standard Greek under changes of speaking rate. Arvaniti found that while in Standard Greek a faster speaking rate led primarily to a reduction in vowel duration, in Cypriot Greek vowels and consonants were reduced to a similar degree. This suggests that Cypriot Greek may show less vocalic reduction than Standard Greek in general. However, this is a hypothesis that requires further investigation, including the examination of all the vowels in the system and the use of additional segmental and prosodic environments to those examined in Arvaniti (2001a) and Eftychiou (2007). The manipulation of the prosodic environment, in particular, may prove to be crucial, as recent research has shown that prosodic position—in addition to the immediate segmental context—can greatly influence vowel reduction. For example, Tserdanelis (2003) shows that the [u] of the clitic [su] is not reduced when [su] is phrase-final and carries a "continuation rise" in pitch, but is reduced in phrase-initial position.

The examination of the patterns of reduction and timing in Cypriot Greek is also of interest to the study of rhythm, since work in this area suggests that linguistic rhythm and vowel reduction interact (Arvaniti 1994, 2009, Bertinetto & Bertini 2008). This connection has not yet been explored in the studies of Cypriot Greek.

3. The consonant system of Cypriot Greek

Descriptions of the Cypriot consonantal system differ substantially from one another. One of the main differences is in the treatment of geminates, which in some analyses are not treated as separate phonemes (e.g. Newton 1972). In Table 1, I present the consonantal system of Cypriot Greek as it emerges from the work of Newton (1972) and others; in this table I take the position that the geminates are distinct phonemes, a position that is addressed in more detail in section 5. As Table 1 clearly shows, the Cypriot consonantal system is rather complex, particularly when compared to Standard Greek. For instance, the Cypriot system includes post-alveolar consonants, which are lacking from Standard Greek, as well as palatal consonants and a trill, which are present but non-

contrastive in Standard Greek. If we include in the system the most frequently used allophones, shown in gray in Table 1, it is clear that Cypriot has a rich and varied consonantal inventory.

Table 1: The phonological system of consonants in Cypriot Greek; segments presumed to be non-contrastive (allophonic) are shown in gray.

	Labial	Alveolar	Post-alveolar	Palatal	Velar
Stop	p p^hː b	t t^hː d		c c^hː ɟ	k k^hː g
Affricate		ts	ʧ ʧː ʤ		
Fricative	f fː v vː	θ θː ð ðː s sː z zː	ʃ ʃː ʒ ʒː	j jː	x xː ɣ ɣː
Nasal	m mː	n nː		ɲ	ŋ
Lateral		l lː		ʎ	
Tap		ɾ			
Trill		r			

4. The phonetics of Cypriot geminates

Geminates are the only aspect of the consonantal system of Cypriot Greek that has been examined in some detail. So far we have several phonetic studies that examine primarily the acoustics of lexical geminates in word-initial and intervocalic position (Arvaniti 1999b, Arvaniti & Tserdanelis 2000, Tserdanelis & Arvaniti 2001, Muller 2001, Payne & Efthychiou 2006, Christodoulou 2007). These studies differ in their details; e.g. Arvaniti (1999b), Arvaniti & Tserdanelis (2000) and Tserdanelis & Arvaniti (2001) examine only intervocalic geminates but control for stress and word length and include a variety of consonants (stops, fricatives, affricates and sonorants); Muller (2001) examines word-initial and intervocalic [ʃ] and stops ([p], [t] and [k]) but without controlling for stress or word length; Payne & Eftychiou (2006) examine both word-initial and intervocalic geminates and control for stress, but their study is limited to [l] only; finally, Christodoulou (2007) examines only geminate stops, without controlling for stress, word duration or the position of the geminates in the word. As a result of these discrepancies, the studies show some differences in their results, but they all present the same overall picture: geminates are 1.5-2 times longer than singletons. The extent of the durational

differences between geminates and singletons depends primarily on stress and the position of the consonants in a word: in word-medial position the difference in duration is smaller than word-initially (Arvaniti 1999b, Arvaniti & Tserdanelis 2000, Tserdanelis & Arvaniti 2001, Payne & Efthychiou 2006); similarly, the difference is bigger when the geminate is followed by a stressed vowel; the two effects are additive as the work of Payne & Eftychiou (2006) clearly shows (see Figure 3).

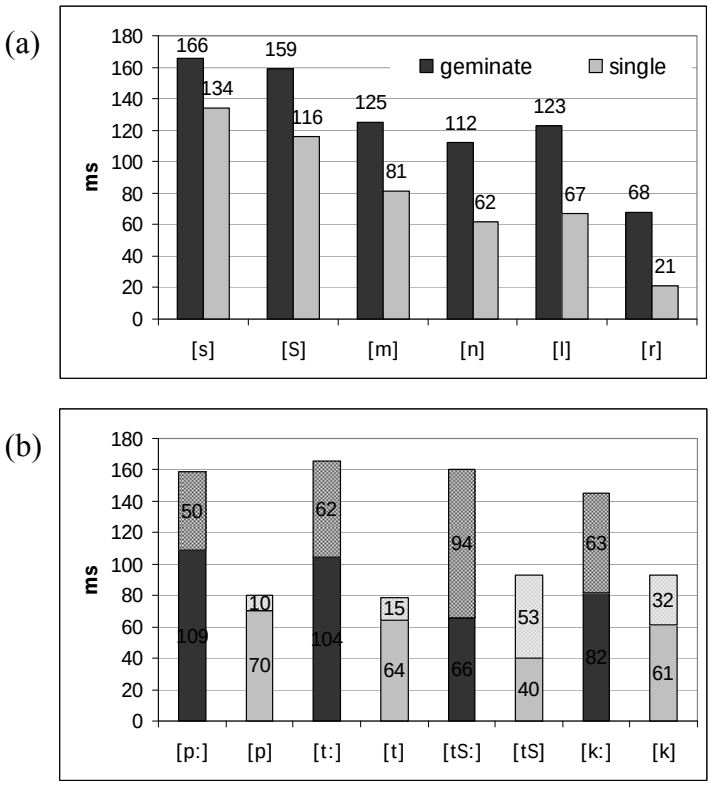


Figure 2: In panel (a), mean durations of Cypriot geminate and singleton fricatives ([s] and [ʃ]) and sonorants; in panel (b), mean durations of Cypriot geminate and singleton stops and the affricate [[tʃ]. In panel (b), solid color columns represent the closure duration of stops and the affricate [tʃ], while patterned columns represent the duration of aspiration (for stops) or frication (for the affricate). In both panels, *S* stands for [ʃ]. Figure based on Tserdanelis & Arvaniti (2001).

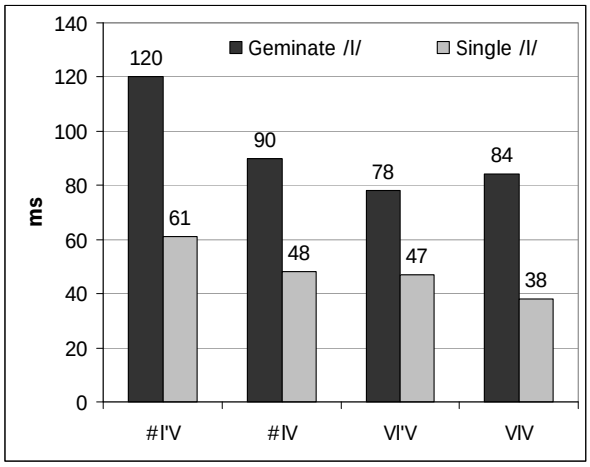


Figure 3: Average duration of singleton and (lexical) geminate /l/ in word-initial (#l) and word-medial (VlV) position; results presented separately for /l/ followed by stressed ('V) and unstressed (V) vowels; after Payne & Eftychiou (2006).

It is also worth noting that the difference in duration between singleton and geminate stops and affricates does not pertain only to the closure, as in other languages such as Swiss German (Kraehenmann 2001), but also to the aspiration portion (frication in the case of the affricate). Thus, Cypriot geminate stops are heard as aspirated (Newton 1972, Arvaniti & Tserdanelis 2000, Tserdanelis & Arvaniti 2001, Christodoulou 2007). The presence of aspiration could be related to the fact that Cypriot geminates can appear word-initially, a relatively rare phenomenon among the world's languages (among many, Ladefoged & Maddieson 1996). Nevertheless, a functional explanation should be avoided, as there are languages in which geminate stops are not distinguished from singletons by aspiration but both may appear word-initially; in these languages, then, geminate and singleton stops are not perceptually distinct in contexts in which the difference in closure duration is neutralized (see Kraehenmann 2001 for such results from Swiss German).

In addition to differences in duration, Newton (1972) notes that Cypriot geminates are *fortis*, that is, they have a more tense articulation that singletons. This impression is also reflected in an early phonetic description of Cypriot by Firth (Firth 1937, printed as part of Coleman 2006). The fact that Cypriot singleton stops can be lenited intervocalically

(Arvaniti 1999a, Davy & Panayotou 2003), while geminates do not supports the view that geminates are produced with a fortis articulation.

However, despite the general auditory impression of tenseness, and the evidence from lenition, studies have not so far found any acoustic parameter that reflects this impression. Specifically, Arvaniti & Tserdanelis (2000) examined not only the duration of geminates, but also parameters that are associated with fortis articulations, as well as other parameters that are said to accompany the presence of geminates. These parameters were: Root Mean Square (RMS) amplitude, amplitude differences between the first and second harmonic (that indicate differences in phonation), the duration of the vowel preceding the geminate and the acoustic quality, in terms of the first two formants, of the vowels preceding and following the consonants in question. None of these parameters showed strong differences between geminates and singletons: geminates did not have higher average amplitude (RMS) than singletons (though by virtue of being longer they are likely to sound louder; Beckman 1986; Arvaniti 2000); there were few differences in phonation between singletons and geminates, and those present were largely related to the aspiration of the stop geminates, not to tenser voice associate with geminates (as was hypothesized by Arvaniti & Tserdanelis); finally, duration and quality were not significantly different between vowels abutting singletons and vowels abutting geminates. These results should not be taken to mean that such differences do not exist. They do indicate, however, that if such differences do exist, they must be rather weak and thus difficult to detect statistically unless a large number of speakers is studied. In turn, this would mean that any parameters additional to duration would constitute rather subtle secondary cues to gemination, with duration remaining the main cue.

The investigation of the nature of Cypriot geminates would benefit the most from *articulatory*, rather than acoustic, studies of differences between singletons and geminates; e.g. if geminates are fortis consonants, they should show a greater degree of lingual contact than singletons, at least as far as stops are concerned. This issue is briefly examined in Eftychiou (2004) but the results remain inconclusive, mainly due to difficulties in this study. Specifically, Eftychiou collected electropalatographic

(henceforth EPG) data from one speaker who could not tolerate the artificial palate for more than a few seconds at a time. The results from this speaker do not provide a clear picture: for instance, while this speaker's geminate [l] shows more extensive lingual contact than the singleton [l], consistent with the idea of the geminate being fortis, the same does not apply to [s]. A larger study with more speakers is clearly necessary in order to better understand the phonetic realization of Cypriot geminates.

Of particular interest in the study of Cypriot geminates is the examination by Payne & Eftychiou (2006) of the duration of postlexical geminates. Postlexical geminates are created in Cypriot Greek when a word-final /n/ follows any consonant (except stops and affricates), by the complete assimilation of the /n/ to the following consonant, as exemplified in (1). The creation of geminates is subject to prosodic restrictions, but so far we have no studies that examine this issue; it appears that geminates can be created at least within the domain of the prosodic word (which includes hosts and their clitics); e.g. /tin lotːa su/ > [ti lːotːa sːu] "your sow, acc." Following these prosodic restrictions, Payne & Eftychiou examine the duration of postlexical geminate [l], in contexts like (1). Such postlexical geminates are considered equivalent to lexical geminates (see Malikouti 2001a, 2003 and references therein).

(1) /ton loɣon/ > [tolːoɣon] 'the reason, acc.'

In addition, however, Payne & Eftychiou examine the duration of the postlexical geminate [l] that is created when a word-final /n/ follows a geminate /l/, as in (2).

(2) /en lːios/ "it's very little"

Traditional phonological descriptions suggest that in cases like (2) the /n/ is deleted, due to phonotactic restrictions on the permissible number of intervocalic consonants (a point to which I return in section 5). This deletion should give rise to the phonetic sequence [elːios] and thus the geminate [l] in (2) should be identical to the geminate [l] in (1). However, as shown in Figure (4), this is not the case: first, postlexical geminates created by the fusion of a word-final /n/ and a following singleton tend to be shorter than word-initial lexical geminates (though Payne & Eftychiou found this difference only in stressed syllables); in addition, postlexical geminates created by the fusion of /n/ and a following

geminate are significantly longer than lexical word-initial geminates. As can be seen in Figure 4, this applies to [l]s in both stressed and unstressed position. The difference is sufficiently large for Payne & Eftychiou to dub the segments created by the fusion of an /n/ and a following geminate "supergeminates".

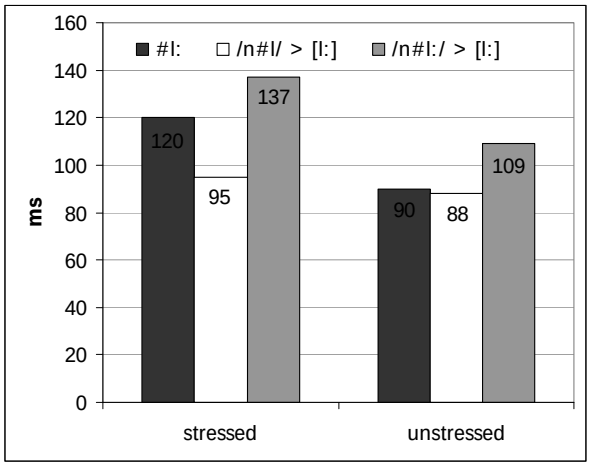


Figure 4: Mean duration of word-initial lexical geminates, postlexical geminates (underlyingly consisting of two single consonants) and "supergeminates" (underlyingly consisting of a singleton /n/ and a geminate /l/); adapted from Payne & Eftychiou (2006).

So far this difference between the two types of postlexical geminates has only been documented for /l/ and thus it is not certain that it applies to all postlexical geminates. It would be worth examining other such sequences to see if the presence of supergeminates can be generalized for Cypriot Greek. If so, such a result would be problematic for phonological analyses which, as shown in section 5 below, rely heavily on the idea that word-final /n/ is deleted before geminates.

Here I do not discuss further a phonological account that would take the results of Payne & Eftychiou (2006) into account for two reasons. First, because as mentioned, these results have not yet been shown to apply to the Cypriot system at large. Second, a recent perceptual study (Armosti 2007) found no evidence that the durational difference uncovered by Payne & Eftychiou is used by Cypriot speakers during perception. Specifically, Armosti (2007) conducted a perceptual experiment in which the stimuli

were based on the sequence /en ipa lia/. In this sequence the duration of [l] can vary depending on whether [l] is the reflex of a singleton, a lexical geminate, a postlexical geminate or a supergeminate, as shown in (3)-(6).

(3) /ˈen ipa ˈlia/ > [ˈen ipa ˈlia] “I did not say Lia”

(4) /ˈen ipa ˈlːia/ > [ˈen ipa ˈlːia] “I did not say a little”

(5) /ˈen ipan ˈlia/ > [ˈen ipa ˈlːia] “they did not say Lia”

(6) /ˈen ipan ˈlːia/ > [ˈen ipa ˈlːʳia] “they did not say a little”

Armosti’s results do not show evidence that Cypriot speakers can distinguish these sequences based on the duration of [l]. However, it is possible that additional cues are needed or that a different design would yield the effect expected given the production data of Payne & Eftychiou (2006). This is certainly a topic for further research.

Another segment that shows interesting durational variation is the voiced palatal fricative [ʝ] as used in the dialects, such as that of Larnaca, that substitute [ʝ] for the lateral palatal [ʎ] (that is, these dialects do not contrast [ʝ] and [ʎ] but use [ʝ] for both). Newton (1972) notes that [ʎ] is longer than an average singleton consonant, and thus could possibly be seen as phonetically geminated. More recently, Armosti et al. (2006) have shown that this longer duration is also a feature of [ʝ] when it is used in the place of [ʎ], as is /ʝaʝa/ “glasses” (/ʝaʎa/ in other varieties of Cypriot and all varieties of Standard Greek). This difference in duration is evident in Figure 5 which shows the words [ʝaʝːa] “glasses” and [ʝaʝa] “grandma”. As can be seen, the intervocalic [ʝ] is longer in “glasses” than in “grandma”. The presence of this lengthening seems to reflect the underlying structure of the words; in “glasses”, [ʝ] is assumed to be the phonetic reflex of two underlying segments, /l/ and /i/, while in “grandma” it is most probably opaque to the speakers and perhaps should be seen as phonemic. These types of differences provide some evidence against the general trend of treating “glide-hardening” in Cypriot Greek as similar to the formation of glides in Standard Greek. Results like these suggest, rather, that the

underlying representations may be different in the two varieties (e.g., to my knowledge, similar durational differences have not been observed in Standard Greek).

Finally, from a phonetic perspective, the data clearly show that [j̟] is a fricative not a glide as it is often said to be. As Figure 5 shows, [j̟] is realized as a glide only in weak positions, such as the first syllable of both [j̟aj̟ːa] and [j̟aj̟a] in which it is intervocalic (in the utterance) and unstressed. In addition, these Cypriot data show a lack of extensive voicing for [j̟] in stressed syllables. This is another difference between Cypriot and Standard Greek (in which palatal fricatives are not normally devoiced).

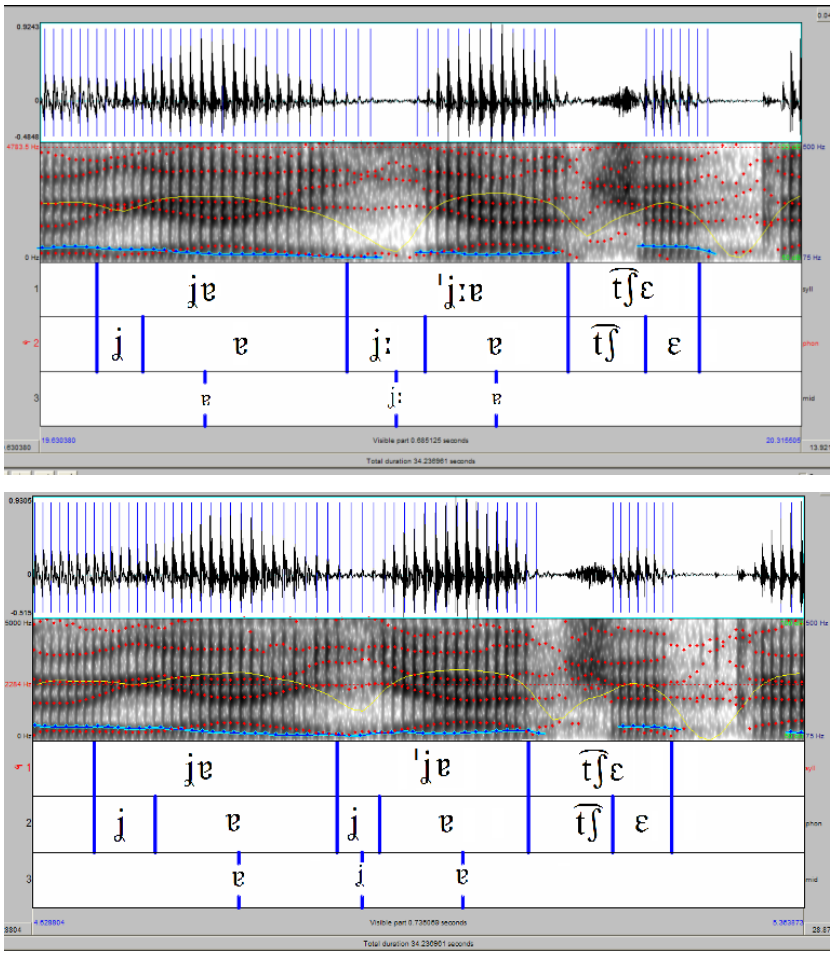
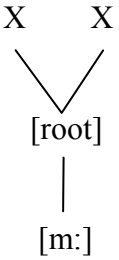


Figure 5. Waveform, spectrogram and annotation of the words [j̟aj̟ːa] "glasses" (panel a) and [j̟aj̟a] "grandma" (panel b), after Armosti et al. (2006).

5. The phonology of Cypriot geminates

Cypriot geminates have been analyzed in three different ways. First, geminates have been treated as fortis consonants (Firth 1937, Davy & Panayotou 2003 for stops only); second, they have been analyzed as clusters of identical consonants (Newton 1972), and finally they have been treated as geminates proper (Charalambopoulos 1985, Malikouti-Drachman 1987, 2001a, 2003, Arvaniti 1999a, 1999b, 2001a, 2001b, Muller 2001, 2002, Payne & Eftychiou 2006, Christodoulou 2007). Following the analysis of Malikouti-Drachman (1987) most researchers now accept the position that Cypriot geminates should be represented as one root associated with two timing slots as shown in (7) below.

(7)



This analysis explains the split behavior of Cypriot geminates, that is, the fact that geminates behave as one segment in some cases and as two segments in others. Specifically, geminates behave as one segment when it comes to palatalization: velar geminates become palatals when followed by the front vowels, /i/ and /e/, as exemplified by the alternations in (8)-(11).

(8) [purek^{h}ːa] “cake, fem.” (used as term of endearment)

(9) [purec^{h}ːin] “cake”

(10) [sak^{h}ːos] “coat”

(11) [satʃːi] “coats”

In contrast, when a cluster of consonants that can *both* undergo palatalization precedes a front vowel, only the consonant adjacent to the vowel is palatalized, as shown in (12) and (13).[2]

[2] It is important to note that examples such as [pefkos] “pine” ~ [pefci] “pines” used in Muller (2002) do not provide adequate support for this argument, as [f] cannot undergo palatalization in Cypriot Greek; cf.

(12) [ʝaxni] “dish cooked with tomatoes”

(13) [ʝaxɲa] “dishes cooked with tomatoes” *[ʝaʃɲa]

This aspect of the behavior of geminates cannot be easily explained if we treat geminates as clusters of identical consonants. If that were the case, we would expect (11) to surface as [saktʃi], that is, to pattern with (13). In order to avoid this possibility, Newton (1972: 51), who treats geminates as clusters, has to evoke two (arbitrary) rules that assimilate /k/ to /tʃ/ and /x/ to /ʃ/ before /tʃ/ and /ʃ/ respectively. Furthermore, although the analysis of geminates as clusters may reduce the inventory of Cypriot Greek and bring it closer to that of the Standard (both important considerations for generative phonologists in the 1970s), this analysis goes against the Obligatory Contour Principle (OCP) according to which sequences of identical phonological elements are banned (or at least dispreferred); clusters of identical consonants are precisely sequences of this type. Thus, this aspect of the behavior of the Cypriot long consonants is best accounted for if they are analyzed as geminates. It is also compatible with analyzing them as fortis consonants.

On the other hand, geminates behave as two segments when it comes to clustering, a feature that has been used to argue for the cluster analysis. Specifically, geminates do not form clusters with other consonants. Most importantly, if such clusters are created either postlexically or due to morphological derivation, the presence of the geminates always leads to simplification of the cluster by deletion (since Cypriot Greek does not allow more than two consecutive consonants, with the exception of clusters with /s/). Thus, when a word-final /n/ follows a stop, both are retained with the nasal assimilating for place to the stop and the stop assimilating for voice to the nasal, as in (14). However, if the stop is a geminate, then the nasal is deleted, as in (15). (Note, however, that the results of Payne & Eftychiou, 2006, cast doubt on this description of complete nasal

[arfos] “brother” ~ [arfi] “sister”. Similarly, the other example presented in Muller (2001: 153), namely [marankos] “carpenter” ~ [maranci] “carpenters” is equally unfortunate for two reasons: first, the word [marankos] is a loan from Standard Greek, the Cypriot word for “carpenter” being [pelekanos]; second, the use of this example to argue that in clusters only the consonant immediately preceding the front vowel palatalizes rests of the very dubious premise, totally unsubstantiated for Cypriot Greek, that /n/ does not assimilate for place to following stops.

deletion, as they suggest that a trace of the "deleted" nasal remains.) A cluster of three consonants can also be generated by morphological processes. Thus, in (16), the addition of the plural suffix /a/ to /xarti/ "paper" results in "glide hardening", i.e., /xartca/, a form that is simplified by the deletion of /t/ yielding the surface form [xarca] "papers" that satisfies the phonotactic constraints of Cypriot Greek (see Coutsougera, this volume, Muller 2001, 2002, Malikouti 2003, Malikouti 2001a for a review). A similar type of deletion takes place when a geminate is involved, as in (17): in this case, the addition of the plural suffice /a/ leads to the form /xap^{h}ːca/ "pills" which is simplified, to conform to Cypriot phonotactics, by the loss of one of the two slots of the geminate (cf. structure in 7); thus while "pill" has a geminate [pː], "pills" has a singleton.

(14) /ton cirio/ > [toɲɟirio] "the gentleman, acc."

(15) /ton c^{h}ːelin/ > [toc^{h}ːelin] "the bold man, acc."

(16) [xartin] "paper, nom." ~ [xarca] "papers"

(17) [xap^{h}ːin] "pill" ~ [xapca] "pills"

Now, both the alternation between geminates and singletons exemplified in (17) and the nasal deletion shown in (15) can be explained by the geminate or cluster analysis. On the other hand, neither pattern can be explained if we consider geminates to be single but fortis consonants. This applies both to the original analysis of Firth and to analysis of Davy & Panayotou (2003), according to whom only stops are fortis consonants while fricative and sonorant geminates are true geminates. This is because all geminates behave alike, independently of their manner of articulation. This is exemplified in (18), which shows that a word-final /n/ deletes before a geminate fricative as it does before a geminate stop in (15), and was also discussed above with respect to sonorants (see example 2). In addition, fricative geminates also simplify in the presence of "glide hardening" as example (19) illustrates. On the other hand, palatal fricatives behave in the same way as stops that can be palatalized: cf. examples (20) and (21) to examples (10) and (11).

(18) /ton ʃːilːon/ > [toʃːilːon] "the dog, acc."

(19) [cːefːin] “mood” ~ [cːefca] “moods”

(20) [aʃːin] “flask, nom.” ~ [aʃːu] “flask, gen.”

(21) [kutʃːin] “lima bean, nom.” ~ [kutʃːu] “lima bean, gen.”

Overall, these phonological patterns can be successfully accounted for by the geminate analysis. In contrast, the cluster analysis and the fortis analysis explain some aspects of the behavior of the geminates, but cannot account for all of them.

In addition, the cluster analysis in particular is incompatible with the *phonetic* behavior of geminates. Specifically, a distinction is sometimes made between “real” geminates and clusters (e.g. Ham 1998). According to this account, these two types of segments show different phonetic behavior, which reflects their underlying structure: clusters of identical consonants syllabify as onsets and their duration is not controlled by phonological structure; in contrast, geminates are moraic and moraic structure controls their duration. As a result of this purported difference, clusters are expected to be more variable in duration than geminates (Ham 1998). This type of variability does not appear to apply to Cypriot geminates, however. As shown in (Arvaniti 1999b, 2001a) Cypriot geminates are affected by changes in speaking rate, but the changes in their duration are not greater than the changes undergone by singleton segments.[3]

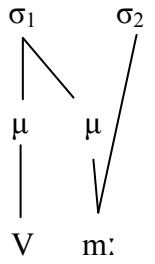
The fact that the fortis and cluster analyses cannot adequately account for the behavior of Cypriot geminates does not mean that the geminate analysis is unproblematic. First, the fact that geminates can become singletons in clusters, as in (17), is somewhat problematic for this analysis: one of the characteristics of geminates is said to be their ‘inalterability’ that is, the fact that they tend not to undergo processes that change them some way (Schein and Steriade 1986). The inalterability of Cypriot geminates is manifested in the

[3] The only exceptions to this trend are the difference between the tap [ɾ] and trill [r] rhotics and the VOT of singleton and geminate stops. For both pairs, the singleton (tap, short-lag VOT) shows less variability than the geminate (trill, long-lag VOT respectively), but as Arvaniti (1999b, 2001a) argues, this is only because the former articulations do not allow for durational variability; e.g. taps are ballistic movements that cannot be shortened or lengthened at will, while trills can contain two to six pulses.

fact that they do not lenite, like singleton consonants, but the deletion of 'half' the geminate, so to speak, does go against this presumed feature of geminates.

Cypriot geminates pose additional problems for phonological theory. Specifically, following Hayes (1989) it is generally accepted that geminates are moraic and ambisyllabic. Thus, they are typically represented as in (22).

(22)

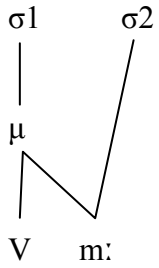


This representation is problematic for Cypriot Greek geminates for two reasons. First, it assumes that all geminates are word-medial, so it cannot easily account for word-initial geminates. Although such geminates will often appear in the middle of an utterance and can, presumably be syllabify as codas of the last syllable of the preceding word, the problem does remain for utterance initial position (for additional discussion, see Muller 2001, 2002). In addition, as mentioned, geminates are considered to be moraic. Yet, Cypriot Greek does not present differences in phonological weight, in that there are no phenomena in the language that allow us to distinguish between heavy and light syllables; rather, the overall phonological patterns of Cypriot Greek suggest that each syllable contains one mora.

In order to solve this problem of "light" geminates, which applies to other languages as well as Cypriot Greek (e.g. Hindi, Leti and Malayalam), Broselow et al. (1997) suggest that in languages of this sort geminates share the mora of the preceding vowel, as shown in (23). Since moraic structure is said to control not only phonological weight but also the duration of segments, the account of Broselow et al. predicts that languages with geminates represented as in (23) will show shortening of the vowel that precedes the geminate. Although Broselow et al. present results from Hindi, Malayalam and Levantine Arabic that conform to this prediction, the same does not seem to apply to Cypriot Greek:

the studies of Arvaniti (1999b), Tserdanelis & Arvaniti (2001), and Christodoulou (2007) do not find evidence that vowels preceding geminates in Cypriot Greek shorten.

(23)



The overall behavior of Cypriot geminates does not support the view that moraic structure controls both duration and phonological weight. Rather, it supports the view that weight and duration are separately controlled by moraic structure and the skeleton respectively (Tranel 1991, Hume et al. 1997, Arvaniti 2001b, Muller 2001). In addition, however, the overall phonetic behavior of Cypriot geminates could reflect the fact that they may not be fully-fledged geminates, or may be atypical geminates in some ways.

6. Conclusion

The above discussion has amply demonstrates that we know little about the phonetics and phonology of Cypriot Greek. Even the issue of gemination that has been examined both empirically and theoretically by several researchers is still not fully understood. It is clear that we need more studies of the acoustics, articulation and perception of both lexical and postlexical Cypriot geminates in order to be able to understand their behavior. Hopefully these studies will also shed light on the phonological status and best representation of geminates cross-linguistically.

In addition, many other aspects of Cypriot speech remain little understood. Thus, we know virtually nothing about the linguistic and sociolinguistic factors that affect the realization of Cypriot vowels, and know very little about the phonetics of its consonantal inventory beyond what pertains to the geminates. Another topic that has been barely touched upon is the prosody of Cypriot Greek. We do not yet know how stress is manifested in this variety; we know from studies that control for stress (Arvaniti 1999b,

Tserdanelis & Arvaniti 2001, Payne & Eftychiou 2006) that both vowels and consonants are longer in stressed than in unstressed syllables and that the effect is stronger word-initially. But we do not know if there are other parameters involved and if so, which ones. We know very little about the rhythm of Cypriot Greek, beyond the observations of Arvaniti (2001a) regarding the timing of vowels and consonants and the possibly smaller degree of vowel reduction by comparison to Standard Greek. We also know very little about the prosodic structure of Cypriot Greek; with the exception of Drachman et al. (2001), which deals only with the lower levels of the prosodic tree, the foot and the prosodic word, we do not know how higher levels are constructed and how the syntax of Cypriot plays into this. To give but one example, it is noted that the assimilation of final /n/ is much more widespread in Cypriot Greek than in Standard Greek, but its domain of application is not known. Finally, with the exception of Arvaniti (1998) and Grice, Ladd & Arvaniti (2000), which deal only with the intonation of polar questions in Cypriot Greek, we do not have any studies of Cypriot intonation.

It is important to note that studies on all these aspects of Cypriot phonetics and phonology do not have only a descriptive value, the documentation of one of the most robust and widely spoken varieties of Greek, but great theoretical interest as well. As this review of the work on geminate shows, and as the discussion of phonotactics (Coutsougera, this volume) and opacity due to "glide-hardening (Drachman, this volume) also attest, Cypriot poses serious problems for current theories of phonological structure. It is thus imperative to use it further as a test case, the kind of case that can make or break a theory. I hope that the current volume will provide the impetus for this research.

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