Palatalization in Educated Cairene Arabic

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Abstract

In the speech of some educated Cairenes, the coronal stops /t d tˤ dˤ/ acquire a secondary palatal articulation before high front vowels and glides, resulting in [tʲ] or [dʲ]. Based on first-hand data, this article provides a detailed phonetic and phonological investigation of this palatalization process in an attempt to fill a descriptive gap in the literature on Cairene Arabic. By examining the full range of triggers, targets, and potential blockers, I demonstrate that this is a phonetic coarticulatory effect, and that it should be distinguished from phonological assimilation. I also explore the hypothesis that this process – characterized as a sound change in progress – has been phonologized in a different sociolect of Cairene Arabic.

1. Introduction

The term *palatalization* covers a range of phenomena; some are synchronic, phonetic or phonological, and others diachronic. Palatalization processes are known to apply in a local fashion, and are triggered primarily by front vocoids (vowels and glides) and less frequently by mid front vowels (Kochetov 2011: 1672). As a rule, the output consonants have some palatal articulation, and the nature of that articulation distinguishes two major types: secondary palatalization and full palatalization (Bateman 2007).

The first type of palatalization involves the addition of secondary, i.e. vocalic, palatal articulation to the target consonant, while keeping its primary articulation intact. This is often allophonic, as in the English word *canteen*, with [tʲ] (van de Weijer 2011). In some languages, such as Russian, a contrast may develop between consonants with secondary palatal articulation and their non-palatalized counterparts, e.g. [nʲos] 'he carried' vs. [nos] 'nose' (see Padgett 2003). The other type involves mutations of velar or alveolar/dental stops to palatoalveolar affricates in the neighborhood of front vowels and palatal glides. These shifts in primary articulation, e.g. /k/ or /t/→ [ʧ], are commonly historical but may also have a synchronic status.

This article examines a process of secondary palatalization (the first type) in Educated Cairene Arabic,[1] which has been characterized as a sound change in progress. The process is commonly referred to as *weak palatalization* (henceforth WP), and involves the addition of a secondary palatal articulation to coronal stops before various realizations of high front /i/. Since both plain /t d/ and emphatic /tˤ dˤ/ undergo WP, it is also necessary to consider how WP interacts with pharyngealization (emphasis spread) in this dialect. My main goal is to determine whether the shift to palatal [tʲ] or [dʲ] is phonetic coarticulation or phonological assimilation (see Cohn 2007 for a discussion of why coarticulation and assimilation are not the same). I will provide acoustic and data-grounded evidence that WP is only a phonetic coarticulatory effect, i.e. it is *not* part of the phonology of educated Cairene. Furthermore, I will bring up the case of full palatalization (the second type) in an uneducated sociolect of Cairene Arabic, and discuss the hypothesis that weak and strong palatalization represent two consecutive stages through which a sound change may take place.

Palatalization in Cairene has been analyzed in a sociolinguistic study by Haeri (1994, 1997), which also includes a basic phonetic description. And while no reference is made as to its phonetic vs. phonological status, Watson (2002) analyzes the process (in the autosegmental framework) as

[1] Although Cairene Arabic is often characterized as a homogeneous variety, one cannot help but notice a major split based on social class and educational status. The process described in this study is limited to the speech of middle-class, educated speakers, which is roughly equivalent to Badawi's (1973) *'āmmiyyat al-mutanawwirīn* (or semi-literate spoken Arabic).

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phonological based on Haeri's generalizations. WP is also briefly mentioned in Badawi (1973), Royal (1985), and Woidich (2006) as a property of women's speech in Cairo, whereas Skogseth (2000) maintains that it is one of the characteristics that give Egyptian Radio Arabic, i.e. Modern Standard Arabic as spoken by Egyptian radio/TV announcers, its distinctive "Egyptianness".

Given the paucity of material on WP, I collected original data followed by careful examination of the patterns. Four informants were recruited: two personal female acquaintances and two students (a male and a female) selected from an adult class in translation at the American University in Cairo. The informants – all university educated, Cairo natives, in their twenties and thirties – were asked to read aloud six lists carefully prepared to test potential participating segments in WP. The stimulus words, which included ca. 10% fillers, were listed both in isolation and within carrier phrases. Around 200 target tokens were recorded, and samples representing all potential phonological contexts were analyzed using Praat 6.0.05 (Boersma & Weenink 2015).

The remainder of the article is organized as follows. First, I discuss the phonetic correlates of WP in Cairene based on spectrographic evidence; then I present the distributional patterns and argue that WP is a phonetic coarticulatory effect. Finally, I explore the phonologization hypothesis and conclude.

2. The Phonetics of Weak Palatalization

Secondary palatalization is defined articulatorily as a raising of the front of the tongue toward the hard palate, as for an [i] vowel, during the articulation of a consonant that has a non-palatal primary articulation (Clark et al. 2007:64). It is often more apparent at the release than during the primary constriction of a consonant (Ladefoged & Maddieson 1996:363). Palatalization of consonants with coronal articulation usually involves the displacement of the tongue, often producing a slightly different primary constriction location (ibid, p.365).

There are two main acoustic cues for palatalized coronal stops when compared to non-palatalized ones. First, the duration of the release noise burst and aspiration is longer for palatalized consonants. Shaheen (1979:88-9) points out that the period of aspiration separating the closure phase of [non-palatalized] coronal stops from vowel resonance is on average 30ms in initial position and 60ms in inter-vocalic position. Second, due to the presence of friction, the release of palatalized consonants is more gradual (Haeri 1997:48). Figure 1 shows WP of /t/ for one female subject, where the duration of the noise burst between the release of [t] and the onset of the following vowel [i] was measured at 81ms. This is the marked noise segment in the waveform, the end of which coincides with the onset of the voicing bar in the spectrogram. Note that the word-final [i] has a low F1 of 367 Hz and a relatively high F2 of 2710 Hz.

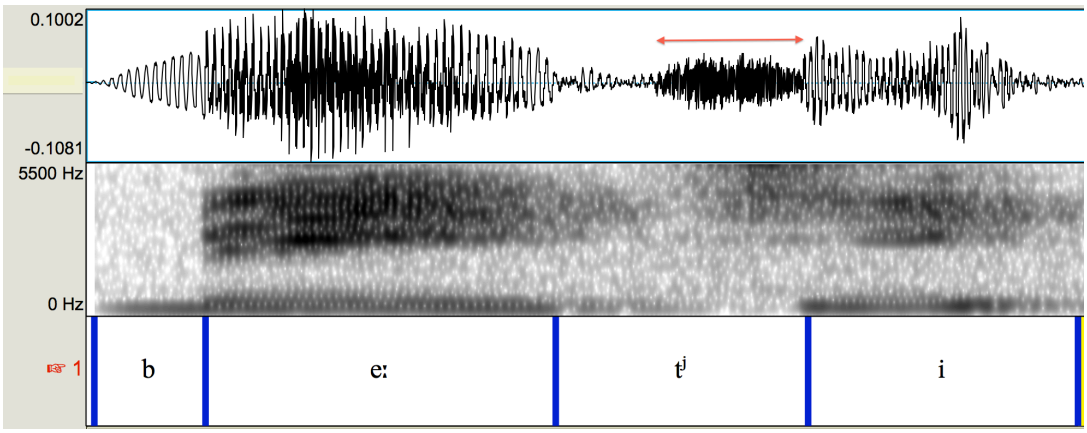

Figure 1. Spectrogram and waveform of the word /beːti/ 'my house' demonstrating a palatalized coronal stop [tʲ] before word-final [i] (38-year-old female speaker of Cairene)

Compare that to the non-palatalized coronal stop [t] in a related word pronounced by the same speaker (Figure 2). Here the duration of the release noise burst is 17ms, due to the aspiration on [t]. (According to Royal (1985:150), release duration could approach zero for unaspirated, non-palatalized consonants). This discrepancy in the behavior of word-final [i] versus mid [eː] as triggers of WP is often attributed to their phonetic height (see Section 4).

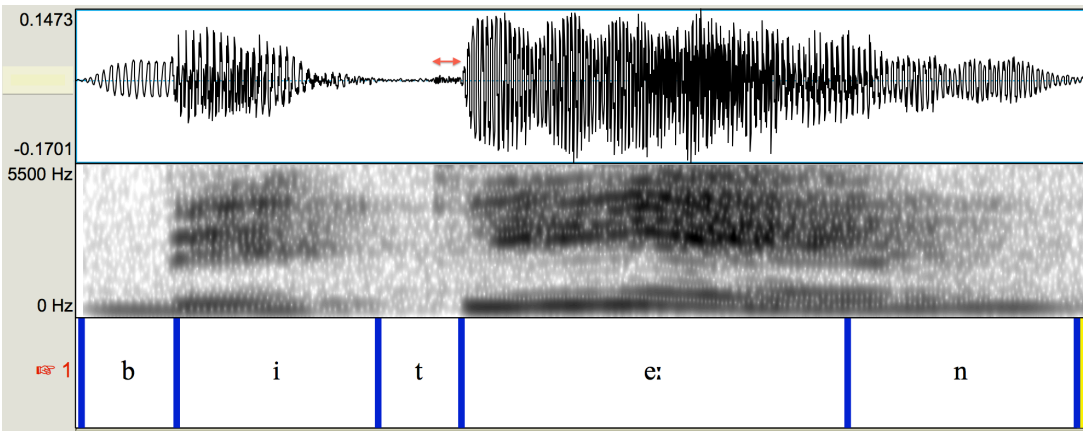

Figure 2. Spectrogram and waveform of the word /biteːn/ 'two houses' demonstrating a non-palatalized coronal stop [t] before [eː] (38-year-old female speaker of Cairene)

For the pharyngealized (emphatic) consonants /tˤ/ and /dˤ/, palatalization triggered by /i/ allophones is somehow puzzling. Let's explain why. It is well established that pharyngealized consonants in Cairene have a backing and/or lowering effect on adjacent vowels (Harrell 1957, Broselow 1976, Woidich 2006). In particular, high front vowels exhibit clear F2 lowering, pertaining to centralization, and F1 raising, pertaining to vowel lowering (see e.g. Schulte 1985:8, Norlin 1987:38). Figure 3 shows the effect of a pharyngealized coronal stop /tˤ/ on a non-palatalizing /i/, where the release noise burst for aspiration is only 12ms. Remarkably, the F2 frequency of [i] drops to 1960 Hz next to [tˤ] – compared to an average 2250 Hz next to plain [t]. This F2 drop takes the form of a transition (circled) which lasts for about 17ms, after which there is a shift toward a higher, steady-state F2 value for most of the vowel duration. In addition, the target [i] has a fairly high F1 frequency of 642 Hz.

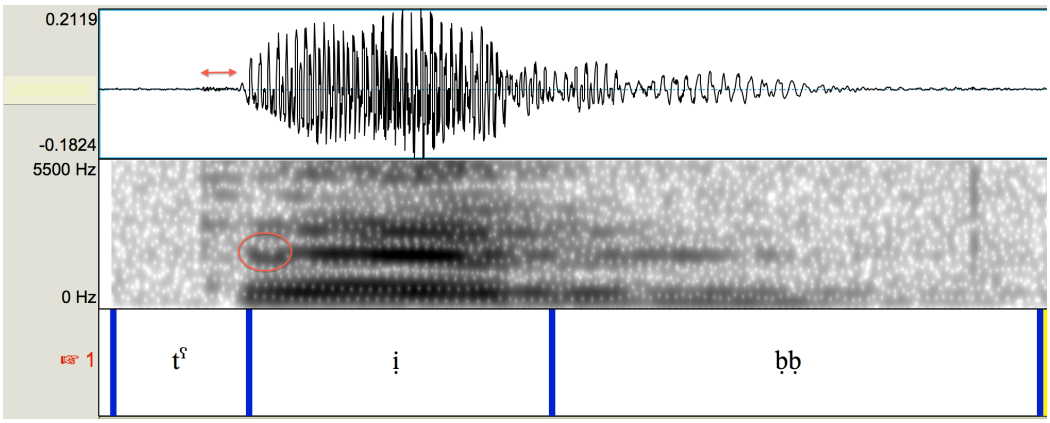

Figure 3. Spectrogram and waveform of the word /tˤibb/ 'medicine' demonstrating a non-palatalized coronal stop [tˤ] before non-final [i] (38-year-old female speaker of Cairene)

Ghazeli (1977) claims that a relatively large F2 transition characterizes [i] after a pharyngealized consonant, and describes the articulatory gesture underlying the transition as follows:

> "If the vowel following the pharyngealized consonant is palatal and front [i], the back of the tongue gradually moves forward to achieve the target position of the palatal vowel… it takes longer to move the mass of the tongue to reach the steady state of [i] from a pharyngealized consonant than from its non-pharyngealized counterpart. This difference in distance is translated into a long F2 transition" (p.79).

If we accept this broad interpretation of [i] under pharyngealization, then how could it trigger the palatalization of /tˤ/ and /dˤ/? Auditory judgements indicate that WP in Cairene targets coronal stops before [i] without regard to their underlying pharyngealization. This has led Haeri (1994, 1997) to suggest that when palatalized, emphatic consonants are articulated with weaker or no pharyngealization – i.e. they are de-pharyngealized – such that they are phonetically indistinguishable from their plain cognates. In the current study, this conclusion is verified by acoustic evidence showing that formant transitions for pharyngealization are covered by frication noise (see below). Further evidence comes from what we may call *gender complementary distribution* of pharyngealization and palatalization in Cairene, whereby women display more palatalization and men more pharyngealization. Female speakers with little or no WP generally show stronger pharyngealization effects when compared to speakers with abundant palatalization. Most women, however, tend to "conceal" pharyngealization by one of two strategies (Royal 1985:104). One is a *fronting strategy* by which speakers do not place the tongue far enough back in the production of pharyngealized consonants. The other is a *disguising strategy* by which speakers start with the tongue in a backed position for the pharyngealized consonant but accomplish most of the tongue movement forward to the [i] target before the onset of the vowel.

In addition to the strategic articulatory weakening of pharyngealization, WP of /tˤ/ and /dˤ/ also has an impact on their audible pharyngealization. Increasing the duration of consonantal noise delays the onset of vowel voicing and also decreases the proportion of the F2 transition that is most salient during the vowel (cf. Royal 1985:105). The spectrogram and waveform in Figure 4 display WP of /tˤ/ in the word /nuttˤi/, where the release noise duration is 82ms (nearly identical to the noise duration in Figure 1). The F1 value for the final [i] is 407 Hz, which is higher than that of [i] in Figure 1 (367 Hz) but lower than that of [i] in Figure 3 (642 Hz). The F2 value for the same vowel is 2350 Hz, which is lower than that of [i] in Figure 1 (2710 Hz) but higher than that of [i] in Figure 3 (1960 Hz). In what appears like a masking effect, the turbulent noise portion of the target consonant – marked by the arrow – conceals the F2 transition to the following vowel, leading to phonetically inaudible pharyngealization. Compare that to Figure 3, where the formant transition is *not* masked, and the following vowel is properly centralized.

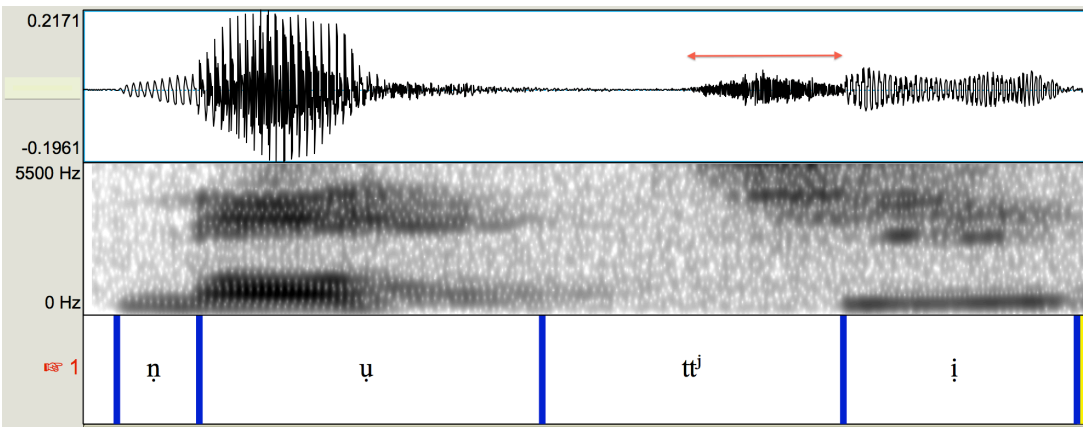

Figure 4. Spectrogram and waveform of the word /nuttˤi/ 'jump! F.SG.' demonstrating a palatalized coronal stop [tʲ] before word-final [i] (38-year-old female speaker of Cairene)

The findings of this section reaffirm Haeri's observation that upon secondary palatalization of /tˤ/ or /dˤ/, the emphatic character is phonetically suppressed, either partially or completely. It is simply not possible to be simultaneously palatalized and pharyngealized. However, concealing an acoustic cue does not mean the loss of the corresponding phonological feature unless there is contrastive evidence to that effect. The data in the following section illustrate that WP does not result in the loss of pharyngealization on preceding and following segments.

3. Patterns of Weak Palatalization

This section is devoted to illustrating the context of (non-)application of WP. Palatalization of the coronal stops /t tˤ d dˤ/ (singleton and geminate) is triggered by certain realizations of a following high front vowel phoneme /i/; namely the glide [j], long [iː], and word-final [i]. It is not triggered by word-internal or epenthetic short [i]. In addition, my informants showed no instance of WP before [eː] or any other vowel (e.g. front low or back), before another consonant, or before a pause. (These are contexts claimed by Haeri (1997:58) to trigger WP, though quite infrequently.) Note that the effect of pharyngealization spread from /tˤ dˤ/ remains on the vowels,[2] depicted with a dot underneath the symbol or above symbols with descenders.

First, the palatal glide [j] always triggers WP of /t tˤ d dˤ/. This takes place within morphemes or across word-boundaries, as exemplified in (1a-b).

(1) [j] as a trigger of WP

a. [madʲˈjuːn]	'indebted'	[ˈdeːn]	'debt'
[ˈhadʲja]	'calm F.SG.'	[ˈʔahda]	'calmer'
[ˈf̣adʲj̈a]	'empty F.SG.'	[ˈʔ̣af̣dˤa]	'emptier'
[ˈẉat̪ʲj̈a]	'low F.SG.'	[ˈʔ̣aw̪tˤa]	'lower'

b. [ˈnaːmit] but [ˈnamitʲ ˈjaʕni] 'she went to sleep, I mean'

[ʔil-ˈwalad] but [ʔil-ˈwaladʲ jiˈʔullik] 'the boy tells you F.SG.'

Long surface [iː] is always stressed and triggers palatalization across the board. The alternations below show how WP is triggered by [iː] morpheme internally (2a) or at morpheme boundaries before the plural suffix *-iːn* (2b). This does not apply to word boundaries since no word may start with a vowel in Cairene.

(2) [iː] as a trigger of WP

a. [ʔaˈt̪ʲiːl]	'one killed M.SG.'	[ˈʔutala]	'ones killed'
[b̪aˈt̪̣iːʔ]	'slow M.SG.'	[b̪uˈtˤaːʔ]	'slow PL.'
[ˈt̪̣iːn̪̣a]	'mud'	[ˈtˤaj̈j̈in̪]	'he daubed with mud'
[baˈdʲiːl]	'substitute'	[baˈdaːjil]	'substitutes'
[n̪̣iˈdʲ̣iːf]	'clean M.SG.'	[n̪̣uˈdˤaːf]	'clean PL.'

b. [siˈttʲ-iːn] 'sixty' [ˈsitta] 'six'

[m̪̣aḇsuˈt̪ʲ-iːn̪̣] 'pleased PL.' [m̪̣aḇˈsuːtˤ] 'pleased M.SG.'

[mawguˈdʲ-iːn] 'present PL.' [mawˈguːd] 'present M.SG.'

[ʕ̣addˤaˈdʲ-iːn̪̣] 'given to biting PL.' [ʕ̣aˈddˤaːdˤ] 'given to biting M.SG.'

WP is not triggered by the long mid vowel [eː] either morpheme-internally or across morpheme boundaries, as shown in (3).

[2] Pharyngealization spread in Cairene is a bidirectional process with no blockers, triggered primarily by the consonants /tˤ dˤ sˤ zˤ rˤ/, affecting all vowels and consonants in the prosodic word domain (see Harrell 1957, Schulte 1985, Watson 2002, Youssef 2014, *inter alia*).

(3) Lack of WP before [eː]

[teːs]	'bull'	[tˤeˌːr]	'bird'
[deːn]	'debt'	[dˤeˌːf]	'guest'
[binˈt-eːn]	'two girls'	[χaˈttˤ-eˌːn]	'two lines'
[xaˈdd-eːn]	'two cheeks'	[bˌiˈttˤ-eˌːn]	'two eggs'

Short [i] triggers WP only when it is word final. In addition to word-final non-suffixal [i] (e.g. CVCV verbs ending in *-i* in (4a)), both derivational and inflectional [i] suffixes trigger WP of preceding coronal stops /t tˤ d dˤ/ for all four speakers (4b-c). Note that word-final vowels in open syllables are never stressed, with the single exception of [di] 'this' (Broselow 1976).

(4) Word-final [i] as a trigger of WP

a. [ˈwˌitʲi]	'he got lower'	[wˌiˈtˤeˌːt]	'I got lower'
[ˈhidʲi]	'he calmed down'	[hiˈdeːt]	'I calmed down'
[ˈrˌidʲi]	'he became satisfied'	[rˌiˈdˤeˌːt]	'I became satisfied'
b. [ʕafaˈriːtʲi]	'devilish'	[ʕafaˈriːt]	'devils'
[naˈbaːtʲi]	'vegetarian'	[naˈbaːt]	'plant'
[ˈwˌaːtʲi]	'low M.SG.'	[ˈwˌattˤˌa]	'he lowered'
[ˈʕaːdʲi]	'normal M.SG.'	[ˈʕadda]	'he crossed'
[ˈʔˌaːdʲi]	'judge'	[ˈʔˌadˤˌa]	'he carried out'
c. [ˈbeːtʲ-i]	'my house'	[ˈbeːt-u]	'his house'
[ʃˌaˌnˈtˤˌitʲ-ˌi]	'my handbag'	[ˈʃˌaˌntˤˌa]	'handbag'
[χaˈbˌattʲ-ˌi]	'you hit F.SG.'	[χaˈbˌattˤ-ˌu]	'I hit him M.SG.'
[ˈsiːdʲ-i]	'my lord'	[ˈsiːd-u]	'his lord'
[ˈʕˌaddʲ-ˌi]	'bite! F.SG.'	[ˈʕˌaddˤ-ˌu]	'bite him! M.SG.'

Epenthetic [i] at both morpheme and word boundaries does not trigger WP.[3] Take the example [χˌaddˤ] 'he scared' ~ [χaˈddˤˌi-ˌni] 'he scared me', in which the epenthetic [i] is inserted before the consonant-initial suffix *-ni* to avoid impermissible CCC clusters. Note that stress shifts to the (bolded) epenthetic [i] in (5a); thus we know that it is not just a phonetic transition. Similarly, no palatalization is observed when [i] is inserted at word boundaries, as shown in (5b).

(5) Lack of WP at morpheme and word boundaries before epenthetic [i]

a. [binˈt**i**-na]	'our daughter'			[ħˌuˈttˤˌ**i**-ˌnˌa]	'put M.SG. us!'
[χˌaˈddˤˌ**i**-ˌni]	'he scared me'			[ʃaˈdd**i**-ni]	'he pulled me'
b. [bint]	'daughter'	+ [ˈlajla] (name)	→	[ˈbint**i**-ˈlajla]	'Layla's daughter'
[ˌnˌuttˤ]	'jump! M.SG.'	+ [ʔilˈħabl] 'the rope'	→	[ˈˌnˌuttˤˌ**i**-ˌlˈħabl]	'jump the rope!'
[χˌaddˤ]	'he scared'	+ [ˈʔahlu] 'his folks'	→	[ˈχˌaddˤˌ**i**-ˈʔahlu]	'he scared his folks'

Non-final [i] is never a trigger of WP, regardless of stress. Examples of unstressed non-final [i] include disyllabic words containing [i] in their second syllable and longer words containing [i] in their first syllable (6a). Stressed non-final [iː]s include monosyllabic words with [i] nucleus, some disyllabic words with initial stress, and verbs that have shifted stress to their penultimate syllable after suffixation (6b). Note that shortening of a long [iː] trigger results in the loss of palatalization on the subsequent target,

[3] The phonetic quality of the epenthetic vowel is variable. While some speakers pronounce it as a lax high front [ɪ], others pronounce it as a lower schwa [ə]. This variation allowed Haeri (1997:52), who had a much wider sample of informants, to observe *occasional* WP across word boundaries, triggered by epenthetic [i].

whether or not there was stress shift, e.g. [bˌaˈttʲiːxˌ] ‘watermelon’ > [bˌaˈttˤiˌxˌ-nˌa] ‘our watermelon’ and [maˈdʲiːna] ‘city’ > [maˈdint-u] ‘his city’.

(6) Lack of WP from unstressed and stressed non-final [i]

a. [ˈtiktib]	‘you M.SG. write’	[ˈfˌitˤiˌr]	‘he had breakfast’
[ˈnidim]	‘he regretted’	[ˈnˌidˤiˌf]	‘he became clean’
[ˈsaːtir]	‘protector’	[ˈħidiʔ]	‘quick-witted’
[tirˈbaːs]	‘bolt’	[tˤiˈħiːnˌa]	‘tahini’
[dibˈbaːn]	‘flies’	[dibluˈmaːsi]	‘diplomat’
b. [tibn]	‘chopped straw’	[dibb]	‘bear’
[tˤiˌbˌbˌ]	‘medicine’	[dˤiˌʕˌf]	‘double’
[ˈtirmis]	‘Egyptian lupine’	[ˈtiniħ]	‘thick-skinned’
[ˈtˤiˌliʕˌ]	‘he came up’	[ˈdibla]	‘ring’
[tikˈtib-u]	‘you PL. write’	[niˈdim-na]	‘we regretted’

Finally, contrary to the claim that WP is blocked by an adjacent sibilant in a given domain (Haeri 1992: 172), my informants showed no sign of such blocking in the syllable or word domain, as shown in (7a-b). Since this blocking effect was explained via dissimilation, I tested words that have different sibilants (including the negation suffix -ʃ) both preceding and following the potential targets.

(7) WP with a sibilant in the syllable and word domain

a. [fiˈtˌiːsˌ]	‘for nothing’	[tˌiːzˌ]	‘buttocks’
[ma-ʃaħaˈttʲiːʃ]	‘you didn’t cadge’	[mˌaˌ-ʃˌaˌfaˈttˌiːʃˌ]	‘you F.SG. didn’t sip’
[mˌaˌ-ʃˌaˌbˌaˈttˌiːʃˌ]	‘you F.SG. didn’t cling’	[ma-jʔaˈddʲiːʃ]	‘he doesn’t cross’
b. [xaˈbas-tˌi]	‘you F.SG. baked’	[ʔˌaˈsˤaˌt-tˌi]	‘you F.SG. intended’
[ˈʕiʃtˌ-i]	‘you F.SG. lived’	[ˈwˌisˤtˌ-i]	‘my waist’
[ˈʃˌaˌrtˌ-i]	‘my condition’	[ˈmˌiʃˌtˌ-i]	‘my comb’
[ˈʔˌazˤdˌ-i]	‘my intention’	[ˈruʒd-i]	(male name)

To sum up, WP in Cairene targets the coronal stops /t tˤ d dˤ/, applying across the board and exclusively before the palatal glide [j], long [iː], and word-final [i]. It is not initiated by the phonetically lower word-internal or epenthetic short [i] or by the long mid vowel [eː]. Further, palatalization is not blocked by other sibilants in the same domain, and it does not interfere with pharyngealization spread. The following section is concerned with formulating an appropriate generalization of this pattern.

4. Is Weak Palatalization Phonetic or Phonological?

In order to explain the above distribution of /i/ triggers, two possibilities are entertained: stress and vowel height. It appears that the most problematic aspect is to determine whether or not short [i] is a trigger, and only one of these two factors can account for the empirical facts. This will also provide a clue to defining WP as either phonetic or phonological.

The first factor that could point to a phonological process is the role of stress. WP is triggered by long [iː], which is always stressed, but it is an artifact of Cairene stress that surface long vowels are only allowed in stressed position (Harrell 1957:61) while underlyingly long unstressed vowels are subject to shortening. The palatal glide [j] – which occupies the mora-less syllable onset position – is also a trigger regardless of syllable stress. Short [i] does not trigger palatalization word-internally, stressed or not; and when it occurs word-finally (always unstressed), it does trigger the process. If we assume that word-final [i]s trigger palatalization because they are unstressed (following Bhat 1978), we would also expect unstressed non-final [i]s to be triggers, which is factually incorrect. We conclude that (phonological) stress is an irrelevant factor for WP in Cairene.

The second factor is vowel height. From an articulatory point of view, surface realizations of /i/ in Cairene are distinguished by height (Haeri 1994:93). Most importantly, long [iː] is higher than short [i] throughout, and word-final [i] is higher than non-final [i].[4] Given that the most favored environment for palatalization is before high front vowels, Haeri argues that vowel height explains the following facts about palatalization: (i) that long [iː] and [j] are triggers regardless of word position; (ii) that [eː] environments do not trigger WP; and (iii) that short [i] is only a trigger word-finally but not elsewhere. Recall that the last fact was especially problematic for a stress-based account. My acoustic measurements confirm that word-final [i] is consistently higher than non-final [i]. The mean F1 value for ten final [i]s, all unstressed, is 385 Hz, while the corresponding mean value for ten non-final [i]s, divided between stressed and unstressed, is 602 Hz. The selected examples exclude any pharyngealized environments which cause raising of F1; but even in such cases, a final [i] has a lower F1 than a non-final [i] – e.g. 407 Hz in Figure 4 vs. 642 in Figure 3. As expected, epenthetic vowels pattern with non-final [i] in having a high F1 frequency. These observations denote that the discrepancy in the behavior of WP triggers is due to their phonetic height in different word positions, rather than their phonological feature specifications.

As for the targets, it is surprising to learn that the emphatic coronal stops /tˤ dˤ/ undergo WP. This is surprising given the feature analysis of emphatics as involving secondary [RTR] or [Dorsal] (e.g. Davis 1995, Youssef 2014), whereas a high front palatalization trigger has secondary [Coronal] (e.g. Clements & Hume 1995). Even if a V-node is allowed to host two place features simultaneously, there is an articulatorily grounded incompatibility between [Dorsal] and [Coronal] secondary place features (see Archangeli & Pulleyblank 1994:172-6). The result is that the emphatic coronal trigger depharyngealizes – perhaps necessarily – once it acquires a palatal quality, thus neutralizing with its plain counterpart. Nonetheless, pharyngealization still occurs throughout the rest of the word, indicating that WP is a mere phonetic effect.[5]

Shahin (2002:47) contends that, on the basis of economy considerations, a property should be treated as phonetic by default and should only be deemed phonological if and only if there is evidence that it is "phonologically visible". Hence, in the absence of any phonological evidence (such as lexical exceptions, sensitivity to word-internal structure, opacity effects, etc.), WP must be taken to be phonetic. It is indeed a coarticulatory effect, whereby the articulation of the target consonant is affected by the high and front position of the tongue in the production of the following vowel.

5. The Phonologization of Weak Palatalization

Some uneducated female speakers in Cairo exhibit a "stronger" palatalization in their speech. The process targets the coronal stops /t tˤ/ and to a lesser extent /d dˤ/ before specific realizations of the high front vowel /i/, and is blocked by a palatal fricative /ʃ/ in the coda of the same syllable. Strong palatalization, also known as affrication, is defined as a switch in the main place of articulation of the consonant "from apical to post-alveolar", as in /t/ → [ʧ] (Watson 2002:258). Youssef (2010) contends that strong palatalization in uneducated Cairene is phonological, as opposed to phonetic WP. And there is an interesting interplay between these two cases of palatalization from a sound change perspective.

Haeri investigates the hypothesis that palatalization in Cairene is a sound change in progress. The systematic distribution of weak and strong palatalization according to age, education, and social class supports this hypothesis. She observes that women in Cairo generally have frequent and advanced palatalization (see also Royal 1985:150), and concludes that they are the innovators of this sound change.

[4] Mitchell (1956:10) suggests that [i] has a tense quality when it is long or word-final, while it is realized as lax [ɪ] elsewhere. A discussion of the tenseness/laxness factor will not be included here.

[5] A reader for *Nordlyd* points out another analytical possibility offered by a rule-based framework: that this could be an instance of counterbleeding, where the palatalization rule applies after pharyngealization spread has applied. Under such analysis, WP belongs to the postlexical phonological level, and pharyngealization spread would have to be postlexical, too. This is hard to argue, though, since pharyngealization spread sometimes refers to the morphology.

This replicates findings in many other speech communities that women use the "non-standard" variants of changing variables more frequently than men do (Labov 1991).

In trying to answer the question of how recently this sound change took place, Haeri (in the absence of real-time data) makes conclusions based on comparisons of different age groups. Her results show that women above age 50 have no affrication, while in the next (30-50) age group there is a jump to 28% and up to 40% in the youngest age group. These findings suggest that affrication "probably did not exist for speakers above age 50 when they were children or adolescents [her data were collected in 1987-1988]. In other words, it was not part of the phonology of Cairene in the 1920s or 1930s" (1994:98-9). On the other hand, based on observations that the oldest age group has 15% WP, that WP is most salient in the 30-50 age group, and that affrication is replacing it for the youngest age group (see Figure 5), Haeri convincingly infers that WP preceded affrication.

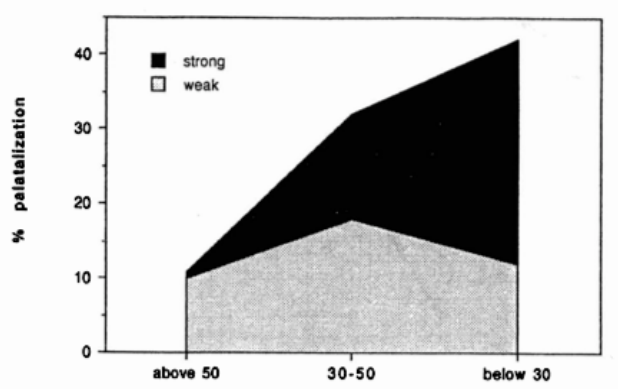

Figure 5. Correlation between frequency of weak and strong palatalization and age
(reproduced with permission from Haeri 1994:101)

According to Haeri (1994:100-8), social class and education are among the factors influencing palatalization. WP is clearly exhibited in the speech of highly educated upper and upper-middle class women (29%), which adds to its cosmopolitan and urbane connotations. Affrication, on the other hand, seems to be a feature of less educated lower/lower-middle class women, and this may serve as a partial explanation to its stigmatization (see Geenberg 2012). If WP came in first, as argued above, then it was an innovation of upper/upper-middle class women, whereas affrication is replacing it for women below age 50 who are in the lower/lower-middle classes (Haeri 1994:105). What happened is that women of the latter group have taken a phonetic coarticulatory effect (namely, secondary palatalization) along phonological lines (namely, full palatalization). But how does such a sound change actually come about?

There is certain agreement among historical linguists that at some point during its active period, a sound change has a phonetic basis (Janda 2003). Thus, sound change occurs as phonetically conditioned variation superseded by speakers' enforcement of phonological and sociolinguistic conditions (ibid.). Hyman (1976:408) introduced the term *phonologization*, whereby over time low-level phonetic variation evolves into phonological patterns. What begins, then, as a predictable effect of phonetic context ends up unpredictable. In view of the well-established phonetic motivation for palatalization in coarticulation and auditory misperception (Kochetov 2011:1686), phonological affrication in Cairene can be understood as arising from sound change involving these phonetic factors. If upper/upper-middle class women started the phonetic coarticulation of coronal stops to following high vowels, one possibility is that lower class women – who generally want to imitate what is considered a prestigious sociolect – failed to perceive the exact phonetic environment and so generalized the triggers to other surface forms of underlying /i/, including the phonetically non-high epenthetic vowel and non-final unstressed [i] (see Youssef 2010). Another possibility is that the extension of the palatalizing environments and the realization of affrication is a marker of class identity expressing an opposition to the upper/upper-middle class. That is, there may

be covert prestige in strong palatalization so that speakers want to sound distinct from what might be an educated norm.[6] Under either interpretation, we can surmise that WP – by virtue of being extended to broader unpredictable contexts – has been phonologized, but remarkably in a different variety of Cairene.

6. Conclusion

Weak palatalization is a relatively known sociolinguistic phenomenon in Cairene Arabic, but the phonetic/phonological conditioning favoring it has not been studied in detail. This article explored the segmental classes involved in Cairene WP: its high front triggers, its coronal stop targets, and its secondarily palatalized outputs. Perhaps the most intriguing aspect is that although the emphatic coronal is depharyngealized when it palatalizes, pharyngealization spread is still present. This is a very interesting case of sociolinguistic variation introducing phonetic opacity to the system.

A fundamental issue for any study of palatalization is *when* it may actually be considered part of the phonology of a language, and *when* it is only an instance of phonetic coarticulation. I showed that WP is phonetic in educated Cairene but may have been phonologized in uneducated Cairene. In this way, one could propose some sort of chronological development from weak to strong palatalization in the two varieties. Whether or not this is provable, the generalizations drawn here provide details that would inform future sociolinguistic research on the topic.

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[6] I am grateful to an anonymous *Nordlyd* reader for calling my attention to this interpretation.

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