Glossologia, A Greek Journal for General and Historical Linguistics Vol. 11-12.131-166 (2000)
(Preliminary version in Historical Linguistics: Ohio State University Working Papers in Linguistics 52.203-233 (1999).)

Variation in voiced stop prenasalization in Greek

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ABSTRACT

Ancient Greek clusters of nasal (N) plus voiceless unaspirated (T) or voiced stop (D), merged to ND in Middle Greek, yielding ND or D in different modern dialects. Impressionistic studies suggest that currently there is stylistic variation between D and ND in all dialects, with ND as the high variant. Our study reveals that age, not style, is the most important factor in ND/D variation, with speakers under 40 using dramatically fewer ND tokens than older speakers; at the same time NT, a variant which reflects spelling conventions and is possible only across word boundaries, emerges as a careful style marker. This abrupt change of pattern coincides with important sociopolitical changes in Greece, such as the official demise of Katharevousa, the high variety of Greek diglossia. Thus, this change in apparent time suggests a real sound change in progress away from the previous pattern of stable variation.* (Modern Greek, diglossia, voiced stop prenasalization, stop-voicing)

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* We would like to thank Wolfson College, Oxford, and the Astor Travel Fund of the University of Oxford for providing the funds for the lead author to visit The Ohio State University where most of the data analysis was carried out. Thanks are also due to Mary Beckman for advice and help in Columbus, Bruce Connell for allowing us to use equipment from the Oxford University Phonetics Laboratory for the recordings in Greece, and the audiences at the Annual Meeting of the LSA (Los Angeles, 1993), and at seminars at Oxford and Reading Universities, for their helpful comments.

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Ever since the pioneering work of Labov (1963), it has been recognized that the study of sound change cannot be divorced from a consideration of synchronic variation. Similarly, the social context in which variation occurs must be taken into account, for there is a crucial social dimension in the spread and generalization of sound change throughout a speech community.

In this paper, we examine variation in the realization of voiced stops[i] in Modern Greek, and arrive at the conclusion that the ways in which the phonetic variation correlates with various social factors indicate a sound change in progress. What makes this Greek case of some interest is the fact that the resolution of stable variation, which has been present for at least several centuries, has been induced by political and concomitant social changes that have taken place in Greece in the past 20 years.

We first present the historical background to the Modern Greek situation, which is important for the assessment of the nature of the variation reported on. We then turn to a sociophonetic study, followed by a discussion of our results.

HISTORICAL BACKGROUND

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[i]A decision had to be made on whether we should refer to "voiced stops" or "nasal+stop" clusters with regard to what surfaces as oral or prenasalized voiced stops in Modern Greek. Both terms are phonologically loaded, but we decided to use the term "voiced stop" as it is phonetically accurate, and we do not wish at present to make any claims about the phonological status of surface voiced stops in Greek.

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Three types of homorganic nasal-plus-stop clusters occurred in Ancient Greek: nasal (N) plus voiced stop (D), nasal plus voiceless unaspirated stop (T), and nasal plus voiceless aspirated stop (T^h), as summarized in (1a-c):

1. Ancient Greek nasal-plus-stop clusters:
    a. ND: [mb, nd, Ng], spelt <mb, nd, gg> respectively
    b. NT: [mp, nt, Nk], spelt <mp, nt, gk> respectively
    c. NT^h: [mp^h, nt^h, Nk^h], spelt <mf, nq, gc> respectively

Relatively early on in the development of Post-Classical Greek, during the Hellenistic period (Browning 1983: 26-7; Sturtevant 1940: 83-5), the aspirated voiceless stops changed to voiceless fricatives, even in the clusters with nasals, and thereafter the original NT^h clusters followed their own path of development more akin to that of N + /s/ clusters (the other nasal-plus-fricative cluster).

The ND and NT clusters, on the other hand, merged to ND (Tonnet 1993: 40-46). The oral closure of the Ancient Greek voiced stops, which in other environments became voiced fricatives, was maintained after nasals, while the Ancient Greek voiceless unaspirated stops, which otherwise remained stable throughout the language's history, became voiced after nasals. The postnasal voicing of NT clusters was most likely a Byzantine/Middle Greek innovation, beginning around the 6th or 7th centuries and completed by roughly the 10th to 12th centuries AD.[ii]

[ii]The relationship between this innovation and the tendency towards postnasal voicing of dental stops in Greek of the Hellenistic and Roman periods (Bubeník 1989: 239) is unclear, and irrelevant in any case to the later developments under consideration here.

Evidence for the merger of NT and ND comes from several sources. Spellings such as <pevmmpi> in 7th century papyri (Tonnet 1993: 45-6) for Ancient Greek <pevmpei> ({·pempej}) 'sends' point to a merger on the assumption that the first <m> indicates the nasal; thus the remaining letters, <mp>, must represent something else, and that cannot be the voiceless stop {p}, which would have been spelt simply with the letter <p>, not the digraph <mp>. Therefore <mp> must stand for the voiced stop {b} here. Equally revealing are reverse spellings, understandable in the context of a merger of NT and ND, e.g., <pondikovn> 'mouse' for etymological <pontikovn>, or <tsigkavna> 'Gypsy-woman' from earlier <aqiggavna> (*Tale of the Quadrupeds* 150, 285 (14th c.)). Finally evidence comes from the use of <NT> spellings in loan words with ND in the source language, e.g., <mantavto> 'news' from Latin {mandatum}, <Loumpardoiv> 'Lombards' (*Chronicle of Morea* 1012 (13th c.)), or <empoukkwvnetai> 'crams one's mouth' (Prodromos IV, 73 (12th c.), a verb derived from the Latin *bucca* 'mouth'.

From this ND outcome in Middle Greek, two major developments are found in Modern Greek dialects (Mirambel 1959; Newton 1972): (i) preservation of ND word-internally, and simplification to D word-initially, and (ii) simplification to D in all positions. Newton (1972: 94 ff.) observes that the former outcome is found "throughout the south east [...], most of northern Greece and much of the Peloponnese" (the Peloponnesian dialects being the basis for the modern Athenian dialect on which Standard Modern Greek is based). The latter outcome is found in "all Cretan, Thracian and eastern Macedonian dialects, as well as those spoken in the islands which belong to the northern complex" and the Ionian islands of Kephalonia, Ithaki and Zakinthos (Newton 1972: 95)[iii]. Thus the two dialect types differ according to the presence or absence of a nasal in

[iii]Other developments also occured but to a lesser extent. For instance, Mirambel (1933) mentions some Modern Greek dialects of Asia Minor which, at least around the turn of the century, had nasals without stops as the outcome of ND; e.g. Cappadocian has

the outcome of earlier ND in word-internal position. For example, from Ancient Greek <pevnte> ({·pente}) 'five' and <avndra-> ({·andra-}) 'man', representative modern dialects, like Rhodian (a south eastern dialect) and Cretan in (2), show:

2. a. Rhodian: {·pende} Cretan: {·pede}
   b. Rhodian: {·andras} Cretan: {·adras}

The sound changes discussed so far concern the lexical level, i.e., applied within word boundaries. In addition, stop voicing now applies post-lexically[iv], i.e., across word boundaries, although the environments in which it takes place have not yet been given a full description[v]. It is not our intention here to give a full account of the rules of post-

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{meno} 'enter' (versus Standard Greek {beno}), from earlier {embeno}. Also, in a few dialects, the nasal assimilated completely to the following stop, yielding DD, an outcome "found at least in the Dodecanesian islands of Simi and Kalimnos" (Newton 1972: 95), and also in parts of Cyprus and Chios (Mirambel 1933: 164). Despite such differing outcomes, for the vast majority of dialects over a large area covering the central part of the Greek-speaking world the outcomes that are found are either ND or D. Since these are the only outcomes present in the dialects which provided the basis for the formation of the modern Standard language we focus our attention on them.

[iv]Based on the Neo-Grammarian view of sound change, in which sound changes apply at first without regard for word boundaries, our expectation is that these rules applied post-lexically in Middle Greek too, but there is no firm evidence for this.

[v]For instance, Newton (1972: 97) talks about "close syntactic structures" which include, among others "the nasal-final forms of the article before a following noun". He adds, however, that the notion of "close syntactic structure" is not easy to define and gives as an example the fact that the word {an} 'if' undergoes nasal assimilation in point of articulation to a following voiceless stop, but does not trigger voicing of the stop, as in

lexical stop voicing in Greek. Suffice it to say that it applies at least when certain function words, such as the negative markers {Den} and {min}, and all articles and weak object pronouns ending in /n/ precede a noun (or a verb) beginning with a voiceless stop; e.g.,

3. a. <den kapnivzw> {Den ka·pnizo} → {De(N) ga·pnizo} 'not I-smoke'
   b. <ton tourivsta> {ton tu·rista} → {to(n) du·rista} 'the tourist/ACC'
   c. <thn peiravzw> [tim pi·razo] → [ti(m) birazo] 'her I-tease'[vi]

The post-lexical context presents an added problem, however. In most occurrences, a head noun or verb with an initial voiceless stop is not preceded by a word-final nasal that would trigger voicing of the stop. As a result, the voicelessness of the stop is maintained underlyingly and frequently surfaces, as in the nominative singular case (4a), and when a verb is followed by a nonpronominal object (4b), or is preceded by a pronominal object which does not end in a nasal (4c):

4. a. <o tourivstas> {o tu·ristas} 'the tourist/NOM'
   b. <peiravzw thn Elevnh> {pi·razo tin e·leni} 'I-tease Helen'
   c. <ta kapnivzw> {ta ka·pnizo} 'them I-smoke'

/an pis/ --> {am pis} 'if you-say'. Nespor & Vogel (1986) on the other hand, claim that nasal assimilation and stop voicing are two prosodic rules of Greek which operate optionally (and together) in the Clitic Group prosodic domain, while Malikouti-Drachman & Drachman (1992) account for stop voicing by syllabification rules.

[vi]In all cases, the nasal assimilates to the stop for place of articulation. Nasal assimilation is a more widespread phenomenon than stop voicing, and as it is not always connected with stop voicing (see Lodge 1993, Newton 1972), it will not concern us here.

Therefore, at all stages of Greek in which post-lexical voicing occurred, there would be synchronic motivation for an underlying voiceless stop in all the words that show initial D in the post-lexical context for NT developments, because of the morphophonemic alternations between T and ND (or D). Thus, at each such stage, synchronic rules would be needed which mirror the sound changes: NT --> ND or NT --> D, depending on the dialect. By extension, it has been argued that all surface voiced stops can be treated as deriving from an underlying NT (among others, Kazazis 1969; Malikouti-Drachman & Drachman 1992; Newton 1972; Warburton 1970; but see also Lodge 1994 for a different perspective). Under such an analysis, there has been phonological stability with these developments for a long time in Greek; at any given stage since Middle Greek, there would be synchronic motivation for a nasal being involved in the derivation of voiced stops, whether or not the voiced stop occurring on the surface was preceded by an overt nasal.

SYNCHRONIC VARIATION

Developments in the last few decades suggest that both ND and D dialects exhibit variation in the realisation of voiced stops. The D dialects show ND pronunciations as high style variants (Kazazis 1968; Newton 1972), while the ND dialects show a tendency to simplify ND to D word-internally in casual speech (Kazazis 1976; Newton 1972).

There are several explanations for this variation in the pronunciation of voiced stops. On the one hand, the appearance of ND pronunciations in D dialects is understandable given that "Standard Modern Greek" is described as one of the ND dialects, and ND has been the pronunciation prescribed by grammarians (see Mackridge 1990a: 71 for a discussion). The higher prestige of ND is probably also related to the influence of spelling: in Modern Greek, voiced stops are always written with a nasal element ({mb} is

orthographically <mp>, {nd} is <nt>, and {Ng} is <gk> - and occasionally <gg> word-internally), and spelling is much more closely related to pronunciation in Greek than in other languages with historical orthography.

The influence of spelling can be partly attributed to the importance of the written language during a century of diglossia in Greece: the so-called "puristic" archaizing high variety of Greek, Katharevousa, was primarily a written language, the use of which was associated with education and power (on the importance of the written language and the prestige of Katharevousa see among others Browning 1982; Frangoudaki 1992; Mackridge 1990b). Thus, the prestige of the written word may well have been reflected in pronouncing words as they are spelt, a trait obviously associated with literacy and education, hence with a formal style of speech. Kazazis (1968) for instance, mentions that a Greek first-year student visiting him pronounced {koli·(m)bo} 'I-swim' as {koli·mpo}, a completely unnatural pronunciation, which Kazazis interprets as the student's attempt to appear more formal and educated in front of him, the professor.

More important from our point of view, however, is the simplification of ND to D, which nowadays seems quite widespread in ND dialects, including Standard Greek, as spoken in major cities like Athens. As early as 1972, Newton notes that "in the Peloponnese there do seem to be speakers, particularly among the younger generation, whose speech would place them here [in the D dialects] rather than in group B [the ND dialects]; indeed in Athens itself the nasal is rarely perceptible at least as far as fairly rapid speech is concerned"; and further on, "many speakers in the Peloponnese and northern Greece have a very slight nasal onset [...] and indeed often seem to show fluctuation in the clarity with which the nasal element is articulated" (Newton 1972: 95). Householder (1964) suggests that in Athenian Greek at least, there are groups of words which are pronounced with ND or with D depending on their origin. This, however, does not seem to be the case any

more (if it ever was, given that naive speakers do not usually know the etymology of words). Thus, more recently, Mackridge (1990a: 71) remarks: "As the situation appears today, in Athens at least, the absence of the nasal in such cases is generalized, even among people with higher education, though it is more widespread among the young, especially the males, and the less well educated [our translation]".

What emerges from the above impressionistic accounts is that in Standard Greek and many other dialects ND and D are perceived as being stylistically distinct: the observations of Kazazis (1968, 1969), Newton (1972), and Mackridge (1990a) suggest that prenasalized stops are perceived as reflecting a higher style than oral ones.

Recent quantitative studies (Charalabopoulos, Arapopoulou, Kokolakis & Kiradzis 1992; Pagoni 1989) have attempted to determine some of the social and linguistic correlates of the ND/D variation (henceforth (ND)). Pagoni (1989) recorded 22 middle class informants reading a word list (a mixture of words with voiced stops and distractors) and a short passage which imitated newspaper style. She found that the realization of (ND) depends on age, with older speakers using more ND tokens than younger speakers, on education, with more educated speakers using more ND tokens than less educated ones, and on what she terms "beliefs and attitudes towards life and society" (p. 410), with more conservative speakers using, not surprisingly, more ND tokens. However, Pagoni's sample was rather limited in three ways. First, the data represent a formal style of speech. Second, the sample included only word-internal ND, and so provides no information on the realization of ND in word-initial and post-lexical position. Finally, her speakers formed a closely knit social network of conservative middle-class educated Athenians. Pagoni herself follows Milroy (1987) in accepting that "no claim can be made that the speech samples collected in this way are representative of the speech of a whole community" (Milroy 1987: 38 quoted in Pagoni 1989: 403).

Charalabopoulos et al. (1992), on the other hand, provide important information on the linguistic factors which influence (ND) realization, but have little to say on the social factors involved, as their sample of 20 speakers consisted of university students between the ages of 20-30, i.e., of educated speakers of the same generation. A second limitation of their study is that it included only casual speech, with all the data being elicited during an informal interview between two people who knew each other well, thereby eliminating the possibility of investigating a stylistic dimension to the variation. Third, the speakers were from Thessaloniki, Greece's second largest city, situated in the north of Greece. Thessalonikiotes speak Standard Greek, but they have a distinct accent, which may have biased the results; our impression as speakers of Greek, as well as that of other Greek linguists[vii], is that D is less prevalent in Thessaloniki than in Athens. Despite these limitations, certain of Charalabopoulos et al.'s observations are revealing. Particularly interesting is the comment that data from four older speakers, who were University lecturers, differed dramatically from those of the main body of the research: "The picture here is entirely different with a significantly higher tendency for prenasalization in all contexts, even in word-initial position" [our translation] (p. 296). In contrast, they observe that among the young speakers "the tendency not to prenasalize voiced stops is overwhelming, in contrast to the accepted norm that these sounds are pronounced oral in word-initial position but prenasalized word-internally" (p. 295). Finally, they mention that "no important differences between men and women were observed relating to the question of voicing and prenasalization" (p. 301).

The evidence from these two studies would suggest that the current situation is merely a continuation of a long period of stable variation (in the sense of Labov 1981: 184). This

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[vii]We thank Evagelos Petrounias of the University of Thessaloniki for his observations in this regard.

view is further supported by (a) the fact that the ND/D variation has a history within Greek of at least several hundred years, perhaps even longer, and (b) the phonological stability of underlying NT, as noted above, resulting from the post-lexical application of the stop-voicing rule. However, there are several reasons why we would like to question this interpretation of the available data. First, we note that in both studies there were no significant differences between the speech of men and women; this lack of difference is thought to be an indication of a sound change that has been completed (Labov 1990). Second, the age of the speakers emerges as a very important factor both in Pagoni (1989) and in Charalabopoulos et al. (1992), indicating that we may be dealing with change in apparent time. Thus, although the results of these two quantitative studies provide valuable insight into the ways the social factors affect the realization of voiced stops, further study of the status of (ND) in Greek seemed necessary, in particular the investigation of whether in fact the current situation represents continued stable variation or a real change in progress altering the nature of the (now unstable) variable (ND).

METHOD

Material and speakers

The material used in this study included two speech styles, reading and conversation, and so is intermediate between the very formal style elicited in Pagoni (1989) and the very informal one elicited in Charalabopoulos et al. (1992).

Thirty native speakers of Greek, ranging in age from 18 to 71, were recorded in Athens, Greece. All the speakers lived in Athens, though only nineteen of them had been brought up there. The rest had been brought up in other parts of Greece (e.g., Corfu, Thessaly, Siros and Mani) but had lived in Athens most of their lives. Three speakers had lived in

England in the past, but had all returned to Greece several years before the recording. The specific question addressed by this study was not explained to the speakers; they were told that it related to the first author's research in linguistics, but no more details were given prior to the recording.

The speakers were asked first to read a two-page narrative of childhood reminiscences; they were asked to read the text twice with a small break in between, a procedure none of them found particularly tiring. The speakers were instructed to have a look at the text and read it as they would at school where it is standard practice to ask pupils to read literature passages aloud. The text was written in informal style so that the speakers would be encouraged to read in a natural way; most speakers, in fact, adopted a natural and lively style similar to that described by Laferriere (1979: 607) for her Irish speakers.

The text contained 18 instances of voiced stops in word-initial position, 26 instances of word-internal voiced stops, and 15 instances of post-lexical voiced stops[viii] (see Appendices I, II and III respectively). The stops were more or less evenly divided between the three places of articulation, including the two allophones of /g/ ({*ʃ*} before the front vowels /i/ and /e/, and {g} elsewhere).

An extract from the text is given below in phonetic transcription (in which target sequences are underlined), and in translation :

[viii]There were in fact other post-lexical voiced stops, some of them across boundaries which, according to Nespor & Vogel (1986) and Newton (1972), should block stop voicing. For the purposes of the present study we included in our data only those clusters which according to all studies can surface as voiced stops: i.e., those which involve a definite article plus noun, a personal pronoun plus verb, or one of the negative markers, {Den} and {min}, plus verb.

{fisi·ka a·fti Den ·itan i ·moni fo·ra pu ·vrika to be·lamu ‖ ·imuna skada·¥ariko pe·Di | ce si·xna me ·malonan ‖ mˆa fo·ra | ja pa·raDiVma | ·epeza sti bla·tia | otan ·epçase mˆa Dina·ti ·bora ‖ a·di na ·trekso sto ·spiti san ·tala pe·Dja | e·Vo ·kaQisa capo·lamvana ta bubuni·ta ce ti vro·çi | me apo·telezma na ·jino mu·skiDi ‖ to ·ti ·ksilo ·efaVa ja·fto | De ·lejete ‖}

'Of course this was not the only time I got into trouble. I was a naughty child and was often scolded. One time, for example, I was playing at the [village] square when a heavy rain storm started. Instead of running home, like the other children, I stayed to enjoy the thunder and the rain, getting drenched as a result. I can't describe the thrashing I got for this.'

The reading of the text was followed by approximately 30 minutes of conversation with each speaker; the topic varied depending on his or her interests and background (e.g., the University entry examination some of the younger speakers had just taken, the reasons for the telecommunications strike one of the speakers was taking part in, etc.). In general the speakers were relaxed and most of them soon forgot the tape recorder completely; some even expressed surprise when the tape recorder was turned off at the end of the interview, as they had not noticed when the recording had begun.

The recordings took place in reasonably quiet conditions, either in the speaker's or the first author's house. Although every possible precaution was taken to avoid noise, if prolonged noise (such as a telephone ringing or a dog barking) happened to occur during the reading session, the recording was stopped and when the noise was over the speaker was asked to repeat a paragraph or a few lines. No such interruption was deemed necessary during the recording of the conversation.

Measurements and statistical analysis

The reading data were digitised at 16 kHz and wide-band spectrograms of the target sequences were obtained using a Kay-Sonagraph 5500. The data were classified into categories on the basis of the spectrograms and the auditory impression given by each token. In cases of doubt the spectrographic evidence prevailed. Initially, it was decided that seven categories should be used for the classification of the tokens: oral voiced stop (henceforth D), prenasalized voiced stop (ND), nasalized vowel + voiced stop (v$D), voiceless stop (T), nasal + voiceless stop (NT), nasalized vowel + voiceless stop (v$T), and voiced fricative (F). These categories were considered necessary in order to capture differences in the phonetic realisation of the stops, which were discovered in the process of the acoustic analysis (for example, Charalabopoulos et al. 1992, and Pagoni 1989, who base their results solely on auditory transcription, do not make any mention of fricative pronunciations in place of stops - on the limitations of auditory transcription see Kerswill & Wright 1990).

For the statistical analysis, however, some of the categories into which the tokens were originally classified were pooled. Thus, categories ND and v$D were both classed as ND, categories NT and v$T were both classed as NT, and categories D and F were both classed as D. The reason for pooling the realization categories with a nasal element on the basis of the voicing of the stop was that despite differences in phonetic realisation, the presence or absence of nasality appears to be perceived categorially by the native speakers. That is, naive native speakers seem to classify voiced stops as either oral or prenasalized without making any further distinctions relating to the degree of nasality. A similar situation obtains in production: preliminary measurements show that the length of the nasal as opposed to the oral segment varies widely from token to token even within the data of the same speaker, and does not seem to depend on any of the parameters that

affect the presence/absence of nasality itself; for instance, the prenasalized tokens of older speakers (who in general used the ND variant more) do not show longer nasal stretches than those of younger speakers. It is also significant that in previous studies, in which auditory analysis only was used, there is no reference to degrees of nasality, although Pagoni (1989: 408) does have a category for tokens "with a very slight nasal onset i.e., cases that could be attributed to both categories [prenasalized and oral] due to a fluctuation in the clarity with which the nasal element was articulated". Similarly, voiced fricatives, (F), were classed with D, because they were auditorily virtually indistinguishable from oral voiced stops, (D), but auditorily and acoustically distinct from underlying voiced fricatives[ix].

The conversational data were analyzed auditorily, and the relevant tokens, found word-initially, word-internally and post-lexically, were classified in the four categories mentioned above: ND, D, NT and T. Acoustic analysis of these data was not considered essential given the familiarity of the transcriber with the material, provided by the more detailed analysis of the reading data.

For the statistical analysis, the percentage of tokens in each category was calculated for each speaker, and these percentages, rather than the raw data, were used. The data were classified according to the following independent variables: gender, age, education, class and style of speech (reading and conversation). For age, the speakers were classified into

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[ix]The acoustic analysis of such tokens shows that the reason for the difference between the two types of voiced fricatives relates to amplitude: underlying voiced fricatives had lower amplitude than voiced stops which were pronounced as fricatives. The latter appear to be a pronunciation variant favored by the younger male speakers.

three groups, from 18 to 30, from 31 to 45 and from 46 to71[x], each comprising ten speakers, five men and five women. The age groups were chosen so that the same number of years be included in each one of them as far as possible. At the same time, each group corresponded to a different stage in the life of the speakers (cf. Thibault & Vincent 1990): most of the people in the first age group still lived at home or had just started their own family and career; those in the second group were largely established in their profession and had growing families, while most of those in the third age group were moving towards retirement and already had grown up children.

For education, the speakers were classified according to level completed: primary, secondary and higher education. Here the sample was not evenly divided, with primary education being particularly underepresented (there were just two speakers with only primary education in the sample). This low number is due partly to the fact that secondary education became compulsory in Greece in 1976, and partly to the fact that even before that time most children in big cities like Athens stayed at school for at least two or three years after the compulsory six.

Finally, speakers were grouped for class on the basis of occupation and income (see Thibault & Vincent 1990 on the validity of a socio-economic classification of speakers on the basis of their profession). The speakers were classified in three groups, namely as professionals, white-collar, or blue-collar workers. For the speakers who had just finished school or were university students class was determined on the basis of their

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[x]This last age group appears to span a much wider age range. However, the age of nine of the speakers was between 46 and 60; there was only one speaker who was 71 years old. His speech was not different from that of the other speakers in this age group.

parents' occupation and income. For women who did not work outside the home, class was decided on the basis of their family background and present situation[xi].

For the statistical analysis twelve dependent variables, which represented the percentages of each of the variants of (ND), in word-initial, word-internal and post-lexical position, were used. The data from the two readings of the text were pooled in each case, as initial tests did not show any differences between the percentages from the two repetitions. Multivariate fixed-effects analyses of variance (MANOVAs) were performed on these data, and significant results were followed by univariate tests on each of the variants; for factors with more than two levels (e.g., age) these were followed by planned comparisons, as were significant interactions between factors.

RESULTS

(ND) realization differed depending on whether (ND) was word-initial, word-internal or post-lexical. Figure 1 shows the percentage of the three main variants, ND, D and NT, in word-initial, word-internal and post-lexical position. (We will not be discussing the results for variant T, as it accounts for less than 1% of the data.) As can be seen in Figure 1, there were far fewer ND tokens in word-initial position than either word-internally or post-lexically, but only a small difference between the word-internal and post-lexical percentages of ND. In contrast, variant D shows considerable reduction from initial to internal and post-lexical type. Finally, while in the two lexical positions NT is virtually non-existent, it reaches 10.75% post-lexically. Because of these differences between the

[xi]To be sure, these class categories are somewhat rough, but in the context of Greek society, which is not sharply socio-economically stratified, we feel that they are adequate for our purposes.

three types of (ND), and in order to make the results clearer, we present the effects of the various sociolinguistic factors separately for word-initial, word-internal and post-lexical (ND).

Word-initial (ND)

The realization of (ND) in word-initial position was 97.1% D, the rest of the tokens being prenasalized. Although the percentage of prenasalized tokens was very low, it is interesting to note that nearly 3% of the tokens did show prenasalization, contrary to impressionistic accounts which claim that word-initial stops are always oral (among others, Newton 1972). These results are in agreement with those of Charalabopoulos et al. (1992) who also found prenasalized word-initial tokens. The results were not affected by age, class, or education, but were affected by gender (Wilks' λ (2, 57) = 0.88, $p < 0.028$). Specifically, women used more ND and fewer D tokens than men in word-initial position (for ND, $F(1, 58) = 7.49$, $p < 0.008$; for D, $F(1, 58) = 6.72$, $p < 0.01$). This result, however, was affected by style; planned comparisons show that while men's and women's reading percentages were the same ($X = 1.5$, and $X = 3.34$ respectively), male speakers used fewer ND tokens than female ones ($X = 0.55$, and $X = 5.25$ respectively) in conversation ($p < 0.007$), and consequently more D tokens ($p < 0.009$). This difference is difficult to explain; however, prenasalized stops, especially in word-initial position, may sound somewhat emphatic, so their highest percentage in the data from female speakers could indicate higher involvement in the conversation; for instance, many of these prenasalized tokens appeared in ejaculations, such as {ba} 'no [I don't think so]' and {bo·ri} 'may be'.

Word-internal (ND)

In the word-internal context two variants, ND and D, prevailed and account for 99.85% of the data. The only significant factor in (ND) realization was age (Wilks' λ (4, 112) =

0.39, $p < 0.000001$), which affected both D and ND (for ND, $F(2, 57) = 43.16$, $p < 0.0000001$; for D, $F(2, 57) = 43.44$, $p < 0.0000001$). Planned comparisons showed that the speakers in the two youngest age groups had the same pattern, presented in Figure 2, which differed substantially from that of the older speakers; specifically, speakers in the 17-45 age range used mostly the D variant, while speakers in the 46-71 age group used both variants equally (for age groups 1 : 3, $p < 0.000001$ both for ND and D; for age groups 2 : 3, $p < 0.000001$ both for ND and D).

As shown in Table I, style also influenced the realization of (ND), though the results did not reach the 5% significance level (Wilks' λ $(2, 57) = 0.91$, $p = 0.078$). Style, however, did interact with age. As can be seen in Figure 3, no style differences were found in the data from the two younger age groups, which showed similar low ND percentages in both styles. In contrast, the speakers of the oldest age group showed a significant difference between reading and conversational style: in their data the percentage of the prenasalized tokens increased considerably in reading compared to conversation ($p < 0.04$). Despite this result, the difference in ND usage between the first two age groups on the one hand and the third group on the other was retained in both styles (for age groups 1 : 3, $p < 0.000001$ for the reading style, and $p < 0.000002$ for the conversational style; for age groups 2 : 3, $p < 0.000001$ for reading, $p < 0.0001$ for conversation). No differences relating to style were found between the first two groups ($p < 0.82$ for reading and $p < 0.25$ for conversation). (The same comparisons for the variant D gave exactly the same results.)

In contrast to age and style, our results did not show any differences between the pronunciations preferred by men and women in word-internal position, as shown in Table II (Wilks' λ $(2, 57) = 0.93$, n.s.). This similarity was not affected by style (Wilks' λ $(2, 55) = .92$, n.s.), or age (Wilks' λ $(4, 106) = .98$, n.s.).

Similarly, there were no differences related to class (Wilks' λ (4, 112)= 0.96, n.s.), or education (Wilks' λ (3, 52) = 0.92, n.s.) (see Tables III and IV). (Note, however, that the statistical results on education refer only to speakers with secondary and higher education, because of the small number of speakers with only primary education in the sample.)

Post-lexical (ND)

In contrast to the data from word-internal (ND) which showed little sociolinguistic variation, with the exception of the age effect, in the realization of post-lexical (ND) age, style and gender played a part.

As mentioned, age was again an important factor for (ND) realization (Wilks' λ (6, 110) = 0.58, $p < 0.000009$), though not all (ND) variants were affected by age in the same way (for ND, $F(2, 57) = 18.53$, $p < 0.000001$; for D, $F(2, 57) = 9.57$, $p < 0.0002$; for NT, $F(2, 57) = 2.17$, n.s.). As shown in Figure 4, the ND percentage was very low in the first two age groups, and their score was significantly lower than that of the older age group (for age groups 1 : 3, $p < 0.000001$; for age groups 2 : 3, $p<0.000004$), though there were no differences between them. Similarly, the two younger groups had the same percentage of D tokens, which was much higher than that of the older speakers (for age groups 1: 3 $p < 0.00006$; for age groups 2 : 3, $p < 0.005$). Thus, for the ND and D variants, the pattern with regard to age is the same as the one for word-internal (ND). On the other hand, the use of the NT variant showed similarities between the youngest and oldest age groups, but also a higher percentage among the speakers of the 31-45 age group, whose data were significantly different from those of the youngest speakers ($p < 0.04$).

Style also affected the realization of (ND) in the post-lexical position (Wilks' λ (3, 56) = 0.78, $p < 0.003$). As can be seen in Figure 5 the percentages of ND and NT were much lower in the conversational than in the reading style (though for NT this was only a trend), while the percentage of D increased in conversation (for ND, $F(1, 58) = 4.8$, $p < 0.03$; for D, $F(1, 58) = 9.65$, $p < 0.002$; for NT, $F(1, 58) = 3.58$, $p < 0.06$).

Unlike word-internal (ND), the post-lexical realization of the variable did show differences between men and women. As shown in Figure 6, the percentage of ND was the same betweeen male and female speakers ($F(1, 58) = 0.1$, n.s.). On the other hand, women used more NT tokens than men ($F(1, 58) = 4.05$, $p < 0.04$), with a concomitant decrease in D tokens, which, however, did not reach statistical significance ($F(1, 58) = 2.42$, $p < 0.12$).

Education did not affect the results (Wilks' λ (3, 52) = 0.97, n.s.). Similarly, class had no effect on (ND) realization (Wilks' λ (4, 112)= 0.96, n.s.). However, class interacted somewhat with style, in that white collar workers showed lower percentages of D in reading than in conversation ($p < 0.03$), with an accompanying trend for more NT in reading than conversation ($p < 0.10$). This difference in style was not observed in the data of blue collar workers or professionals, and did not affect variant ND ($F(2, 54) = 0.04$, n.s.).

In summary, the factors influencing the realization of post-lexical (ND) were age, style and gender. These factors, however, affected each of the three variants, ND, D and NT, differently: specifically, while ND and D were affected by age and style, and not by gender, NT was affected primarily by gender and to a much smaller extent by style. These results sugest that in addition to the main effects, the three factors that influenced (ND) realization interacted with one another in various ways.

First, similarly to the word-internal data, style interacted with age (see Figure 7). Specifically, no differences between the reading and conversation percentage of each of the variants were observed in the data from the youngest age group. In the oldest age group, there were such differences, but they affected only variants ND and D: in particular, the speakers in the oldest group used ND more frequently in reading than in conversation, with mirror image effects on the D variant; however, style did not have any effect on their use of the NT variant (for ND, $p < 0.0001$; for D, $p < 0.001$; for NT, $p < 0.5$). Thus, allowing for the use of the NT variant post-lexically, both the youngest and the oldest speakers reproduced the pattern observed in their word-internal data. In contrast, the speakers of the 31-45 age group did not treat the post-lexical and word-internal context in the same way: in their data, no differences due to style were observed in their use of ND, but their percentage of D tokens was much lower in reading than in conversation ($p < 0.03$), with a concomitant increase in NT tokens ($p < 0.05$).

Gender also interacted with style (see Figure 8), unlike in the word-internal data which showed no such differences between men and women. In particular, while men's data did not show any effect of style, women had a lower D percentage in reading both in comparison to their conversational style ($p < 0.001$), and in comparison to the men's reading style ($p < 0.03$). These differences were also present in their NT results: in this case, women used significantly more NT tokens in reading both in comparison to their conversational data ($p < 0.003$), and to the men's reading style ($p < 0.002$). In contrast, the ND variant was not affected either by gender or style.

These differences in the effect of style in the choice of variant by men and women seem also to be related to age, in that men and women within each age group did not always behave in the same way (this result is again different from that on the word-internal data).

As can be seen in Figure 9(a, b), which presents the results for the three variants in each style separately for men and women of each age group, there were again no differences in the use of the ND variant between the sexes, in that men and women of each age group behaved similarly (allowing for the effects of style on the choice of variant, which affected men and women of the oldest age group equally). This similarity of pattern was preserved in the other variants, D and NT, as well, for the speakers of the oldest and the youngest age groups. In the 31-45 year old group, however, the speech of men and women did not show the same pattern; while men's choice of variant did not seem to be affected by style, women's was, with the result that in reading women showed a lower percentage of D tokens than men ($p < 0.05$), and a concomitant higher percentage of NT tokens ($p < 0.01$). These differences did not appear in the conversational data of men and women of this age group. In short, it appears that women of the 31-45 age group are the most sensitive to the use of NT as a careful style marker, an effect not observed among the older or younger speakers, irrespective of their sex, or in the men of the same age group.

DISCUSSION AND CONCLUSION

In summary, we saw that the pronunciation of (ND) depended primarily on type (word-initial, word-internal and post-lexical), age and style, and to a lesser extent gender. First, our results confirm traditional accounts that word-initial voiced stops are virtually always pronounced oral (but the occasional presence of nasality, also observed by Charalabopoulos et al. 1992, is noteworthy).

Second, in word-internal (ND), variation in the use of the ND and D variants shows a strong correlation with age, with speakers below the age of 45 displaying a dramatic reduction in ND pronunciations when compared with older speakers, while other social factors, such as gender, education and class, did not affect the speakers' choice of variant. Significantly, style did not affect (ND) realization, except in the case of the older speakers, who showed an increase of ND usage in reading.

Finally, we found that the pronunciation of post-lexical (ND) was also affected by age, but that within each age group (ND) was affected in different ways by gender, style of speech, and (to a small extent) class[xii]. In the youngest age group none of these factors influenced (ND) realization, and in the majority of cases the variant used was D. In the oldest age group, style affected the choice of variant of both men and women equally, resulting in higher ND and lower D percentages in reading than conversation. In the mid age group, on the other hand, women showed an increase of NT in reading compared to conversation; this increase was at the expense of the D variant, while women's percentage of ND pronunciations remained the same in the two styles. Unlike the youngest and oldest age groups, women in the middle group behaved differently from men, whose pronunciations were not affected by style.

[xii]Broadly similar results are reported in a recent quantitative study of prenasalization and stop voicing in the post-lexical context (Mikros (to appear)), which is based on data from five families, each of them being considered a minimal social network. Mikros' results, however, are difficult to interpret and compare to ours because he takes the presence of the nasal and the voicing of the stop as two independent markers, so that in his results our ND and D categories are classed together under "voicing", and our NT and ND categories are classed together under "nasalization".

The overwhelming effect of the age factor compared to all others shows change in apparent time in our sample, which, here, we claim, reflects a real linguistic change in progress away from a previously stable pattern (cf. Bailey, Wikle, Tillery & Sand 1991). That is, we would like to suggest that the current situation is not simply a change in the relative status of the D and ND variants. The status of these variants, which have been present in Greek for a considerable amount of time, is indeed different from what it was just a few decades ago (the period which most traditional grammars and descriptive works report on): ND is no longer a marker of careful speech, and D a stigmatized form. But we would like to suggest that in addition to this change of status, prenasalized voiced stops are now disappearing from Greek.

This interpretation of the results is based on several observations, the most imporant being the change of pattern between speakers below and above 45 years of age. On the one hand, our results show that for the older speakers, ND and D are equally valid both word-internally and post-lexically. For these speakers, the prestige of ND is evident in their increased usage of it in reading, a result unique to this age group. Moreover, older speakers do not seem to use NT post-lexically to any significant extent, a situation which is understandable given that they have the option of using ND instead, i.e., of simultaneously applying the stop voicing rule and maintaining a formal style of speech.

For those below 45, on the other hand, there are further differences between post-lexical and word-internal (ND) according to age group (17-30, 31-45). Word-internally, the stability and low percentage of ND among all speakers below 45 suggests that for them ND is no longer a viable option as a careful style marker in this context; hence their failure to use it more in careful style, and their use of D in the vast majority of cases.

In the post-lexical context, however, these two age groups present different pictures. For the 17-30 year olds, the unavailability of ND seems to be accompanied by the full acceptance of D, which is no longer stigmatized as an "indication of careless pronunciation" (Mackridge 1990a: 72); that is to say, for the majority of these speakers the change from ND to D is completed.

Among the 31-45 year olds, however, D is not fully accepted post-lexically: while ND is no longer available to them, D retains some of its old stigma, hence it is avoided in this context. However, with ND unavailable, and D stigmatized, speakers need another marker for careful style, so they opt for NT, that is they chose not to apply the stop-voicing rule[xiii]. It is interesting to note that this dilemma affects mostly those groups of speakers who have traditionally been described as being most sensitive to prestige norms, in our case women, and white collar workers (see among others, Labov 1972, Trudgill 1974, and the discussion in Hudson 1980: 121, 148-155).[xiv] In one instance, an 18 year old woman, who originally read one sequence as {tide·tarti} 'on Wednesday', after a short hesitation pause repeated the sequence as {tin te·tarti}. However, it is significant that speakers like her did not feel they were being careless when they were pronouncing D in the word-internal context, and there were no instances of corrections of, say, {b} to

[xiii]Although we have no direct evidence for this, we make what we believe to be a safe assumption that NT was always possible, at least in slow careful speech. We do know, though, that in recordings of early 20th century Greek songs one can hear NT pronunciations, e.g. those in "Greek-Oriental Rebetica. Songs and Dances in the Asia Minor Style. The Golden Years: 1911-1937", Arhoolie Productions, 1992 (from the collection of Prof. Martin Schwartz).

[xiv]We acknowledge criticisms such as Eckert's (1989) who questions these assumptions. We feel, however, that they are valid for Greek society, and in any case provide us with a framework within which to explain our results.

{mb} word-internally. It is equally significant that the observed differences between word-internal and post-lexical (ND) relate mainly to the D and NT variants, but leave ND largely unaffected.

This change of pattern across generations would be relatively unremarkable if it were not for the abruptness of the change. Our interpretation is that this dramatic age division is related to overwhelming political changes in Greece which led to the official demise of Katharevousa in 1976. Such a relationship between linguistic change and "catastrophic social events" is not uncommon, as Clermont & Cedergren (1978), Kemp (1981), Labov (1990), and Laferriere (1979) demonstrate. In the Greek case, after the 1974 fall of the seven year military junta, which had re-enforced the use of Katharevousa as the official language of administration and education, the newly elected democratic government abolished the official use of Katharevousa in all aspects of public life. This move was in part a reaction to the connection of Katharevousa with the junta, a link which had undermined its former status as the high variant of Greek diglossia. Frangoudaki (1992: 369) for instance, states that "since the 1950s, the use of K Greek [Katharevousa] connotated acceptance of established hierarchies, respect for traditional values, resistance to change, and support of the given order" and goes on to show how this power of Katharevousa was slowly undermined by its increasingly wide use, which was intensified even further during the junta. Through such extensive use Katharevousa became increasingly understandable to a larger part of the Greek population, an outcome which was facilitated by more widespread access to education. Thus, Frangoudaki continues (1992:69 ff.), Katharevousa "gradually lost its legitimacy, thus losing its function as a

high code", and "after the restoration of parliamentary government (1974), [...] served to identify the speaker with prodictatorship positions".[xv]

Thus, the age division in our results suggests that both the very young speakers, who had very little contact with katharevousa, and the slightly older ones, the vast majority of whom rejected katharevousa because of its association with the dictatorship, are increasingly less sensitive to the waning prestige of the Katharevousa-linked ND variant. Understandably, the effect is less pronounced among the 31-45 year olds, who may well have rejected katharevousa, but cannot be expected to be impervious to the prestige of the language in which they were educated. Hence the speech of this age group is in a state of flux; in contrast, the speech of the youngest group presents a consolidated pattern, which is clearly very different from that of the oldest speakers, who were educated in Katharevousa and spent the largest part of their lives with at least some contact with it.

In conclusion, in the case of Greek voiced stops, a changing social environment - i.e., political changes together with changes in the nature of Greek diglossia - has given rise to linguistic change as opposed to merely adding to the already existing socially and stylistically conditioned variation.

[xv]Frangoudaki (1992) goes on to discuss the reasons why in the past decade or so a resurgence of Katharevousa militants has taken place in Greece. Although we agree entirely with her results and interpretation, this movement is sufficiently restricted to high intellectual circles so as not to have direct relevance to the way our speakers use (ND). Having said that, we would not wish to deny that some of the speakers in our sample may have had strong views about the linguistic decline of Greece and held quite conservative views regarding language.

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Table I: Mean percentages and standard deviations of the ND and D variants according to style; (ND) is word-internal.

	Reading		Conversation	
	ND	D	ND	D
Mean	24.49	75.25	19.14	80.85
S.D.	28.61	28.49	21.21	21.21

Table II: Mean percentages and standard deviations of the ND and D variants according to gender; (ND) is word-internal.

	Women		Men	
	ND	D	ND	D
Mean	23.71	76.27	19.92	22.62
S.D.	22.61	79.82	27.65	27.56

Table III: Mean percentages and standard deviations of the ND and D variants according to class; (ND) is word-internal.

	Blue collar workers		White collar workers		Professionals	
	ND	D	ND	D	ND	D
Mean	15.6	84.39	21.82	78.02	24.4	75.43
S.D.	18.62	18.62	23.63	23.6	29.18	29.08

Table IV: Mean percentages and standard deviations of the ND and D variants according to education; (ND) is word-internal.

	Primary education		Secondary education		Higher education	
	ND	D	ND	D	ND	D
Mean	30.48	69.51	21.46	78.53	20.90	78.80
S.D.	22.02	22.02	23.06	23.61	27.76	27.66

Table V: Mean percentages and standard deviations of the ND, D and NT variants according to class; (ND) is post-lexical.

	Blue collar workers			White collar workers			Professionals		
	ND	D	NT	ND	D	NT	ND	D	NT
Mean	9.22	79.19	11.24	13.42	72.006	13.21	16.63	74.61	7.40
S.D.	13.93	29.28	25.17	15.52	26.65	16.13	24.02	27.80	9.50

Table VI: Mean percentages and standard deviations of the ND, D and NT variants according to education; (ND) is post-lexical.

	Primary education			Secondary education			Higher education		
	ND	D	NT	ND	D	NT	ND	D	NT
Mean	18.73	54.13	27.28	13.23	75.15	10.55	14.19	76.29	8.001
S.D.	18.70	33.30	36.41	15.16	25.66	15.95	23.35	27.90	9.10

Figure captions

FIGURE 1: Mean percentages of the variants ND, D and NT in word-initial, word-internal and post-lexical position.

FIGURE 2: Mean percentages of the variants ND and D in word-internal position for the three age groups.

FIGURE 3: Mean percentages of the variant ND in word-internal position, according to style, for the three age groups.

FIGURE 4: Mean percentages of the variants ND, D and NT in the post-lexical environment for the three age groups.

FIGURE 5: Mean percentages of the variants ND, D and NT in the post-lexical environment according to style.

FIGURE 6: Mean percentages of the variants ND, D and NT in the post-lexical environment according to gender.

FIGURE 7: Mean percentages of the variants ND, D and NT in the post-lexical environment, according to style, for the three age groups; capital R and grey symbols stand for reading style, capital C and white symbols for conversational style.

FIGURE 8: Mean percentages of the variants ND, D and NT in the post-lexical environment according to style and gender; capital R and grey symbols stand for reading style, capital C and white symbols for conversational style.

FIGURE 9: (a) Mean percentages of the variants ND, D and NT in the post-lexical environment, according to style and age, for female speakers only; (b) mean percentages of the variants ND, D and NT in the post-lexical environment, according to style and age, for male speakers only; in both cases, capital R and grey symbols stand for reading style, capital C and white symbols for conversational style.

Appendix I: The words with word-initial voiced stop in the text.

{b}	
{ba·stuni}	'walking stick'
{be·la} (twice)	'trouble/ACC'
{·bora}	shower
{bubuni·ta}	'thunder'
{·baˆo}	'bathroom'
{bo·rusa}	'I could'

{d}	
{·defja}	'tambourines'
{dre·pomun}	'I was shy'
{dara·verja}	'contact' (colloq.)
{·dopça}	'native/PL'
{do·mata}	'tomato'
{du·lapa}	'wardrobe'

{g}	
{·*ɟ*oni}	'howlet/ACC'
{·*ɟ*emˆa} (twice)	'reins'
{gre·mos}	'precipice'
{·griza}	'grey/PL'

Appendix II: The words with word-internal voiced stop in the text.

{b}	
{·olibo}	'[mount] Olymbos/ACC'
{·eboros}	'merchant'
{a·beli}	'vineyard'
{ebisto·sini}	'trust'
{bubuni·ta}	'thunder/PL'

{d}	
{ko·da} (four times)	'close'
{·pada} (four times)	'always'
{tsa·dirja}	'gypsy tents'
{·adres}	'men'
{·Dedron}	'trees/GEN/PL'
{skada·¥ariko}	'naughty'
{a·di}	'instead'
{skada·¥es}	'naughty deeds'
{a·diQeta}	'in contrast'
{a·distixo}	'equivalent'

{g}	
{fra·gokotes}	'guinea fowls'
{a·*f*iksi}	'to touch/SUBJ'
{a·guri}	'cucumber'
{a·Vo*f*ista}	'without complaining'
{e·goˆa}	'grandchildren'

Appendix III: The post-lexical voiced stops in the text.

{b}

{tin ·pirakse}	→	{ti·birakse}	'it bothered her'
{stin pla·tia}	→	{stibla·tia}	'at the square'
{ton pa·pu}	→	{toba·pu}	'the grandfather/ACC'
{ton pa·tera} (twice)	→	{toba·tera}	'the father/ACC'

{d}

{tin te·tarti}	→	{tide·tarti}	'on Wednesday/ACC'
{Den tus mi·lusa}	→	{Dedusmi·lusa}	'I didn't talk to them'
{Den ti stenaxo·ruse}	→	{Dedistenaxo·ruse}	'it didn't use to upset her'
{Den ton fo·vomastan}	→	{Dedonfo·vomastan}	'we were not afraid of him'
{Den ton fi·lusame}	→	{Dedonfi·lusame}	'we did not kiss him'

{g}

{tin kra·vji}	→	{tigra·vji}	'the cry/ACC'
{tin kavali·cevo}	→	{tigavali·cevo}	'I mount it [the mare]'
{den ·ksero}	→	{De·gzero}	'I don't know'
{ston ·cipo}	→	{sto·*ɟ*ipo}	'in the garden'
{ton ka·vVaDon}	→	{toga·vVaDon}	'the quarrels/GEN/PL.'