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A Laboratory Phonology Investigation Into The Vocalic Inventory of Lebanese

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Abstract

This dissertation is a descriptive analysis of the phonetics and segmental phonology of the vowels of the variety of Lebanese spoken in Central Mount Lebanon. The analysis relies on acoustic data collected from 19 native speakers in December of 2018, to establish the surface and underlying vocalic inventories of the variety. It then draws conclusions on the contrastive features that set the underlying vowels apart from one another, and on the shape and size of the inventory. The contrastive features are established through use of the Successive Division Algorithm. The result is a vocalic inventory consisting of a symmetrical long monophthong system of 6 phonemes, an atypical short monophthong system of 3 phonemes, a diphthongal system of 7 to 8 phonemes, and a long variable monophthong system of 1 phoneme whose realisation varies freely between two otherwise contrastive qualities.

Keywords: Lebanese, vowels, vowel systems, descriptive phonetics, descriptive phonology, phonological features.

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In attempting to work out how Lebanese adapts French loanwords, I learnt first and foremost that the literature on Lebanese segmental phonology is cruelly outdated. Patrick and Michael did encourage me to think outside the box, but even in the early days of writing my MSc dissertation, I knew that I was going to have to look into the phonetics of the variety to elucidate the patterns that make up its phonology. The plan was never to stop, but I would not have been able to find my footing and keep going had it not been for Patrick, Michael, and Dr Bert Remijsen, whom I was immensely fortunate to take a session on elicitation with. To Bert as well, I owe a debt of gratitude.

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Part I

Preamble

Chapter 1

Introduction

The dialects spoken in Lebanon are heavily prone to change, by virtue of the importance of foreign languages to everyday life within the country. And yet few are the studies (the latest segmental study of Lebanese to my knowledge dates back to 1971) that look at the phonetics and phonology of Lebanese, much less so specifically the vowels thereof.

The present dissertation aims to establish the vocalic inventory of Central Mount Lebanon Lebanese, which is a variety spoken in Central Mount Lebanon (that is, the Beirut Governorate, the Metn District, and the Baabda District — the capital city and the two most central districts within the Mount Lebanon Governorate). It shows influences from varieties from all around the country, as well as from English and French.

A vocalic inventory can be thought of as a set of vocalic phonemes, the features that define them, and the realisations each of them covers in speech. The analysis I present here starts by setting out a set of hypothetical categories of sounds, then proceeds by finding stimuli to elicit realisations of them, collecting recordings from native speakers, then discussing the phonetics and phonology of the categories that surface in realisation to deduce the contrastive categories, or phonemes, that make up the inventory. A featural analysis of the phonemes discussed ensues, to finally allow me to comment on the shape and size of the inventory.

Part I of this dissertation situates it in the literature. Part II covers my experimental design and the bulk of my phonetic and phonological analyses, including duration and length, the vowel space from the bottom to the top, diphthongs, and epenthesis. Part III draws conclusions beyond the immediate segmental analysis, touching on contrastive features and the shape and size of the inventory.

Chapter 2

The Sociolinguistic Situation

2.1 Arabic and Diglossia

Many studies have been done on the phonetics and phonology of Arabic, which is somewhat controversial because Arabic refers to a wide range of spoken varieties which differ widely in their lexicons, syntaxes, and phonologies, on the basis of a shared ancestry: they all relate to 8th century Classical Arabic. Classical Arabic itself was documented as early as the 8th century by Abū Bishr ‘Amr ibn ‘Uthmān ibn Qanbar Al-Baṣrī, a Persian grammarian best known as Sībawayh, in his five-volume grammar of the Arabic language Al-Kitāb (*‘The Book’*).

Today’s colloquial varieties of Arabic are, expectedly, very different from Classical Arabic (henceforth CA). The people who speak these varieties, however, for political and religious reasons, continue to refer to their spoken varieties as Arabic, all the while considering them corrupt versions (Fleisch, 1974, p. 3) of a so-called ‘Purest Arabic Language’ (اللغة العربية الفصحى), also known as l-ṣarabe l-naḥawe (*‘Grammatical Arabic’*) in Lebanon. Watson explains that this standard variety, termed Standard Arabic, started as CA (the medieval variant ‘based primarily on the language of the western Hijazi tribe of Quraysh with interference from pre-Islamic poetic koiné and eastern dialects [then] codified in the Qur’an;’ Watson, 2002, p. 8) and is now Modern Standard Arabic (henceforth MSA), a variety which maintained the morphology and syntax of CA, but underwent heavy changes in terms of lexis and stylistics. The Arabic language today thus has one standard variety and a number of regional and social dialects, such that the standard is nobody’s first language, being exclusively reserved for formal occasions

and more often written than spoken (Watson, 2002, p. 8).

According to Fleisch (1974, p. 3), the regional and social dialects can be grouped into two main blocs: the occidental Arabic dialects spoken in the area from Morocco to Libya, and the oriental Arabic dialects spoken in the area from Egypt to Iraq. These dialect blocs can be broken down into regions (Morocco, Algeria, Tunisia, Egypt, Palestine, Lebanon, Syria, Iraq), each of which has its own urban and rural dialects. All of these varieties are dialects spoken by sedentary speakers, and are distinct from the varieties spoken by the nomads of Mauritania, Southern Algeria, Southern Tunisia, Egypt and the Arabian peninsula.

According to Watson (2002, p. 21), major lexical contrasts¹ in Arabic are indicated through consonants, and this fact is reflected in the Arabic script, a so-called ‘impure’ abjad² which consists of consonants and glides, and occasionally represents short vowels (typically only to make reading easier for beginners). Most colloquial varieties of Arabic are rarely, if ever, written, because they are considered ‘imperfect’ versions of the standard (which, itself, is written). Informal text messaging between friends and family is an exception.

2.2 Of Standards in Lebanon

In my experience, Syrian people (the closest Arab population to the Lebanese people, geographically) have a tendency to text in the Arabic script (probably in part because all high school subjects are taught in MSA in Syria), whereas Lebanese people typically use a transcription scheme consisting of the latin alphabet with its letters’ English or French phonetic values, complemented by arabic numerals for the sounds that are not typically represented in the latin alphabet (those are typically represented with digraphs in more formal or official transcriptions, such as registration documents requiring for names to be written in latin letters; see (1)).

- (1) a. The first name غازي /^hgæ:zi:/ is transcribed as <Ghazi> on passports for instance. It can also be transcribed as <8azi> via text message, although the

¹Major lexical contrasts refer to semantic fields. One example that is widely cited is the root KTB, to which, among others, *kitab* ‘book’, *kāteb* ‘writer’, and *kitāba* ‘a writing’, all relate.

²An abjad is a writing system in which each symbol stands for a consonant. Impure abjads represent vowels as consonants-sized characters, diacritics, or both.

standardization of using digraphs in names (such as <gh> for /ɣ/, or <kh> for /x/) tends to be reflected in other transcription schemes.

- b. An accepted transcription, for instance to send as a text message, of an utterance such as

[jære:t fiʒe ne:m bæki:r l xæmi:s w fi:ʔ se:ʔt l bæd:e l zəmʕa]

‘*I wish I could [go to] sleep early [on] Thursday and wake up whenever I wanted to on Friday.*’ could be <yaret fiye nem bakkir l5amis w fi2 se3t l bade ljem3a.>

There is a divide in how people transcribe³ things (when text messaging for instance) which is informed by their pronunciation as well as their language of instruction (see (2) for example). The fact that people tend to transcribe things in ways informed by their pronunciation might be informative for phonemic analyses (since their orthography is, in a way, a representation of how they conceive of words). This is discussed in more detail by Elhij’a (2012).

- (2) In my experience, the word /ʃwæj/ ‘*a bit*’ is likely to be transcribed as <chwe> by a French-educated Metni person who pronounces it [ʃwe:], or <shwi> by an English-educated Beiruti person who pronounces it [ʃwa:j] (among other things, due to the English name of the latin monograph <i>) or [ʃwæj:]. Conversely, /ʃi/ ‘*something*’ is likely to be transcribed as <she> or <shee> by an English-educated person, and as <chi> by a French-educated person (<shi> is also possible if they were then exposed to English orthography, for instance).

According to Fleisch (1974, p. 5), since plains allow exchanges to occur over larger distances, dialects over plains are more uniform; whereas mountains compartmentalise populations and mountain people are thus more likely to live in small communities, which favours dialectal fragmentation. It isn’t surprising, therefore, that there exist many more dialects of Lebanese (from the mountainous areas of Lebanon) than there do of Syrian (from the Syrian plains), for instance (Fleisch, 1974, p. 6). Besides, the lack of a true written standard (despite the developing standard orthography which is emerging from text messaging among people from different areas and educational backgrounds),

³I use ‘transcribe’ rather than ‘write’ to say that Lebanese people are approximating an orthography based on how they speak. To say that Lebanese people *write* things in Lebanese would be to imply some standard orthography at some level.

means that there is no abstract ‘standard’ in a sociolinguistic sense that people hold each other to (despite the fact that, as Fleisch (1974, p. 6) goes on to say, dialects become a way for a social group to affirm their unity). It is no wonder, then, that, working on Lebanese, Haddad (1984) points out that ‘no matter to what extent the variables (in a sociolinguistic sense) have been restricted or narrowed down, such as interviewing male peers of the same dialectal area, or even brothers or sisters, no less variability has been observed,’ and that, still working on Lebanese, Gouskova and Hall (2009) find that ‘even subjects recruited in Lebanon, from a small area, would likely be linguistically heterogeneous.’

2.3 Research on Lebanese

This doesn’t prevent Bergsträßer, as early as 1915, from discussing some (three, according to Fleisch, 1974) Lebanese dialects as part of his *Sprachatlas von Syrien und Palästina* (although, as Palva (1984, p. 4) says, ‘it was based on a very short field study that covered the Syrian Arabic dialect area [...] and was only complemented with scattered [...] unreliable data collected from the literature’). Feghali discusses the dialect of Kfar ‘Abīda in 1919. Cantineau discusses the distinction between nomadic and sedentary varieties in the area in 1939. El-Hajjé discusses the dialect of Tripoli in 1954. Fleisch (1974) investigates a few Lebanese dialects a little more in-depth (with some attention given to the phonetics of the dialect of Zahle (p. 55-65), but then much less given to that of dialects such as that of Shhīm (p. 204-207), Kfar S’ḡab (p. 221-227), Zyarta (p. 264-267) or of ‘a Southern Lebanese Shiia dialect’ (p. 313-319)). He also presents transcriptions of dialectal texts from Jal Ed-Dīb (p. 344-349), Châtīne (p. 350-353), Bzīza (p. 354-357), Qnāt (p. 358-362), Kafar Dlâqôs (p. 363-366), and Hadchīte (p. 367-374).

Many other studies also take a phonetic or phonological approach to looking at Lebanese in general, rather than at specific dialects thereof (for example Nasr, 1955; Obégi, 1971; Abdul-Karim, 1980; Haddad, 1984; see chapter 4). Muhaydli (1996), working in loanword phonology, uses previous analyses of the phonemic system of Beirut Lebanese.

Since both dialectal and cross-dialectal approaches have been taken, and despite the fact of extreme variation across speakers, it is possible to speak of Lebanese as a general continuum of dialects, just as well as it is possible to discuss more localised dialects.

2.4 Central Mount Lebanon Lebanese

It is important to define with some precision the variety one is discussing, if only in the interest of allowing other researchers to make use of one's findings (this is in fact a problem I have faced when presented with discussions of dialectal Lebanese, which were simply being referred to as 'Lebanese' but were also clearly discussing a regional variety (as evidenced by the data presented). The time dimension tends to make this even more complicated, since, as I discuss in section 4.1, Lebanese varieties seem to be in rapid evolution. The end result is that one researcher could be referring to a variety spoken in a specific village of Mount Lebanon in 1955, another researcher would be referring to a variety spoken in Beirut in 1996, both could be calling their varieties 'Lebanese' (when in fact both varieties would be subvarieties of Lebanese), and then someone using both these data just over half a century after the first was published would end up with incompatible if not downright contradictory data.

2.4.1 On Central Mount Lebanon

The dialect I am working on is spoken in 2018 in Central Mount Lebanon. I define the particular area in question as the Beirut Governorate, the Metn District and the Baabda District, such that the latter two are the most central of the districts within the Mount Lebanon Governorate. These areas therefore make up the epicentres of Central Mount Lebanon Lebanese (CMLL henceforth).

It is important to note that CMLL is a dialect that is heavily influenced by varieties from all around the country, as well as by (mostly North American) English (due to globalisation, the internet and Anglophone universities) and (mostly French) French (due to the French mandate of the second quarter of the

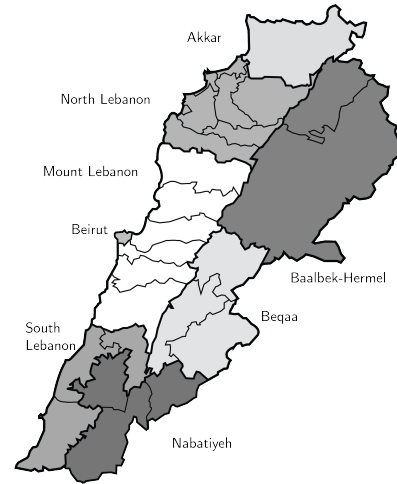


Figure 2.1: The Governorates of Lebanon (Localiban, 2016)

20th century, and Francophone universities). This is much more relevant to Beirut than it is to the rest of Lebanon, mainly because people living or working in Beirut have reasons to be in contact with some or all of these varieties, which they will then take home to their villages or cities north, south and east of Beirut; whereas people from outside Central Mount Lebanon in general have little to no reason to move from their districts to a city that isn't the capital (that is, a citizen from a town near Tripoli, in the northernmost governorate, is more likely to move to downtown Tripoli than to move to downtown Saida in the southernmost governorate). The reasons why that is are threefold.

First, since Beirut is the capital city of Lebanon, it attracts people from everywhere in the country; and people who work in Beirut proper but cannot afford to live in Beirut will find it more affordable to move to the area surrounding it (eg. the districts of Metn or Baabda) than to commute from farther away.

Second, schools teach all of the STEM (Science, Technology, Engineering, Mathematics) subjects (practically everything except Arabic Literature, Civics, History, Geography and Philosophy) either in English or in French; official examinations are then taken in one or the other language, and schools are required by the curriculum to teach their students a third language as of the seventh grade (Shaaban & Ghaith, 1999). The linguistic attitudes of Lebanese students are naturally impacted by the language they study everything in at school, some more than others; so that whether one is 'French-educated' or 'English-educated' quickly becomes 'a salient identity marker in Lebanon' (Sakr, 2017; Diab, 2005).

Finally, since many of the country's more international universities⁴ have a campus in the area; and since international companies that do business in English or French⁵ have offices in the area, almost everyone within Central Mount Lebanon has to have at least a few interactions per day (if only on paper, by email or on the telephone) in one or the other; and everyone else in Central Mount Lebanon has to interact, every day, with at least one person who speaks English or French.

In other words, *most* people in the area *have* to use English or French at least once per day (generally both, and more than once a day), and the people who don't, end up interacting with people who do.

⁴The American University of Beirut, the Lebanese American University, the *Université Saint Joseph*, etc. They often employ American or French staff, and fundamentally operate either in English or in French.

⁵Mainly the service industry in the form of hotels, resorts, restaurant chains, car showrooms, banks...

2.4.2 On Speaking ‘Properly’

Another noteworthy point is the tendency of people to want to speak ‘properly.’ Lebanese students pick up their local dialects at home and then learn Modern Standard Arabic at school; and since there seems to be consensus that local Arabic dialects are corrupt versions of Modern Standard Arabic (see section 2.1), it is only natural that people have a tendency to try to standardise their speech, particularly in melting-pot situations where their interlocutor comes from somewhere else, in Lebanon or the Arab world at large, than they do. The idea that MSA is a more ‘proper’ version of Lebanese permeates everyday speech to the point where borrowings from MSA into Lebanese occur on a daily basis, often without the speaker being aware that they are using a borrowing (it could even be argued that an instance where a word is ‘borrowed’ from a Standard dialect of Arabic into a spoken dialect of Arabic is rather a style shift than a borrowing). MSA words that a speaker of Lebanese may never think of using in Lebanese end up being used, to the point that they become part of the language, see (3).

- (3) The passive form of Lebanese /ʔa:l/ ‘*he said*’ is /n+ʔa:l/ ‘*it was said*’.

The passive form of MSA /qa:læ/ ‘*he said*’ is /qi:læ/ ‘*it was said*’.

The Lebanese expression /bælæ ʔa:l w ʔi:l/, literally ‘*without he-said and it-was-said*’, meaning ‘*give me the facts (ie. not a rumor)*’, makes use of a Lebanized pronunciation of MSA /qi:læ/ (where /q/ > /ʔ/ and the inflection is dropped so that /qi:læ/ > /ʔi:l/). The form /ʔi:l/ by itself would not be understood in other contexts.

2.4.3 A Melting Pot Dialect

With the caveat that any attempt at generalising the description of a language variety as abstracted from its speakers, and the added caveat that there exist large amounts of interspeaker variation in this variety in particular, Central Mount Lebanon Lebanese is therefore what could be called a ‘melting pot dialect’ built on a substratum of older Beiruti, Metni and Baabdati dialects, with heavy influences of spoken varieties from across the country, as well as heavy influences of standard French, standard Arabic, and North American English. Therefore, for a community of speakers as diverse as that of Central Mount Lebanon, it could be argued that the search for a ‘pure’ variety, if the hope is to document the linguistic reality, would be counterproductive.

Chapter 3

Arabic Vowels in the Literature

Classical Arabic, undebatably one of the ancestors of Lebanese as it is spoken today, had three short vowel phonemes: palatal *i, labio-velar *u, and guttural *a. Certain dialects of Arabic have lost the contrast between *i and *u, collapsing to schwa. For many others, there still exists a contrast ‘in certain contexts’, although the emergence of a more centralised, neutral phoneme is observable (Watson notes that the ‘opposition between /i/ and /u/ [...] has been reduced greatly’; Watson, 2002, p. 22). Watson mentions the dialect of Tripoli (in the North of Lebanon) as one area where the contrast has been reduced.

3.1 Watson, 2002

Watson (2002, p. 22) also says that all modern dialects of Arabic have the long vowels /ā/ /ī/ and /ū/, and that they have diphthongs or monophthongs which are historically derived from the Classical Arabic diphthongs *ay and *aw. In the Levant, these are now realised as /ē/ and /ō/ respectively. Some Cairene speakers shorten these monophthongs in closed syllables, but the history of how these monophthongs came about motivates Watson not to consider them (the shortened versions) separate phonemes.

Watson (2002, p. 23) presents some evidence signifying that coalescence no longer applies in Cairene, to argue in favor of considering the mid long vowels ē and ō separate phonemes. Broselow (1976) points out that newer forms with diphthongs were preserved intact, so that mid-vowel monophthongs now contrast with derived diphthongs.

3.2 Al-Ani, 1970

In his 1970 book ‘Arabic Phonology’, Al-Ani investigated the phonology of what he calls Contemporary Standard Arabic (for our purposes, MSA) as spoken in Iraq, based on ‘a valid phonetic description’ he made ‘using [...] technical methods’ such as ‘X-ray tracings, impressionistic judgements and spectrographic displays’ (Al-Ani, 1970, p. 22). He highlights that, while ‘Contemporary Standard Arabic [is] commonly in use in all Arab speaking lands today’ and ‘the common medium of communication through out the Arab world,’ first, ‘it is not the everyday speech of the people’ and second, ‘the phonology varies, however slightly, from one Arab country to another’ (Al-Ani, 1970, p. 18).

In his discussion of vowels, Al-Ani identifies three qualities and two lengths of vowels, which he represents as /i/, /u/, /a/, /ii/, /uu/, and /aa/, and measures the duration and the first three formants’ values for each, within his own speech, having produced the vowels in isolation. He notes that ‘almost all vowels, when recorded, are initiated with a glottal stop,’ which he deems ‘reasonable’ because, he continues, ‘all words in Arabic begin with a consonant’ (Al-Ani, 1970, p. 22). By plotting the short and long vowels (see figure 3.1) according to their first and second formant measurements, Al-Ani finds that, in the case of /a/ and /aa/, ‘there is not only a quantity difference but a substantial quality difference as well’ (Al-Ani, 1970, p. 24).

He finishes his discussion of the vowels of MSA by presenting tracings of the position of the tongue for each vowel, such that ‘each short vowel and its long counterpart [are] placed on one tracing’ (Al-Ani, 1970, p. 24-25). According to his tracings and his analysis thereof, ‘there is little difference [in tongue position] between the long and short counterparts of [the high front and high back] vowels,’ (Al-Ani, 1970, p. 25) but ‘the tongue position with /aa/ seems lower and somewhat more retracted than with /a/’ (Al-Ani, 1970, p. 25).

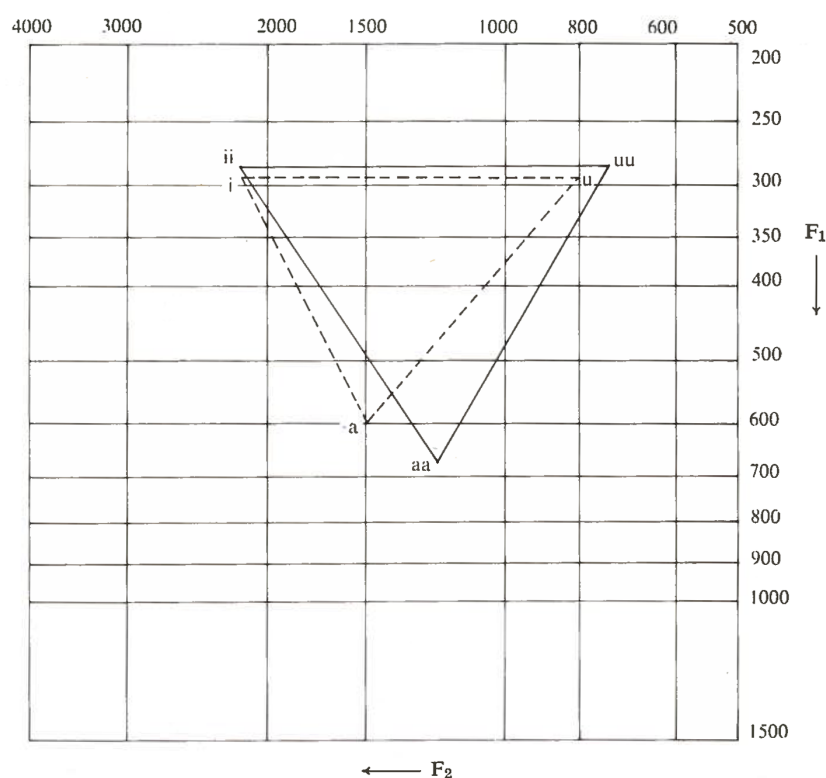


Figure 3.1: The Vowel Space of MSA (‘Short and Long Vowels in Isolation’) according to Al-Ani (1970, p. 25).

3.3 Gairdner, 1925

In ‘The Phonetics of Arabic’, Gairdner (1925) discusses the phonetics of Standard Arabic and of Cairene Arabic in great detail. ‘In Arabic’, he writes, ‘tongue and lips are held absolutely steady from start to finish. In other words, Arabic long-vowels are ‘pure’ (Gairdner, 1925, p. 35). He also points out that, in Arabic, ‘nasalizing is very marked and very unacceptable [sic.]’ (Gairdner, 1925, p. 36), and, speaking of the vowels /i/ /e/ /u/ /o/ /ɒ/ and /ə/, says that, in Arabic, they ‘[do] not differ from the cardinal [ones]’ (Gairdner, 1925, p. 38), also mentioning /æ/, /ʌ/ and /ɑ/ as phonemes of Arabic, effectively describing a quadrilateral such as in figure 3.2.

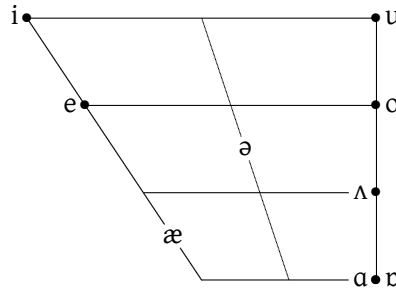


Figure 3.2: The Vowels of Arabic according to Gairdner (1925).

As far as Gairdner (1925) is concerned, ‘the Arabic long *u*: is perfectly pure’ and the use of lax *u* (meaning [ʊ]) follows a regular rule, making these allophones of a category of /*u*/.

According to Gairdner (1925), the use of [ɪ] ‘follows a regular rule’ (‘used when followed by a consonant terminating a syllable’) and the realisation should therefore be considered an allophone of /*i*/. He points out that short *i* (i.e. [ɪ]) tends to be modified ‘in the direction of the mixed [neutral?] position’ (Gairdner, 1925, p. 39) (which he explains as IPA [ɨ], ‘a sound exactly intermediate between *i* and *u*’ in a footnote; Gairdner, 1925, p. 39) when it is followed by the emphatics (which he refers to as ‘velarized consonants,’ but see section 3.4 below). He also makes it a point that when /*i*/ is succeeded by ‘one of these velarized consonants or by *q*, *x*, [ɣ], *ħ*, *ʕ* a glide-vowel is heard resembling the *ʌ*-sound in English *up*’ (Gairdner, 1925, p. 39). This cannot be forced however (‘to labour this [...] would be to exaggerate [such that a] proper pronunciation of the consonant will produce quite as much glide as is necessary’ (Gairdner, 1925, p. 40), making the resulting sound an intrusive ‘vowel’ in the sense of Hall (2006; see section 5.3 for more on intrusive vowels). Finally, when /*i*/ is preceded by a velarized consonant, the vowel is not perceptibly modified, but another intrusive vowel ‘resembling a very short *ʊ* is perceptible’ (Gairdner, 1925, p. 40), see example (4).

- (4) /sʕi:n/ [sʕu:i:n] ‘*China*’, compare to /si:n/ [sin] ‘*the letter s*’.

Gairdner (1925) mentions that Egyptian /*e*/ (which does not exist in Standard Arabic) has the value of cardinal /*e*/. It is prolonged, being a development of the diphthongal /*ai*/ (Watson’s **ay*), and occurs short when followed by two consonants. When /*e*/ or /*e*/ are preceded or followed by a ‘velar’ or other modifying consonant, phenomena may

be observed similar to those noted under /i: i/ but less marked, ‘as may be expected.’ Finally, after /sʕ/, ‘the rounding necessitated by the consonant is carried over to the vowel’ (Gairdner, 1925, p. 40). Likewise, the colloquial Egyptian /o/ is most likely to be found in long form, because it is derived from a diphthongal /au/ (Watson’s *aw), but it does also happen to occur short when followed by two consonants. /o/ is somewhat lowered after ‘the velarizing consonants.’

In the space of low vowels, Gairdner (1925) mentions /æ/, /ɑ/, and /ɒ/. The first, /æ/, is ‘by far the commonest Arabic a-phoneme’. It differs from the English /æ/ in that (1) ‘the highest point of the tongue is a little further back than in English *man* [...] in the direction of the sound in English *bird*’, (2) ‘the tongue is less lax than in English, because’... (3) ‘the [tip] of the tongue is held in firm contact with the lower teeth,’ and finally, ‘the lips are widely separated’ (Gairdner, 1925, p. 41). /ɑ/ is ‘practically as the long vowel in English *father*’ and is ‘only found long,’ such that the mouth is open wide and the tongue is low, but with the tip ‘withdrawn a little from the lower teeth’. /ɒ/ is ‘nearly as the short vowel in [British] English /what/’: flat tongue with the back rising a little.

He also introduces what he calls ‘vague’ vowels: /ʌ/, with a more central quality than /ɑ:/, which is always short and is realised somewhere towards the position of /ə/; and /ə/, which is frequent in colloquial Arabics both in rapidly and vaguely pronounced unaccented short vowels, and as a substitute for short /æ/ word-finally (except if preceded by a velarizing consonant: contrast wa:ḥidə and ʔɒli:zʕɒ). Gairdner (1925) finally notes that in Palestine and Syria, final feminine /a/ becomes /i/; whereas in Egypt this is /ə/.

There are, according to Gairdner (1925), two diphthongs in Classical Arabic: /æj/ and /æw/. They correspond to /æi/ and /æu/ in Colloquial, because in CA ‘the glide is carried up to the consonantal position.’ The diphthongs present the allophones /ɒi/ and /ɒu/ which are conditioned by the same rules as apply to /æ/ becoming /ɒ/ (Gairdner, 1925, p. 45).

Gairdner’s analysis gets a little confusing when he says that the five vowels /æ/, /ʌ/, /ɑ/, /ɒ/, /ə/ are all variants of the a-phoneme, members of the family which the Arabs called *fatha*, because he speaks of three of them as though they were each separate phonemes to begin with.

3.4 Note on Emphatics

Emphatics, as I explain in Sakr (2018, p. 12), are a category of consonants often listed in phonemic inventories of Semitic languages as a separate place of articulation.

The literature does not align when it comes to the phonetic value of emphasis, with some sources (Nasr, 1959, 1955) referring to it as *velarisation*, some (Watson, 1999; Davis, 1995; Obégi, 1971) referring to it as *pharyngealisation*, and some using both terms interchangeably (Naim, 1998, p. 93). It is at any rate undeniable that the feature ([+EMPHASIS]) is contrastive in Arabic.

Laufer and Baer (1988) use a fiberscope positioned in the upper pharynx to ‘[rule] out the theory that emphaticness is realised as velarisation’ both in Hebrew and in Arabic, and rather ‘are realised as pharyngealised, having a secondary articulation in the lower part of the pharynx’ (Laufer & Baer, 1988, p. 66). Until I can run my own analysis of emphasis, I will treat emphatics as pharyngealised consonants, and note them phonetically and phonemically as the corresponding plain consonant with the pharyngealisation mark [ʕ].

Chapter 4

Lebanese Vowels in the Literature

There exist many references to the Lebanese phonemic inventory in larger studies (see section 2.3), to which one might add my own from 2018. The variety Obégi (1971) describes as ‘the speech of the educated urban community whose members are almost exclusively Christians and who have received their formal education in French’ (Obégi, 1971) relates to the variety I refer to as Central Mount Lebanon Lebanese (see section 2.4) in that the former is a subset of the latter, which makes his study a good starting point for this one. Obégi (1971) is, to my knowledge, the most recent phonemic segmental study of Lebanese.

4.1 Nasr, 1955

Nasr works within the idea that ‘the aim of any linguistic analysis is to make people use a language’ (Nasr, 1955) and writes hoping to provide ‘linguistic basis for teaching materials’ (Nasr, 1955) that would allow the teaching of ‘American English to native speakers of Lebanese Arabic’ (Nasr, 1955); concepts which make me suspicious of his work to begin with (because the conceptions he describes sit on the edge of what linguists generally conceive of today, and appear to be rooted in a prescriptivist approach). He also announces that, within the United States of America, ‘the North Central dialect’ is ‘the one used by fifty to sixty percent of the population of the country’ (Nasr, 1955), and that he is therefore choosing it to ‘deal with’ (Nasr, 1955, p. 4). This first chapter of Nasr, 1995 is the only directly useful part to this discussion, as it attempts to provide a phonemic analysis of Lebanese.

Acting as his own informant (but conscious of the occurrence of ‘peculiarities’ due to his ‘particular linguistic background’ (Nasr, 1955, p. 4) in that he was born in Palestine and lived there for eight years, English was his first language and Arabic was his second language, etc), Nasr records five stories, six short proverbs, a list of words, and a conversation with another native speaker (on a phonograph record), then transcribes the recordings. He then extracts and lists the ‘different sounds in the corpus’ and sorts them into charts similar to those of the IPA (‘General type of Nonvocoid’ in rows and ‘Point of Articulation’ in columns, featuring ‘Grooved Fricatives’ and ‘Flapped Vibrants’ alongside categories such as ‘Stops’). Then, he lists the phonetic differences between ‘suspicious pairs’ of phones to decide whether they are phonemes or allophones. He thus concludes that some long vowels are segmental phonemes (Nasr, 1955), that gemination is ‘significant’ (Nasr, 1955, p. 2) (which I assume to mean contrastive) in Lebanese, and that no vowel can be found word-initially (it would be preceded by a glottal stop in the absence of other consonants; Nasr, 1955, p. 50). This last statement matches Al-Ani (1970, p. 22)’s note about MSA word-initial vowels.

After deciphering his data, which are not in any transcription scheme I am familiar with (he doesn’t mention a name for it, or explain it, until the chart, which he presents after the transcriptions — the symbols themselves are sometimes single characters, such as /9/ for the voiced pharyngeal ‘flat’ fricative, and sometimes pairs of characters, such as /Th/ for the ‘voiceless velarized aspirated two-segment stop,’ which I can only interpret as /t^h/) — I recorded myself reading an approximation of his transcriptions and sent it out separately to some native speakers who live in Central Mount Lebanon. They were all in agreement that the variety he discusses is at least close to the one the generation of my grandparents would have spoken; a variety I’d certainly not describe as today’s Central Mount Lebanon Lebanese in the form that I discuss. This is important, because it highlights that, even in as little as two to three generations, native speakers could rather accurately place the generation of the variety (1955 is in fact a few years before my parents were born); which suggests that the variety is in rapid evolution¹.

Nasr presents 7 vowels (/ii/, /i/, /ee/, /aa/, /a/, /uu/ and /u/) and 2 diphthongs (/ai/ and /au/).

It is also worth mentioning that Nasr (1955) refers to *emphasis* as *velarization*, which

¹But take this with a grain of salt. Their impressions are of my interpretation of his transcription scheme, which would have been an abstraction in the first place.

later authors generally disagree with. As for transcriptional purposes, he uses capital letters for emphatics (so /S/ for /sˤ/ for instance).

4.2 Obégi, 1971

Obégi is writing to describe ‘the phonemic system of a Lebanese dialect spoken in Beirut’ (Obégi, 1971). He begins by saying that dialects of Lebanese vary as a function of the religious affiliation of their speakers, noting however that the religious groups involved are concentrated in geographical areas (Muslims in the north and south, Christians in the mountains, and a per-district division in Beirut). He closes his sociological sketch by noting that ‘education is a strong leveling [standardisation] factor among the Christian mountain dialects in Beirut’ (Obégi, 1971), then points out some influence from French and from Classical Arabic (CA)² on the dialect he discusses. He underlines the fact that CA has more impact on Muslim dialects than Christian ones, because CA is the language of the Qur’an and that Muslims make more references to the Qur’an (that is, for instance, quoting it) than do Christians.

Obégi also discusses the influence of education, in that French was generally seen as the prestige language of Beirut, but also in that Modern Standard Arabic has been taking over as a language of education due to policies (Obégi says ‘Classical Arabic,’ but seems to mean Modern Standard Arabic or MSA here). I discuss this in more detail in Sakr (2017), but the policies Obégi refers to (particularly with regards to the Lebanese University, which he says teaches entirely in CA [MSA]) really remained in the realm of wishful thinking, as the Lebanese University also teaches in French and English. In more recent history than 1971, although French has indeed lost ground as a language of prestige, it is being replaced by English, rather than — as Obégi would have it in 1971 — CA [MSA].

Obégi collects his data on tape recordings in 1970, in Beirut. He doesn’t include it, but says that it consists of words lists, texts and conversations, is elicited in Lebanese, and is transcribed in ‘North American phonetic alphabet’ (Obégi, 1971, p. 3). He then proceeds to analyse each sound he identifies in his data by presenting descriptions and

²Obégi seems to use ‘Classical Arabic’ to refer to both Classical Arabic and Modern Standard Arabic. Most speakers of Modern Standard Arabic are unaware of the distinction, particularly due to language ideologies that support the idea that the Correct Arabic used in the Qur’an is unchanging. As seen in section 2.1, Classical Arabic is an older form of Modern Standard Arabic.

distributions of every single one, with at times such degrees of precision that I cannot help but doubt, considering the method used (as far as I can tell, he relies on listening to recordings made on tapes): that he could distinguish a *lax pharyngealised voiceless bilabial stop* from a *pharyngealised labialized voiced bilabial stop* with nothing but his ear and a tape recording seems a little hard to believe. Nevertheless, Obégi obtains, or at least lists, a large amount of phonetic data, and sorts it into phonological categories, which seem sound if one considers the data he sorts into them accurate.

He presents 8 vowels: /i:/, /i/, /e:/, /a:/, /a/, /o:/, /u:/ and /u/.

Finally, Obégi describes emphasis as *pharyngealisation*, and argues in favor of representing it as a ‘long component’, because ‘pharyngealisation often extends through a whole word’ (Obégi, 1971). This is in line with what later literature calls ‘emphasis spreading’ (see for eg. Van de Vijver, 1996; Davis, 1995; Haddad, 1984). He points out that pharyngealised consonants other than /t̤/, /d̤/, /ʃ/ and /z̤/ occur only with the vowel he transcribes as [a] (especially the consonants he transcribes as [b], [m], [n], [l] and [r]).

4.3 Abdul-Karim, 1980

Abdul-Karim sets out to discuss various aspects of the phonology of Lebanese (aiming to ‘focus on a general synchronic analysis of Lebanese Arabic, notwithstanding the numerous intradialectal differences;’ Abdul-Karim, 1980, p. 1). He starts out by mentioning that there are major differences between Classical Arabic on one hand and ‘the modern dialects of Colloquial Arabic’ on the other. He mentions that the medieval Arab grammarians worked on vowel duration, syllable structure and root patterns, but did nothing with regards to stress, which led him to believe that stress was of little to no importance to Classical Arabic. He makes it a point that modern colloquial dialects of Arabic (including Lebanese) have fixed word stress.

Abdul-Karim then presents ‘the phonetic system’ of Lebanese Arabic, in which he gives 5 vowels (/i/, /e/, /a/, /u/ and /o/), and ends his introduction by saying that ‘Lebanese has been the object of most intensive investigation by linguist [sic] working within the framework of structural linguistics’ (Abdul-Karim, 1980) but that ‘[his] is the first analysis of Lebanese phonology within the framework of generative phonology’ (Abdul-Karim, 1980). The very brief discussion of vowels (his entire analysis fits on pages 6 and 7) seems dismissive and oversimplified, particularly in his treatment of vowel length

(which he never really explains is a thing in Lebanese, but then mentions — note the brackets — ‘some dialects of Lebanese Arabic have a rule of lowering *short* i and u to e and o before a single consonant in word final position’, ‘among *long* vowels, five elements appear in the speech of the author [...],’ and, later, ‘the basic opposition between [u] and [uu] is one of *length*, but [this] is also supplemented by a quality difference’; Abdul-Karim, 1980, p. 6, emphases added). This analysis stands in stark contrast with the rigorous analyses of Obégi (1971) of vowel length as phonemic, even though the qualities described are the same. In other words, there are general categories of realisations that can be considered high-front vowels, mid-front vowels, high-back vowels, mid-back vowels, and low-central vowels, in both papers.

Throughout his paper, Abdul-Karim discusses stress assignment, the inflectional phonology of the verb, and the inflectional phonology of the noun, in Lebanese.

4.4 Haddad, 1984

Haddad’s introductory remarks point out the existence of studies on the phonology of Lebanese as early as 1911, all the while highlighting the diversity of dialects that have been discussed in terms of their phonology (he cites papers on *The Vulgar Arabic of Beirut*, the speech of Kfar Abida, the dialect of Ras al-Matn, and the dialect of Tripoli). He also makes reference to Fleisch’s 1974 *Études d’Arabe Dialectal* (Studies of Dialectal Arabic).

Haddad chooses to work on what Cantineau (1939) calls ‘differential’ accents of Lebanese. The idea is that a rule of syncope deletes short vowels in open syllables non-word-finally, but applies to all vowels in ‘non-differential’ accents and only to high vowels in ‘differential’ accents. Abdul-Karim (1980) mentions this notion in passing.

Using the notations of Chomsky and Halle (1968), albeit with some deviations he sets out at the beginning of his work, Haddad works on specific issues in the phonology of Lebanese: stress assignment, syncope, epenthesis, vowel melodies within verbs (that is, how some verbal categories, such as aspect and voice, are marked on different [verb forms] by a systematic change in the quality of the vowels of the stem; McCarthy, 1985, p. 281), some problems with syncope, and the neutralization of contrast between /i/ and /u/. This last point is what is most relevant to the present study.

According to Haddad (1984, p. 256), one of the ‘most salient’ ways Lebanese diverges from other Levantine Arabic dialects is ‘the loss of contrast between [i] and [u] in short

high vowels’ (Watson (2002, p. 21-22) reports that this loss of contrast is not quite so rare). The final chapter of his thesis discusses ‘the synchronic situation with respect to the distribution of [i] and [u] in [his own] speech’ (Haddad, 1984).

He points out that Lebanese, ‘like all modern Arabic dialects,’ has ‘emphatic spread’, i.e. that ‘the feature ‘emphasis’ spreads from [the emphatic] coronal consonant to ‘color’ all of the segments that fall within its span’ (p. 256) and the realisation of this feature on a vowel is that it makes said vowel ‘retracted,’ indeed a distinct allophone (p. 256). For Haddad, ‘emphasis is the property of individual consonants’ (p. 270) and ‘all occurrences of [u] can be derived from an underlying /i/’ (p. 257) — namely, he links emphasis with [u] both in native words and in loans (p. 304), referring to derivation as ‘the rounding effect of emphasis on high short vowels’ (p. 268).

4.5 Muhaydli, 1996

Muhaydli brings up the phonology of Lebanese as part of her 1996 dissertation on English-to-Lebanese loanword phonology. She simply lists the vowels — three short vowels /a/, /u/, /i/, five long vowels /a/, /u/, /i/, /e/, /o/, and two diphthongs /aw/ and /ay/. She adds the diphthongs /ei/ and /oy/ to her chart ‘because of their frequent occurrence in the pronunciation of the loan words’ (Muhaydli, 1996), and while some of her predecessors mention diphthongs, she is (to the extent of my knowledge) the first to actually present them as part of the vocalic inventory.

Muhaydli says that /a/ presents the allophones [a] and [æ], [a] in the context of emphatics and uvulars and [æ] ‘before a consonant in a final position’ (Muhaydli, 1996). She also says that when /a/, /u/ or /i/ occur in unstressed positions, they are realized as [e] (Muhaydli, 1996).

4.6 Sakr, 2018

In Sakr, 2018, I took a list of words that Muhaydli, 1996 uses to exemplify vowels in Lebanese (because hers was the largest inventory I found in the literature at the time, and because the dialect of Lebanese she was working on is the closest to CMLL) and reanalysed them very shallowly through CMLL realisations into what I considered the CMLL Vowel Inventory for my previous work. This reanalysis is shown in table 4.1 (from Sakr, 2018), and allowed me to present the vowel chart in figure 4.1.

Table 4.1: Reanalysis of Lebanese Vowels in Muhaydli (1996), from Sakr (2018).

Word in Muhaydli (1996)	Source gloss	CMLL Realisation	Reanalysis
/ṭūl/	‘length’	[tʰu:l]	/tʰul/
/ṭul/	‘come out’	[tʰɔ:l]	/tʰol/
/zīr nisa/	‘playboy’	[zir nəsa]	/zir nəsa/
/zir/	‘a button’	[zər:]	/zər/
/ḃār/	‘bar’	[ba:r]	/ba:r/
/bar/	‘land’	[bær:]	/bær/
/mīn hōn/	‘who is here?’	[mi:n ho:n]	/min hon/
/min hōn/	‘this way’	[mən hon]	/mən hon/
/xāl/	‘uncle’	[xa:l]	/xa:l/
/xal/	‘vinegar’	[xæl:]	/xæl/
/ṣāb/	‘he hit something’	[sʰa:b]	/sʰa:b/
/ṣab/	‘he poured’	[sʰab:]	/sʰab/
/žār/	‘neighbor’	[ʒa:r]	/ʒa:r/
/žar/	‘he pulled’	[ʒær:]	/ʒær/
/kār/	‘profession’	[ka:r]	/ka:r/
/kar/	‘he rolled’	[kær:]	/kær/
/fil/	‘elephant’	[fi:l]	/fil/
/fil/	‘go away’	[fəl:]	/fəl/

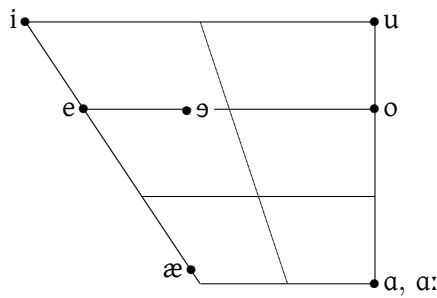


Figure 4.1: The Vowels of CMLL according to Sakr (2018).

One of the main issues I now have with this modeling of the CMLL vocalic inventory

is that it merges all central sounds for want of a proper analysis, including ones that show some frontal coloration (ie. sounds that Gairdner (1925) would consider allophones of /i/). It dismisses the question of quantity (whether in phonetic duration or phonological length), only noting it where it seemed to matter perceptually. And it avoids any treatment of variation in realisations, because the focus of the work at hand was loanword phonology rather than the native segmental inventory.

Finally, while sufficient to represent the CMLL vocalic inventory for the purpose of roughly transcribing speech, this modeling was intended from the get-go to be a rudimentary draft ‘until such a time as there can be a more rigorous analysis [fully] dedicated [to establishing the vocalic inventory of CMLL]’ (Sakr, 2018, p. 14).

For the sake of reference, as well as for the sake of completeness, I include, in table 4.3 the consonantal chart³ I summarised the literature into, from Sakr (2018, p. 11). Note that the phonemic consonantal inventory of CMLL also includes the glides /j/ (palatal) and /w/ (labio-velar).

Table 4.3: The Consonants of CMLL according to Sakr (2018).

	Bilabial	Labial	Alveolar	Emphatic	Pal.alv.	Palatal	Velar	Pharyn.	Glottal
Plosive	p b		t d	tʰ dʰ			k ɡ		ʔ
Nasal	m		n						
Tap			r						
Fricative		f v	s z	sʰ zʰ	ʃ ʒ		x ɣ	ħ ʕ	h
Lat. appr.			l						

³Consonants that were only found in loanwords are in gray.

Chapter 5

Documented Processes

5.1 Historical Imāla

Imāla (إمالة ‘*tilt*’) is a process of vowel harmony. The way Sībawayh describes it in the 8th century, Imāla raises ‘/aa/ to /ie/ in the context of a conditioning high vowel /i/’ (Owens, 2006). It applies to medial or final long low vowels, but can also apply to shorter ones (although this is much more restricted). Owens (2006) points out that the process is inhibited by emphatic and guttural consonants (p. 4), and that, where modern dialects do not have a monophthongal reflex of imāla, the realisation is a high falling diphthong (p. 5). According to (Fleisch, 2012), modern phonetics consider it a palatization and it causes the vowel /a/ to shift from its zone of articulation to that of [ɛ], [e] or [i].

Fleisch (2012) points out that imāla is conditioned by ‘the presence of a *kasra* [a *kasra* is a diacritic mark of the Arabic alphabet whose phonetic quality is that of a short /i/] or a *yā*’ [a *yā*’ is a character of the Arabic alphabet whose phonetic quality can be either that of a /j/ glide or that of a long /i/] in the neighbourhood of the *alif* [an *alif* is a character of the Arabic alphabet whose phonetic quality is that of a long /a/]’ but that it can be inhibited by the presence of what the Arab grammarians refer to as the *mustaʿliya*: ‘the four emphatics, the velars gh /IPA ɣ/ and kh /IPA x/ and kāf /IPA q/’ (Fleisch, 2012). He also theorises the existence of ‘an unconditioned imāla’ which he says the Arab grammarians did not account for, and notes that ‘imāla was not general among the Arabs,’ but that it is accepted in *Qurʾānic* recitation as ‘a simple realization of the phoneme ā’ (Fleisch, 2012). Fleisch (1974, p. 62) discusses imāla in Lebanese particularly in the dialect of *Zaḥle*, citing examples of imāla such as in (5).

- (5) /ħāf biħāf/ ‘he was afraid’
 /āħer/ ‘end’
 /ʔā‘ed/ ‘seated’
 /wā‘ed/ ‘promising’
 /sā‘a/ ‘hour’ ... (Fleisch, 2012)

In Fleisch (2012), he says that imāla has come to ‘acquire a distinctive value’ in modern dialects, citing the examples from Kfar Abīda, Lebanon, in example (6).

- (6) rāje‘ ‘returning’ v/s rāje‘ ‘begin again’
 jāre ‘flowing’ v/s jāre ‘my neighbour’ (Fleisch, 2012)

Note that, in modern CMLL, the first vowel of the first word of each of the pairs in example (6) could be argued to be an underlying /e:/, because low realisations of the vowel would be considered ungrammatical: /re:ʒəʃ/ ‘returning’ v/s /ra:ʒəʃ/ ‘revise!'; /ʒe:re/ ‘flowing’ v/s /ʒa:r+e/ ‘my neighbor’.

If there are tokens in the data that show alternations consistent with imāla, it might well be worth acknowledging the phenomenon in CMLL. If such an alternation does not occur, and the data instead shows that speakers consistently reject one of the forms in each pair of for example [ʔæ:b], [ʔe:b]; [ʕæ:m], [ʕe:m]; [ʕæ:ʃ], [ʕe:ʃ]; [yæ:l], [ye:l]; [ħæ:ʒ], [ħe:ʒ], etc. as ungrammatical, then imāla is a historical process that has played a part in the development of CMLL, but is no longer active and the resulting vowels are no longer allophones of a synchronic vowel category.

5.2 Monophthongization

As mentioned in chapter 3, there has been a monophthongization from Classical Arabic /ai/ and /au/ to /e:/ and /o:/ respectively in Egyptian. The same process has occurred in urban varieties of Lebanese, although there are rural dialects of Lebanese in which the process has not occurred.

Since CMLL is heavily affected by other varieties, it is imaginable that the data will show some degree of alternation between these diphthongs and the monophthongal reflexes they are presented with. Should this not be the case of certain stimuli in the data (which is to say, should there be no alternation), it may be best to regard each of /ai/, /au/, /e:/ and /o:/ as their own separate category of sounds. Should there be

stimuli consistently realised with [ai] and [au], it may be worth considering *them* two separate categories as well, to a total of six vocalic categories: the diphthongs /ai/ and /au/, the monophthongs /e:/ and /o:/, and the diphthongs that alternate in production with monophthongs, /ai̯/ and /au̯/.

5.3 Epenthesis and Intrusive Vowels

Hall (2006), building on distinctions made by Levin in 1987, notes a difference between two types of vowel intrusion: epenthesis (the insertion of a vocalic articulatory gesture to repair an illicit structure) and intrusion (the retiming of existing gestures to produce a vowel-like transition between consonants, simply as a phonetic transition between consonants). It is important to point out that epenthetic vowels need to be discussed as part of establishing a phonological vocalic inventory of Lebanese, since epenthetic vowels ‘[involve] a change to the segmental string’ and will by their nature cause resyllabification, whereas intrusion is purely phonetic, ‘gestural’, and will not appear at any level in the phonology.

A point to be made, however, is that intrusive vowels may become phonologised in what is likely a listener-initiated sound change (Hall, 2006 quotes Ohala, 1981 over this point). And when an intrusive vowel is segmentalised, it loses the characteristics of intrusive vowels. Although not directly urgent outside of a diachronic study of the phonology of Lebanese, it is important to note that the occurrence of epenthesis is likely to be due, at some point in its history, to the occurrence of intrusion. So while I will not be discussing intrusion at length from this point onwards, it may still affect my analyses in the form of resulting epentheses.

We do have documentation of epenthetic vowels, going as far back as Haddad’s impressionistic descriptions in 1984. In 2013, Hall writes that, in colloquial Levantine Arabic dialects, consonant clusters in CCC and word-final CC are frequently broken up by epenthetic vowels. This epenthesis is optional and a same speaker will alternate doing it and not doing it. Additionally, Levantine dialects stress a CVC penultimate except if the vowel is epenthetic, a fact that Hall explains through rule ordering (she puts stress placement before the genesis of epenthesis; Hall, 2013).

Since opaque interactions occur between epenthesis and other processes (for instance, epenthesis counter-bleeds shortening, as in /ja:b – ʃ/ → jabʃ → [jab – iʃ] in her own transcription), and since opacity challenges standard OT, Hall argues for alternative

frameworks like Kiparsky’s Stratal OT (2003), McCarthy’s OT with Candidate Chains (2007), and Harmonic Serialism.

As for vowel quality, Hall (2013) cites impressionistic descriptions for Damascene giving [ə] (Cowell, 2005, p.29), Palestinian giving [e] (Elihay, 2004) and Lebanese giving [i] (Haddad, 1984). She says the epenthetic vowel is usually described as phonetically identical to one of the short lexical vowels in the same dialect, and this is problematic¹ because this means that phonological descriptions by Lebanese speakers (Haddad 1983, 1984; Abdul-Karim 1980) use the symbol [i] for both lexical and epenthetic, which means underlyingly different words are transcribed as if pronounced identically, as in (7).

- (7) /libs/ ‘*clothes*’ [libis]
 /libis/ ‘*wore*’ [libis] (Hall, 2013)

This transcription is even more problematic in that, for Beiruti, ‘the epenthetic vowel is often very short as compared to an underlying /i/. [... An] epenthetic vowel is more easily prone to suprasegmental features such as [guttural]... and emphasis... which considerably alter its quality’ (Haddad, 1984, p. 37). Gouskova and Hall (2009) theorise that epenthetic and lexical [i] would be acoustically identical but expect that the epenthetic vowel would be more ‘slight’ (which they explain as ‘shorter duration, [more centralized], and lower intensity’). They find that they are ‘reliably different for some (though not all) speakers,’ and Hall (2013) subsequently finds a lack of significant difference in the duration of lexical v/s epenthetic vowels.

Experimental data accentuates the difference between the two phonemes, since Gouskova and Hall (2009) found that some speakers of Lebanese differentiate epenthetic and lexical vowels in production (shorter and lower F2 in epenthetic vowels), and that those speakers who epenthesise, epenthesise consistently (suggesting a separate vocalic category in speakers’ phonologies). Hall (2013) found that speakers who epenthesize freely in casual settings avoid epenthesis when being recorded, most likely because they would be style shifting into MSA. As for the realisation of the phoneme, Hall (2013) notes that there is variation as to whether speakers differentiate the epenthetic and lexical vowels, and as to both direction and strength of differentiation. I will therefore be attempting to verify the existence of an ‘epenthetic vowel’ lexical phoneme /V_{ep}/, and document the variation in quality and duration of the epenthetic vowels of CMLL.

¹I take this to mean that this makes the vowel difficult to identify as epenthetic in transcriptions.

Part II

Data, Results, and Analyses

Chapter 6

Experimental Design, Data Collection, and Processing

With the intention of documenting the phonetics, and codifying the segmental phonology, of the vowel inventory of CMLL, I ran a pilot experiment on Obégi (1971)’s data, recording it and observing the vowel formants using Praat.

6.1 Stimuli Selection

The results made me realise that I would need more specialised, recent and localised stimuli (which is to say, words displaying medial vowels — for maximal prominence — in current use in Central Mount Lebanon, where CMLL is spoken) to elicit natural vowels from my speakers, and therefore I wrote a Java program that, using the CMLL consonant (C) inventory presented in Sakr (2018) and a hypothetical, phonetic, vowel (V) inventory extracted from my own speech using formants, as a starting point, generated all possible CVC combinations.

Since the literature (see chapter 4) suggests that length is contrastive in Lebanese, and since I propose in Sakr (2018) that CMLL distinguishes at least one pair of vowel phones by length (/a/ from /a:/), I added the IPA symbol for *long* (:) and made its appearance dependent on a boolean (TRUE or FALSE) variable after the vowel, such that from every C₁—V—C₂ combination possible, C₁ and C₂ being consonants (where C₁ and C₂ could, but didn’t have to, be the same) and V being a vowel, the programme generated [C₁VC₂] and [C₁V:C₂].

Finally, I had the programme prompt for every possibility, and attempted to gloss each one to obtain as many CVC and CV:C words as I could in CMLL, in the hope of then being able to use them in my production study. The stimuli chosen from the glossed CVC list for the data collection phase of this project are given in Appendix C.

6.1.1 A Note on Hypothetical Categories and the Change of Underlying Representations

By the very nature of this project, I had to go from a hypothetical notation in the beginning of my data stages to a better-backed notation toward the end of my phonological analyses. This hypothetical notation establishes *phonetic categories*, which reflects what I was expecting from my participants, as a degree of abstraction from detailed transcriptions that is not yet quite a phonological statement. The stimuli generated above are meant to be at this level of representation; what I call phonetic categories is what my intuition as a native speaker tells me is the realisation group in question. Essentially, I am abstracting from the exact phonetic realisation, which I note between square brackets ([]), into groups or categories of sounds that seem like I could benefit from treating together, which I note between a single pair of forward slashes (/ /), and which ultimately I sort into phonemes, which I note between two pairs of forward slashes (// //).

I use the forward slashes of broad transcription (which are also associated with underlying or phonological representations) when discussing or referring to my hypothetical phonetic categories, because I need an intermediate level of abstraction on the way to abstracting away from raw realisation data into the phonological categories of underlying representation I eventually list in section 14.2. The reclassification from hypothesised categories (/ /) to phonological categories (or phonemes, // //), for comparative purposes and the convenience of the reader, is listed in Appendix B.

For example (this uses a consonant rather than a vowel to avoid confusion), my intuition as a native speaker told me to expect realisations of [p], realisations of [p^h], realisations of [p⁻], and so on, all the while telling me that aspiration is uncontrastive in CMLL, and therefore my phonetic category over these realisations would be /p/. Supposing then that a further stage of analyses told me that all of these realisations of the phonetic category /p/ (that is, [p], [p^h], and [p⁻]) actually occur as an allophone of a phoneme which is more readily realised as [b] (and [b^h], and [b⁻]), I would analyse the phoneme itself to be an underlying //b//, whose realisations include the various realisa-

tions of the phonetic category /p/. As a result, if a word I use as a stimulus occurs in my early sections as /pVC/, the same word will occur after I discuss the phoneme //b// as //bVC// (but if I'm speaking of all the realisations that /b/ versus /p/ covers, it will occur as /bVC/ versus /pVC/, and if I'm speaking of someone specifically saying [p^h], it will occur as [p^hVC]).

Ultimately, the categories I note between a single pair of forward slashes (/ /) are groups of sounds at the line between the phonetic and the phonological level. Depending on how the analysis goes, they can be found to have phonemic status, or they can be a grouping of a phonetic nature. When their status changes, I start using the appropriate notation as detailed above. Since they stake less of a theoretical claim than the phonemic slashes (// //), if an utterance is transcribed with phones whose phonemic status I have no reason to confirm or deny, the single pair of slashes will be used.

When citing my previous work here, I revise my notation to use these three levels. When citing other authors, I use the brackets they choose. To avoid confusion, as of this chapter I mark these cited instances with °.

6.2 Observations about the Stimuli

My intuition (through the data I glossed) lead me to believe that CMLL has a set of words in which a long vowel is in free variation between low (ie. a-like) and mid front (ie. e-like) qualities. These will be words whose MSA equivalent consistently uses /æ:/ in that position. Due to similar intuition, I believe that some words will not allow an /e:/ variant, but some will. This seemingly spontaneous shift (or 'tilt') from a low to a mid-front quality does seem akin to what Fleisch (2012) describes as 'unconditioned imāla'.

- (8) a. <باب> /bæ:b/ (MSA) - /be:b/ (CMLL) but /bæ:b/* (CMLL) 'a door'
 b. <آب> /ʔæ:b/ (MSA) - /ʔe:b/ (CMLL) and /ʔæ:b/ (CMLL) 'August'

CMLL also seems to have words using each of a set of diphthongs, a set of high-mid monophthongs, and a set of sounds that vary in production between both.

- (9) a. /bæj/ but */be:/ 'a father'¹

¹This occurs even if the diphthong is not word-final: /dæjne/ but */de:ne/ 'an ear'.

- /dʕaw/ but */dʕo:/ ‘a light’
- b. /be:b/ but */bæjb/ ‘a door’
/tʕo:n/ but */tʕawn/ ‘tuna’
- c. /ħajtʕ/ and /ħe:tʕ/ ‘a wall’
/kæwn/ and /ko:n/ ‘a universe’

Finally, since I am also interested in exploring the phonetics of epenthesis within CMLL consonant clusters (since the epenthetic vowel exists in CMLL’s phonetic vowel space), I had to add stimuli that would elicit epenthesis, namely $C_1VC_2C_3$ words² (again, C_1 , C_2 and C_3 could, but didn’t have to, be the same, with the added restriction that there could be no gemination in the word).

6.3 Data Collection and Processing

I collected acoustic data in Metn and Beirut between December 2018 and January 2019. I used a Shure SM10A microphone and a Marantz PMD660/661 recorder to obtain digital recordings in WAV format, at a sampling frequency of 44kHz with a bit depth of 16 bit. Whenever possible, and when convenient for my participants, I used the sound booth at the American University of Beirut, with special permission from Dr Niamh Kelly. My participants (some information about the participants whose data was used in this dissertation is given in Appendix A) were recruited via word-of-mouth among friends, and I stopped at 22 recordings due to time constraints.

Two sets of stimuli (CVC stimuli identified in the list generated as explained in section 6.1 to fit the categories hypothesised (including the ones described in section 6.2; the stimuli are given in Appendix C); and CVCC stimuli identified in the literature and through native knowledge to incite epenthesis; given in Appendix D) were placed into natural Lebanese sentences in Chat orthography.

The order of these sentences was randomised, the words replaced by the consonants in them (see example (10)), and the sentences were then added to a macro-enhanced, self-paced PowerPoint presentation. The choice of Chat orthography was meant to minimize the influence of MSA. The consonants were kept to encourage the participant to use the expected forms rather than lexically equivalent forms with different vowels (even though in the case of one word, this was not sufficient).

²Or more accurately as of when I introduce my notation in subsection 6.3.2, $C_1VC_2V_{ep}C_3$.

(10) 7ott l warde [B N] kteben w ntora la tenshaf.

ħotʕ: l-warde bājn kte:b-ājn w ntʕoræ la tənʃaf
 place-IMP.2MS the rose between books-DU and wait for 3FS to dry-IMPERF.3FS

‘Place the rose between two books and wait for it to dry.’

Each speaker was instructed, in Lebanese in Chat orthography on the slideshow, to read the sentence silently, guess the word, say it twice out loud, then read the sentence with the word in position. This would give us the word in citation form twice, with a backup repetition in the flow of speech. Anonymisation of the speakers was ensured by the macros in the presentation, which recorded the date and time of their taking part of the experiment (which they were asked to read for the recording as well), and the macros additionally recorded the sociological factors of gender and religion of upbringing (which participants clicked on the presentation).

Of the 22 recordings, one was eliminated because the participant struggled to make out the words she was expected to identify and produce (which may indicate lack of fluency), and two more were eliminated due to technical difficulties during the segmentation process (among other things, the TextGrid files were repeatedly overwritten by the backup system chosen). The remaining 19 recordings (listed in Appendix A) were segmented in Praat, with four tiers of information: Expected Word, Word Category (eg. long front high-mid monophthong, diachronic diphthong, epenthetic environment, etc.), Realisation, and Hypothesised Vowel Category. All tiers except Realisation were filled programmatically using a Java programme designed to read and write TextGrid formats, and as the segmentation of the Realisation tier was done manually, the output of the programme was verified and, in some rare instances, corrected. Any ‘odd’ realisations of consonants were marked as unacceptable³ as in example (13-b) during the segmentation.

There were 4362 Realisation tier intervals (or tokens) annotated, of which 4355 were deemed acceptable.

6.3.1 Caveat

A caveat comes up for two stimuli: the words ɣæ:l ‘lock’ and dæwæ ‘medication’.

The former was discovered, through the data collection process, to be a little ob-

³If, as per native intuition, the realised word sounded like it could either mean something different than the intended word, or not mean anything at all, the realisation was deemed unacceptable and marked with a [!]. The programmes and Praat scripts which then scoured the TextGrid files ignored these tokens.

scure, and rather than allow the participants who did not recognise the stimulus to get discouraged I asked them to ‘think of the vowel [they] would use in the word for August’ ($ʔæːb$); which is likely to skew the realisations for this word. Since stimulus choice (and participant knowledge thereof) is a relevant factor in determining allophonic variation, tokens of this word were ultimately discarded.

The latter was initially included to provide a basis to contrast realisations of $/dæw.../$ with $/dʰaw.../$ (as in $dʰaw$ ‘*light*’). Tokens of this word were discarded due to the complexity of segmenting the $/æwæ/$ continuum and time restrictions.

6.3.2 A Note on Notation

Whenever possible, I made it a point to use IPA for notational purposes.

Expressing what allows me to group some realisations together into a category that I am hypothesising is however difficult to do in standard IPA in three cases, because the IPA does not account for diachronic categories or phonological environments: and therefore, I saw fit to repurpose some characters with no segmental value within the IPA for representational purposes. Except for specifically $æː$, $\widehat{aj}$ and $\widehat{aw}$, and V_{ep} , specifically used between the forward slashes I associate with my hypothetical categories ($/ /$) or between the double forward slashes I associate with underlying representations ($// //$) if I can convincingly argue said categories to be phonemic, all other notations in this dissertation which are my own are in standard IPA as per their 2015 revision (I do not make any claims about the representations of other authors I am citing).

Therefore, the vowel in a-e alternation is represented as $æː$, the diachronic diphthongs⁴ are represented as though they were regular diphthongs but with the overarching tie-bar traditionally used for affricates and coarticulations ($\widehat{aj}$, and $\widehat{aw}$), and the position where an epenthetic vowels could be expected in realisation is represented as $/V_{ep}/$ (or, if in fact Gouskova and Hall (2009) are right and the epenthetic vowel has become a phoneme in CMLL, the phoneme is represented as $//V_{ep}//$). For readability purposes, I will only use V_{ep} when I specifically intend to speak about an epenthetic environment, such that $/fardʰ/$ and $/farV_{ep}dʰ/$ are both surface representations of a same word (‘*assignment*’), the difference being that the second representation highlights the position

⁴As discussed in section section 11.2, I use ‘diachronic diphthongs’ to speak of categories of underlying diphthongs whose realisation varies freely between the diphthongs themselves and corresponding monophthongs.

in which an epenthetic vowel is expected to occur.

An important distinction to make is that am not claiming that epenthetic vowels belong to any level of underlying representation, but rather signifying by the symbol $/V_{ep}/$ that the position in which it occurs, *is likely to trigger emphasis*, and could therefore be occupied by an emphatic vowel. The idea that I am attempting to convey is therefore that *this position of the representation* allows the occurrence of an epenthetic, and this notation is meant to group the occurrence of an epenthetic vowel of any quality, or the lack thereof, as allophonic realisations of the epenthesis-causing environment.

This allows me to speak of the categories I mention here as in (11).

- (11) a. $/æ:/$ such that $/æ:/ \rightarrow [\alpha:, æ:, e:]$
 b. $/\widehat{aj}/$, $/\widehat{aw}/$ such that $/\widehat{aj}/ \rightarrow [\text{æj}, e:]$ and $/\widehat{aw}/ = [\text{æw}, o:]$
 c. $/V_{ep}/$ such that $/V_{ep}/ \rightarrow [\text{ə}, \emptyset]$, presuming a centralised, neutral quality for the emphatic

6.4 Formant and Duration Extraction

Formant and duration measurements can be obtained using Praat scripts. The difficulty is that formant values obtained using this method rely on detection algorithms which depend on attempts to locate a certain number of formants under a certain frequency, and while the standard maximal frequency sits at 5500 Hz, a combination of the factors used to process digitised audio data will affect the reliability of the algorithm's output. This is especially important when the formants we need to find are close enough that the algorithm may confuse them and read them as just one, as is generally the case with mid-to-high back vowels (in this case, $/o, \text{ʊ}, u/$).

As a result, the extraction of formant values was done on the basis of finding 5 formants under a maximal frequency of 5500 Hz (for female speakers) or 5000 Hz (for male speakers), for all tokens (or non-empty intervals on the Realisation tier) except those containing $[o]$, $[\text{ʊ}]$, or $[u]$. The formants extracted for these tokens were obtained on the basis of finding 2 formants under a maximal frequency of 1500 Hz. Each speaker's tokens were extracted individually with a Praat script, and the mean and standard deviation of each of the formants were obtained for each transcription (of a realisation) for each speaker with a Java programme. Manual measurements using Praat were obtained for each token whose automatically obtained formant values deviated from the mean + two

standard deviations (these were flagged by a Java programme beforehand). The hope was to eliminate as much inaccuracy as possible.

Since the transcriptions were very detailed, there were tokens that only appeared once or twice for a speaker. Since the means and standard deviations were on a per-speaker-per-realisation basis, this would have made it impossible to obtain a mean and standard deviation of any use to the accuracy-enforcing technique (see (12)), and therefore the PhonR package was used (in R) to obtain a visual representation of each speaker's vowel space. Any vowels whose formant values placed them in illogical positions on the chart were then measured manually in Praat.

- (12) Say speaker XX_01 realised eight /e:/ as [e:ə] and exactly one /e:/ as [eə]. The mean and standard deviations for the values of F1 and F2 are calculated for [e:ə] and [eə]. If either F1 or F2 of any of the eight [e:ə] realisations are outside the chosen margin of mean + two standard deviations, the realisation is measured manually. The one [eə] realisation's mean F1 and F2 values would be the F1 and F2 values of the realisation itself, and the standard deviation would be undefined (the calculations for each of the standard deviations would be equivalent to dividing 0 by 0). As such, the method, while effective for realisations represented by more than two tokens in the data, fails for unique realisations.

Diphthong formants were measured at 25% and 75% of their durations using the same method.

6.5 Extraction of Phonological Data

Another Java programme was written to obtain all the realisations from the TextGrid files. It obtained the Expected Words and Realisations, and put the latter into the former by replacing the hypothesised vowel categories, as exemplified in (13-a).

The output was therefore blind to the exact phonetic realisation of the consonants in the words, but kept the detailed realisations of the vowels. A speaker who has a speech impediment rendering all of her /r/ as [ɣ], who additionally dentalises her alveolar plosives, would realise the word /dajr/ as [d̪e:ɣ]. This would show in the output as [de:ɹ] (from replacing the category /aj/ (from the Hypothesised Vowel Category tier) in /dajr/ (from the Expected Word tier) with [e:ə] from the Realisations tier), shown in example

(13-c).

This process generated a phonological listing of the recorded data in terms of vowel allophony, all the while ignoring consonantal allophony in the recordings. To clarify, the output is a hybrid of phonetic vowels in an otherwise phonological word.

- (13) a. **Stimulus:** <B B> ‘door’
Utterance: [beəb] ‘door’

Expected Word Tier: be:b

Hypothesised Vowel Category Tier: /e:/

Realisations Tier: eə

Output: Speaker XX_01 /e:/ be:b [beəb]

- b. **Stimulus:** <B B> ‘door’
Utterance: [buw:e:be] ‘gate’

Expected Word Tier: be:b [!]

Hypothesised Vowel Category Tier: /e:/

Realisations Tier: -

Output: Speaker XX_01 /e:/ be:b [!] -

- c. **Stimulus:** <D R> ‘convent’
Utterance: [de:ər] ‘convent’

Expected Word Tier: dajr

Hypothesised Vowel Category Tier: /aj/

Realisations Tier: e:ə

Output: Speaker XX_01 /aj/ dajr [de:ər]

6.6 Nasalised Vowels

One interesting point to be made, which does not fit anywhere else in this dissertation, is that, in section 3.3, I quote Gairdner (1925, p. 36) as saying ‘nasalizing is very marked and very unacceptable [sic.]’ Out of curiosity, I ran a quick script to count instances of the nasalisation suprasegmental [~] on the Realisations tier across all files. The results are in table 6.1.

Table 6.1: Nasalised realisations in the data

Speaker	Stimulus	Hypothesised Category	Realisation
JS01 [M, 17]	t ^ʰ o:n	/o:/	[õ:]
JS01 [M, 17]	t ^ʰ o:n	/o:/	[õ:]
JS02 [F, 20]	hawn	/aw/	[õ:ə]
JS02 [F, 20]	hawn	/aw/	[õ:ə]
LS01 [F, 48]	kawn	/aw/	[ãw]
LS01 [F, 48]	kawn	/aw/	[ãw]
LS01 [F, 48]	næw	/æw/	[æ̃w]
LS01 [F, 48]	næw	/æw/	[æ̃w]
LS01 [F, 48]	ɤæ:m	/æ:/	[æ̃:]
LS01 [F, 48]	ɤæ:m	/æ:/	[æ̃:]
NM01 [F, 24]	hawn	/aw/	[õ:]
NM01 [F, 24]	hawn	/aw/	[õ:]
NS01 [F, 54]	t ^ʰ o:n	/o:/	[õ:]
PN01 [M, 22]	læ:m	/æ:/	[æ̃]
RK01 [M, 21]	d ^ʰ aw	/aw/	[ãw]
RK01 [M, 21]	t ^ʰ o:n	/o:/	[õ:]
RK01 [M, 21]	t ^ʰ o:n	/o:/	[õ:]
RK01 [M, 21]	ɤæ:j	/æ:/	[ã:]

Out of 19 speakers, 7 nasalised at least one of their tokens. The sociological factors of age, gender and religion of upbringing do not seem to have any impact on nasalisation, which occurs in men and women aged 17 to 54. Though rare (18 tokens nasalised out of 4355 usable tokens is 0.41%), nasalisation is most likely to occur in diphthongs and in the direct vicinity of a nasal. It is impossible on the basis of this data to say for certain whether nasalisation is ‘very marked and unacceptable’ in CMLL, but it is certainly present in the speech of its speakers. Since it is not contrastive in vowels, this is the last I will be saying about it in this dissertation.

Chapter 7

Phonetic Duration and Phonemic Vowel Length

The literature on Arabic (see chapter 3) seems to be in agreement that vowel length was contrastive in Classical Arabic. Watson (2002, p. 22) notes that all modern dialects of Arabic have long monophthongs, Al-Ani (1970) studies duration as a phonetic correlate of length in MSA as spoken in Iraq, and Gairdner (1925) refers to the vowels of Egyptian Arabic as either ‘long’ or ‘short,’ which suggests that length could also be contrastive in Lebanese.

The literature on Lebanese (see chapter 4) supports the suggestion, with each of the authors either using single and double characters to represent length, using a length marker in their transcriptions, or mentioning ‘long’ and ‘short’ vowels in their texts.

In Sakr (2018), I proposed that there was at least one vowel quality that presented minimal pairs for length distinction: the low back vowel (such that //a// and //a:/ would be underlyingly distinct sounds to a speaker of Lebanese). The CVC-generation programme I described in chapter 6 seemed to confirm the hypothesis by suggesting minimal pairs that contrasted these sounds.

7.1 Duration in the Data

A Java programme was used to calculate the average duration of theorised vowel category realisations in words in citation form, from the data collected during the production study. The programme collected the duration values of intervals on the Realisation

tier by the labels on the Hypothetical Vowel Category tier and obtained their average duration (that is, end point minus start point on the time axis).

The data collected from the participants seems to strongly back the claim that there exists a phonemic difference in vowel length, as shown in table 7.1. The highlighted rows show a clear contrast of about 100ms between /a/ and /a:/, but the table actually shows a clear divide between what we can refer to as short vowels (going from 89.94ms to 121.58ms in average duration) and long vowels (going from 203.73ms to 351.21ms in average duration). This advocates for a separate treatment of short (/a, æ, ə, ɪ, ʊ/) versus long (/ɑ:, æ:, e:, i:, o:, u:/) monophthongs¹.

¹I deliberately leave the epenthetic and long alternating vowels and the diachronic diphthongs out of these enumerations, and they will be treated separately.

Table 7.1: Hypothetical categories' durations in increasing order

Category	Count	Average Duration (ms)
/ə/	596	89.94
/V _{ep} /	516	92.47
/ɪ/	85	106.34
/æ/	513	108.70
/ʊ/	328	114.50
/ɑ/	188	121.58
/e:/	152	203.73
/i:/	355	210.15
/æ:/	54	219.10
/u:/	372	220.68
/æ:/	151	222.56
/ɑ:/	150	223.22
/aj̃/	264	227.33
/o:/	36	233.06
/aw̃/	190	238.69
/aj/	38	292.21
/aw/	38	294.93
/æw/	146	295.62
/æj/	76	308.48
/ɑ:w/	36	316.80
/æ:j/	38	340.44
/ɑ:j/	38	351.21

It is also worth noting that a second divide in values, of a lesser size, occurs between what I call ‘diachronic diphthongs’ (ie. /aj̃/ and /aw̃/, at 227.33ms and 238.69ms respectively) and synchronic diphthongs, starting with /aj/ and /aw/ at 292.21ms and 294.93ms respectively. If we postulate a 100 ms average phonetic duration of a phonological timing unit (a skeletal X slot in X theory as discussed for eg. in Bickmore, 1995,

p. 124) for this data, one could argue that synchronic diphthongs, because they seem to fit an XXX measurement, are all underlyingly long, XX monophthongs (M:) that slide into a single X-long glide (ie. M:G).

The reality of the almost doubling of the duration between the proposed short and long vowels in CMLL is comparable to the doubling of the duration between the short and long vowels in Modern Standard Arabic demonstrated by the table in Al-Ani (1970, p. 23), in which his data of short and long vowels produced in isolation go from 300ms in short vowels to 600ms in long ones.

7.2 Arguments for Contrastive Length

An argument could be made, since there exists ‘some degree of ‘natural’ or universal relationship between duration and vowel quality’ (Catford, 2001), that the contrast between what I represent here as, for example, /æ/ and /æ:/, is one of quality rather than length (after all, one of Al-Ani (1970)’s findings about the short and long categories of low vowels in MSA is that they do not overlap exactly in quality or tongue position); and that therefore they should be represented, for underlying representation purposes, as different qualities rather than differentiated by the length marker ː.

Since there is some degree of overlap between the realisations of /æ/ and /æ:/ within the vowel space defined by the formants (see figure 7.1; the mean (F1, F2) pairs sit at (659, 1653) for the 513 tokens of /æ/ and (690, 1579) for the 52 tokens of /æ:/), how does one determine whether the perceived difference is due to length, to quality, or to a combination thereof?

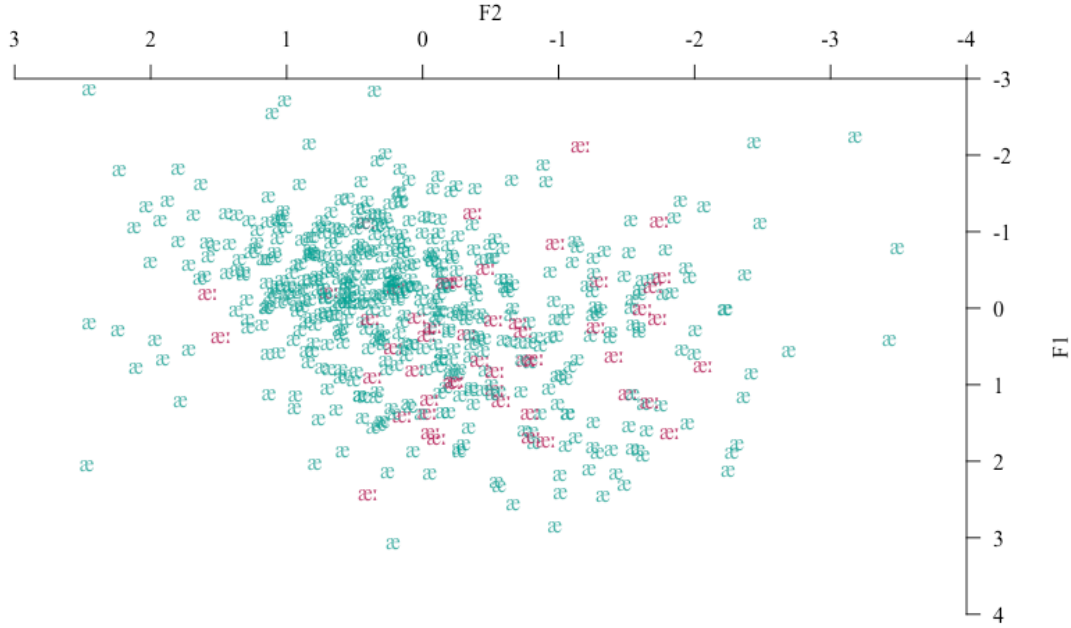


Figure 7.1: Overlap in realisations of /æ/ and /æ:/ in terms of vowel quality, as determined by formants and corrected for intra-speaker variation by z-transform

Remijsen, Ayoker, and Jørgensen (2019) use Linear Discriminant Analysis, or LDA, to test which of a set of factors or combinations thereof predict the contrasts within their proposed three-vowel-length contrast. A similar procedure can be used here to test whether quality, length, or both, could be used to accurately predict which category a token falls under. Should the algorithm correctly predict the proposed category for a given token using a factor or combination thereof, at better than chance accuracy (in this case, since we are classifying tokens as either single-X /æ/ or double-X /æ:/, chance accuracy is 50%), the factor or combination of factors is a good predictor for the category, and the factor(s) at play (quality, length, or both) should therefore be used as the classifying feature.

It must be noted that I am using the set of tokens realised as [æ ~ æ:] precisely because of the overlap in quality. The same analysis could theoretically be done on any pair of categories among those proposed, but since there is less overlap in quality in the cases of [ʊ ~ u(:)] and [ə ~ e(:)] for instance, running an LDA here would tell us little that we don't

already know (since by definition, the most obvious difference between [ʊ] and [u(:)] or [ə] and [e(:)] is one of quality).

Table 7.2: Results of linear discriminant analysis

	Combination	Duration	Quality
Accurately Predicted /æ/	97.66%	97.66%	100.00%
Accurately Predicted /æ:/	80.77%	80.77%	0.00%
Overall Prediction Accuracy	89.22%	89.22%	50.00%

Predictably, since there is a great deal of overlap in quality between /æ/ and /æ:/, quality predicted category with exactly 50.00% accuracy (it classified *all* the tokens as /æ/, presumably because there are a lot more short (513) than long (54) tokens in the dataset; see table 7.1). Duration proved to be a much better predictor with 89.22% accuracy. Combining duration and quality made no difference when compared to just duration, with the exact same level of accuracy obtained.

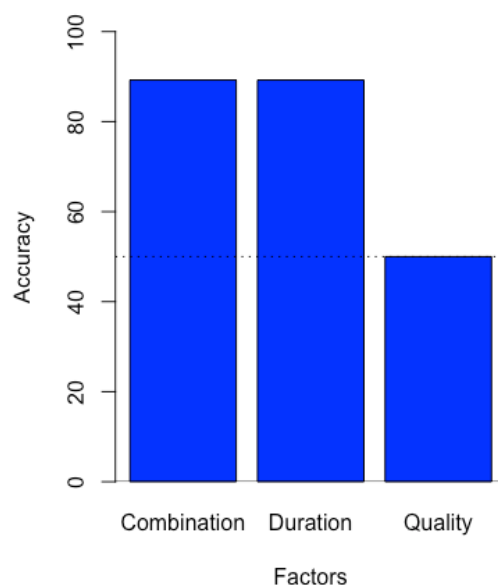


Figure 7.2: Accuracy of classification of tokens into /æ/ and /æ:/

Phonetically speaking, at least, there therefore exists a quantity distinction in terms of monophthongal categories of vowels in Lebanese, which is to say that the phonetic durations support postulating a phonological length contrast.

As far as the phonology is concerned, the existence of minimal pairs (see example (14)) distinguish $\llbracket \text{æ} \rrbracket$ and $\llbracket \text{æ} \rrbracket$. The phonetic realisations of these two proposed categories overlap heavily, as can be seen in figure 7.1, and therefore, at least for the quality of ‘low front vowel,’ length is phonemic.

- (14) a. /dæɪ/ /dæ:l/
 ‘to point (someone to something)’ ‘the character z’

 b. /læm/ /læ:m/
 ‘to pick something up (eg. off the floor)’ ‘the character j’

 c. /næj/ /næ:j/
 ‘raw (eg. meat)’ ‘a Nay (type of flute)’

Similar pairs shown in (15) support a phonological distinction of length in between the low back vowel categories //a// and //ɑ:/. Note that /dʰɑ:l/ was not one of the stimuli used in the production experiment.

- (15) a. /dʰal/ /dʰa:l/
 ‘to stay’ ‘lost’

 b. /sʰab/ /sʰa:b/
 ‘to pour’ ‘to aim, to hit (a target)’

 c. /tʰal/ /tʰa:l/
 ‘to make an appearance’ ‘to reach (something)’

7.2.1 Note on Complementary Quantity

It is worth noting that, in the data, all of the words showing the short vowel in example (14) were often, but not always, produced with a geminated final consonant (ie. [dæɫ ~ dæɫ:], [læm ~ læm:], [næj ~ næj:]). This is in fact the case for all CVC words in the data where the expected (or theorised) vowel category is a short monophthong. The reason I do not suppose that the gemination is underlying here (despite knowing that gemination is phonemic in Lebanese, see Sakr, 2018) is twofold. First, the way quantity seems to be patterning (that is, CV:C and CVC:, but not CV:C:) is suggestive of complementary quantity, a phenomenon (present for instance in Standard Swedish, see eg. Elert, 1965, p. 39) in which there is only one contrast that affects both vowel and coda

duration in alternation; and second, I do not have enough data to theorise on the underlying length of the final consonant, despite the fact that morphology suggests long final Cs as in the examples in (16). Could this be an argument in favour of gemination occurring at a different underlying level?

- (16) a. [dʰal(:)] [dʰal:o(:)]
 ‘he stayed’ ‘they stayed’
 b. [dæl(:)] [dæl:o(:)] [dæl:o]
 ‘he pointed’ ‘they pointed’ ‘he pointed him (eg. in a direction)’

7.3 Generalisation of Length as a Contrastive Feature

Since a length distinction exists between //æ// and //æ:/, by virtue of the typological tendency towards symmetry in the phonologies of languages (Abercrombie, 1967, p. 83), it is worth investigating whether similar length distinctions exist between other pairs of long and short vowels.

The data presented in 7.1 is strongly suggestive of the existence, in CMLL, of two sets of phonological categories of vowels, ones fitting in single X slots (whose realisations’ average durations are between 89.94 and 121.58 ms) and ones fitting in pairs of X slots (whose realisations’ average durations are between 203.73 and 238.69 ms). As such, length as a dimension of contrast is to be considered as part of the inherent featural make-up of each of the categories, so that categories whose realisations fit into a single timing unit could be referred to as ‘short’ (hypothetical /a, æ, ə, ɪ, ʊ/) and categories whose realisations fit into a pair of timing units could be referred to as ‘long’ (hypothetical /ɑ:, æ:, e:, i:, o:, u:/).

The epenthetic vowel category /V_{ep}/ (which is not to be considered phonemic, but should still be considered a category of related vocalic sounds, as present in the phonetic inventory of CMLL as the phonemic categories are in its phonemic inventory, and therefore of interest to this dissertation) is realised with durations comparable to those of the realisations of phonological short vowels (I discuss [V_{ep}] further in chapter 12).

The Alternating Low-to-High-Mid vowel category [æ:] (whose phonemic status I discuss in chapter 9) is comparable in length to the other long phonemic categories, and can therefore be referred to as the *Alternating Long Monophthong*.

Finally, it is worth noting that the Diachronic Diphthong categories [aj̥] and [aw̥]

(which I discuss in section 11.2) are also of comparable length to the long phonemic categories.

Chapter 8

On Low Vowel Qualities

Realisations of short and long monophthongs ranging in quality from [æ] to [a] to [ɑ] occur in the recorded data. The literature (see chapters 3 and 4) typically treats these qualities as allophones of two same underlying categories differentiated by length. For Egyptian, Gairdner (1925) speaks of /æ/° , /ɑ/° , and /ɒ/° , ‘variants of the a-phoneme,’ but also describes them as being separate phonemes in their own rights. In the case of Lebanese, Naim (1998, p. 100) says that ‘/æ/° > [a]° , more rarely /ɑ/° and /æ:/° > [a:]° , more rarely /ɑ:/° ’ in the context of pharyngealisation. Muhaydli (1996) explains that [a]° occurs in the context of emphatics and uvulars, and that [æ]° occurs ‘before a consonant in a final position’ — making it unclear how else the phone is realised. My shallow reanalysis¹ of Muhaydli’s vowels (2018) offered three low vowel phonemes (//æ//, //ɑ//, and //ɑ:/) as in figure 4.1.

The problem here is twofold.

One part of the problem is the extreme rarity of minimal pairs (‘phonetically perfect minimal pairs with //æ// [are] impossible,’ I say in Sakr, 2018). Because emphatic consonants drag low vowels back, it is very tempting to agree with Muhaydli’s allophony

¹What I call a shallow reanalysis could be more accurately be described as native intuition. I took the words Muhaydli uses to exemplify the phonemes she proposes for Lebanese, gave them narrow transcriptions in CMLL, and then tried finding words that opposed other vowels in minimal pairs to the vowels in my narrow transcriptions. This allowed me to establish a minimal set of hypothetical vocalic phonemes, sufficient to work out the workings of loanwords from French into CMLL (since my primary focus was the consonants: I discuss rhotics, bilabial plosives, pharyngealisation, and the denasalisation of vowels, which is an adaptation of nasalisation through consonants rather than reliant on the precise quality of the vowels themselves), all the while allowing me to devote more time to the questions in my dissertation.

hypothesis, with the caveat that her notation fails to capture that the essence of the distinction between the hypothesised allophones is one of fronting rather than of openness. We know that emphasis spreads to surrounding sounds (see for eg. Van de Vijver, 1996; Davis, 1995), and that this translates to a backing of low vowels (which I describe as a ‘lowering of the second formant in adjacent vowels in Palestinian Arabic’ (Sakr, 2018) which ‘follows from the backing of the tongue root which [causes] adjacent vowel articulations to be produced further back in the mouth than [canonical vowels]’ (Zellou, 2011, p. 97)). As a result, I would suggest using the notations $//\text{æ}// = \{[\text{æ}], [\text{a}]\}$ if we’re going by Gairdner (1925)’s assurances that $/\text{æ}/^\circ$ is ‘by far the commonest Arabic a-phoneme’ or the notations $//\text{a}// = \{[\text{a}], [\text{a}]\}$ for typographical convenience.

Another part of the problem is the existence of words such as $/\text{wæ:w}/$ ‘the letter,’ or $/\text{ʔal:a}/$ ‘God, Allah’, that a Lebanese speaker would reject if they were pronounced with the alternative quality (eg. as $*[\text{wæ:w}]$ or $*[\text{ʔæl:æ}]$). In fact, $/\text{ʔal:a}/$ vs $/\text{ʔæl+læ}/$ ‘he told her’ might be a rare example of a minimal pair to showcase contrast between $/\text{æ}/$ and $/\text{a}/$, but some (eg. Nasr (1959)) wave it away by proposing an underlying emphatic $//\text{ʔ}/$ phoneme that only occurs in the word $/\text{ʔalʔ:a}/$ ‘God, Allah’. The issue with this is that it is inelegant, by virtue of it being uneconomical. Another question is whether $/\text{ʔal:a}/$, a morphologically simple word, can really be used in contrast with $/\text{ʔæl+læ}/$, which is actually the verb $/\text{ʔæ:l}/$ ‘he said’ combined with the suffix $/\text{-læ}/$ ‘to her’, and is related to the Modern Standard Arabic $/\text{qal:æ}/$ ‘he said’ + $/\text{læhæ:}/$ ‘to her, for her’. And while it is possible to argue that $/\text{ʔalʔ:a}/$ ‘God, Allah’ is a borrowing from Classical Arabic, it is very much a part of the modern-day Lebanese vocabulary as a native word at this point. I mean that it permeates expressions, first names, and last names, throughout the lexicon, throughout the population (Lebanese Christians use it just as much as Lebanese Muslims or Druzes). The word itself is related to the Syriac ܐܠܗܐ $/\text{ʔalāhā}/^\circ$ ‘God’ (Muraoka & Brock, 2005, p. 11) and therefore predates Arabization.

8.1 Frontness in Low Categories

8.1.1 Stimuli and Data

The stimuli, informed by the intuition of there being various phonetically distinct categories of low vowels in Lebanese, took into account what I initially proposed to represent as $/\text{æ}/$, $/\text{a}/$, $/\text{æ:}/$, and $/\text{a:}/$. The first two categories are short monophthongs, the last

two are the equivalent long monophthongs.

I ran a Java programme that counted the realisation tokens and listed how many of each realisation each category was produced as in the data. The results² are shown in table 8.1. I then ran a z-transform on the formant data and used PhonR to create a chart (figure 8.1) of the vowel space showing the realisations based on the categories initially hypothesised.

Table 8.1: Hypothetical Low Categories' Realisations Count

Category	[æ]	[æ:]	[a]	[a:]	[ɑ]	[ɑ:]	[e:]	Others	Count
/æ/	496	0	9	0	4	0	0	4	513
/æ:/	0	51	0	0	0	0	0	1	52
/ɑ/	0	0	0	0	183	0	0	4	187
/ɑ:/	0	1	0	2	0	142	0	4	149
/æ:/	0	41	0	27	0	4	39	2	113

²/æ:/ is included in table 8.1 because some of its realisations are low vowels. It is however a special category I treat in chapter 9, and is therefore not included in the rest of this discussion or in figure 8.1 for instance.

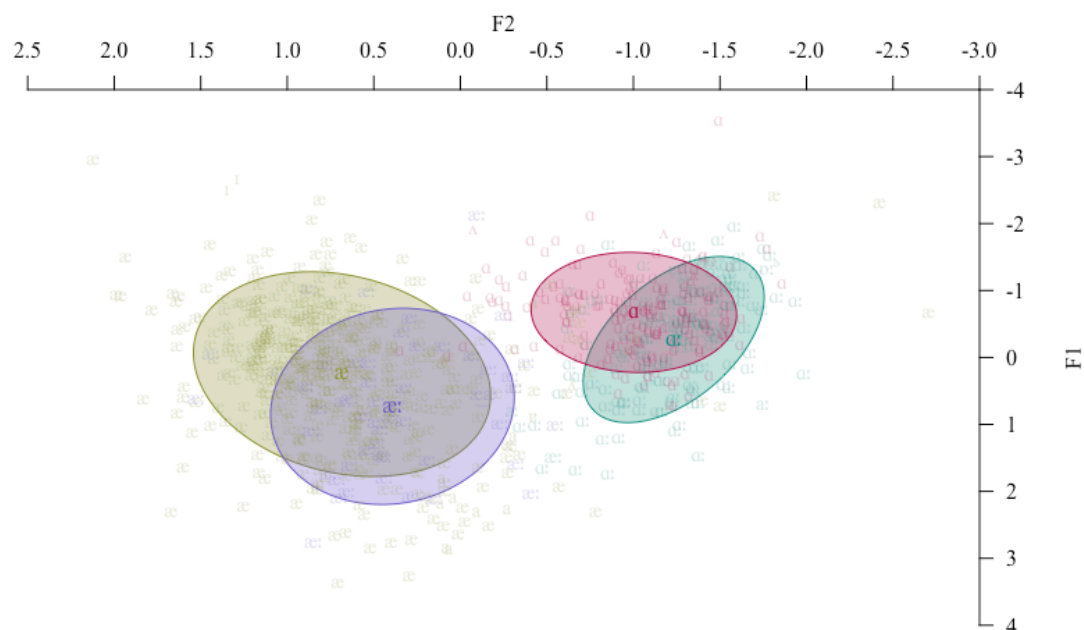


Figure 8.1: Low categories' vowel space, as determined by formants and corrected for intra-speaker variation by z-transform; ellipses show 1 standard deviation around the mean

Acoustically, at least, there is clear evidence for at least two distinct categories in vowel qualities; because the realisations were consistent with expected qualities and because the categories occupy distinct areas of the vowel space. The mean formant values for these categories are given in table 8.2.

Table 8.2: Mean formant values for low vowel categories' realisations

Category	Count	Mean F1	Mean F2
/æ/	513	659	1653
/æ:/	52	690	1579
/ɑ/	187	604	1223
/ɑ:/	149	631	1169

8.1.2 Phonological Discussion of Frontness in Low Categories

While the phonetic vowel space clearly displays distinct categories of realisations, however, the question of whether we should consider these qualities contrastive, and thus recognise their status as phonemic, is still open.

In the absence (or rather rarity) of true minimal pairs, a strong argument in favour of two separate underlying qualities (for a total of four categories, length included) is the existence of words, however rare (see (17)) that use a back low vowel for which a realisation with a front low vowel, or vice-versa, would be ungrammatical, outside of the presence of emphatics (because they condition a backing of the vowel: /æ/° to [a]° as mentioned above, and /ʊ/° ³ to [ɔ]° according to Naim, 1998, p. 100). It is worth noting that most of these words will be loans, which could be a hint that [a] and [a:] will have undergone phonologisation (to //a// and //a://).

- (17) a. [wa:w] *[wæ:w] ‘the letter,’
 b. [ʔal:a] *[ʔæl:æ] ‘God, Allah’
 c. [lambə] *[læmbæ] ‘lamp’ (loan from French)
 d. [nɒmrə] *[nɒmræ] ‘license plate’ (loan from French)
 e. [fær(ə)d] *[far(ə)d] ‘gun’

Note that the realisation [fa.rəd] appears in the data as a relaxed realisation of /fardʳ/. The loss of emphasis can be presumed due to the epenthetic schwa that would have broken the word up into two syllables. [far(ə)d] is thus more likely to be understood as /farV_{ep}dʳ/ ‘homework’ than /færV_{ep}d/ ‘gun’.

This suggests an underlying quality //a// (and by extension, two underlying categories //a// and //a://, since minimal pairs for length with regards to this quality can be found, as in (15)).

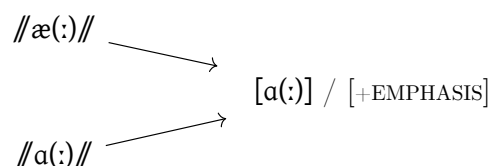
This is strongly supported by instances similar to example (17-e), which suggests that the effect on vowel quality survives the loss of pharyngealisation (as a realisation of emphasis), gradually giving rise to an underlying back low vowel compensating for the fact that emphasis is beginning to lose ground in realisation. The reasons I am calling //a// (and //a://) separate phonemes, rather than a shift in the realisation of emphasis, are that, (1) even with speakers who produced /fardʳ/ as [far(ə)d], pharyngealisation as

³But see chapter 10 for a discussion of hypothesised category /ʊ/.

a realisation of emphatics still happened elsewhere; and (2) words without underlying emphasis, but with back vowels that cannot be realised fronted, such as /wa:w/ ‘the letter,’ or /ʔal:a/ ‘God, Allah’, can be found.

8.2 Conclusions for Low Categories

My analysis in this chapter argues in favour of the categories I hypothesise (whose mean formant values I present in table 8.2) to have underlying phonemic status, as four synchronic low vowel phonemes, two short and two long: //æ//, //a//, //æ://, //a://, such that they merge (in realisation) in emphatic contexts:



Chapter 9

The Alternating Long Monophthong æ:

My data had four stimuli mentioned in section 5.1 meant to elicit tokens of what I represent as Hypothetical Category /æ:/: /ʔæ:b/ ‘*August*’, /ʔæ:m/ ‘*general (adj.)*’, /ʔæ:f/ ‘*to live*’, and /ʔæ:l/ ‘*lock*’, the last of which had to be eliminated as explained in subsection 6.3.1.

/æ:/ is a long monophthong that shows a great deal of variation between low and front-high-mid qualities in realisation, which I suspect is akin to what Fleisch (2012) calls ‘an unconditioned imāla’ (since in theory imāla is a process of vowel harmony which ‘tilts’ low vowels into high-mid vowels in the presence of a conditioning high vowel; the absence of a so-called ‘conditioning’ high vowel in these Cæ:C words makes the imāla affecting the vowel ‘unconditioned,’ which is to say underlying). The reason I am not calling the category ‘imāla’ is that the literature treats the process as applying globally (rather than getting a range of pronunciations covering [a: ~ e:]), we would expect a more or less uniform realisation [e:]), in fact to the point that Fleisch (2012) claims that imāla has come to ‘acquire a distinctive value’ (which cannot be the case if the quality of the vowel is inconsistent between speakers). Indeed, the examples he gives (which I cite in (6) on page 33) are consistently realised, at least in modern-day CMLL, with a value of [e:] for the vowel supposed to have undergone imāla.

It is important to point out that Cæ:C words contrast with a set of words that CMLL speakers conceive of with high-mid vowels, as exemplified in (18). Words that Fleisch (2012) describes in his examples would best fit into the category of words for which an

irreversible process of *imāla* has rendered the vowel into an $/eː/$, as in the first example of (18). Note that in very closely related varieties, such as Syrian for instance, this *imāla* has not occurred and these vowels which, in MSA are realised with an $[\text{æ̥}]$ and in CMLL with an $[eː]$, are realised in Syrian (and potentially in one or more non-CMLL varieties of Lebanese, for which I have no data) with an $[\text{æ̥}]$.

- (18) a. MSA $/b\text{æ̥}ːb/$ CMLL $[beːb]$ CMLL $*[b\text{æ̥}ːb]$ ‘door’
 b. MSA $/ʔ\text{æ̥}ːb/$ CMLL $[ʔeːb]$ CMLL $[ʔ\text{æ̥}ːb]$ ‘August’
 c. MSA $/l\text{æ̥}ːm/$ CMLL $*[leːm]$ CMLL $[l\text{æ̥}ːm]$ ‘the letter ʔ’

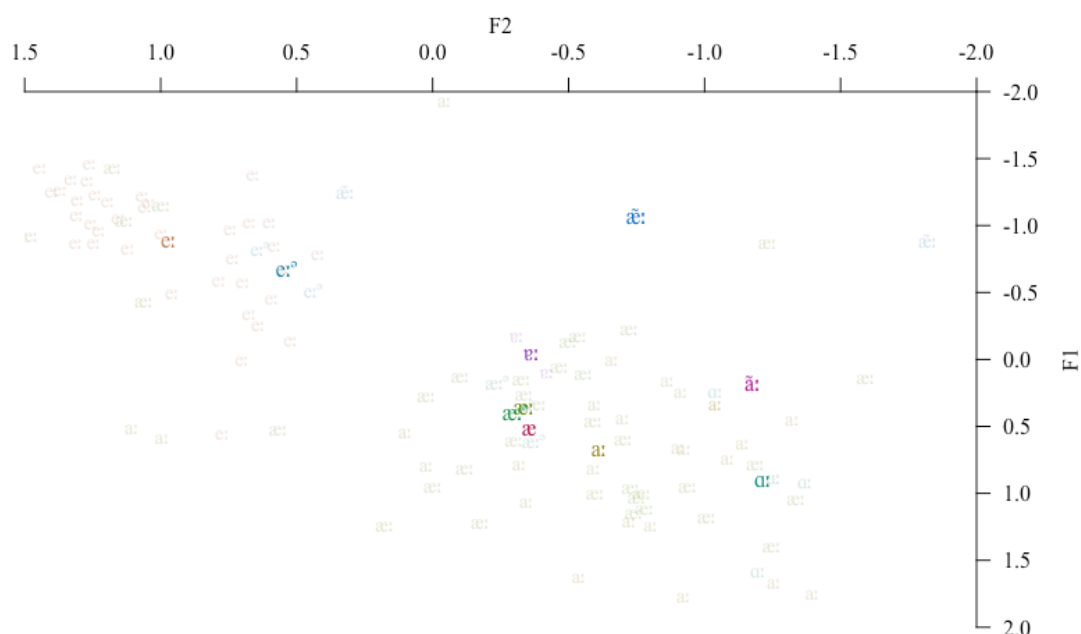


Figure 9.1: $/\text{æ̥}/$'s vowel space, as determined by formants and corrected for intra-speaker variation by z-transform

The data shows, as expected, a great deal of variation (shown in figure 9.1) where the $/\text{æ̥}/$ vowel is concerned. The realisations as transcribed are listed in table 9.1 (while I acknowledge loss of detail due to transcriptions, categorising the qualities involved is essential to be able to develop arguments around them). That being said, and as shown in figure 9.2, only 38% of the tokens were realised with high-mid qualities ($[eː]$), and three

out of the four stimuli being more often realised with low qualities ([α : ~ ɐ : ~ a : ~ æ :]) including one (/ʎ æ :ʃ/) exclusively realised as such.

Table 9.1: / æ :/ Raw and Quality-Combined Realisation Data

Stimulus	[α :]	[ɐ :]	[a :]	[æ :]	[e :]	Low (a-like)	High-Mid (e-like)
/ʎ æ :b/		2	3	21	12	26	12
/ʎ æ :m/	4		19	15		38	
/ʎ æ :ʃ/			5	5	27	10	27
Totals	4	2	27	41	39	74	38

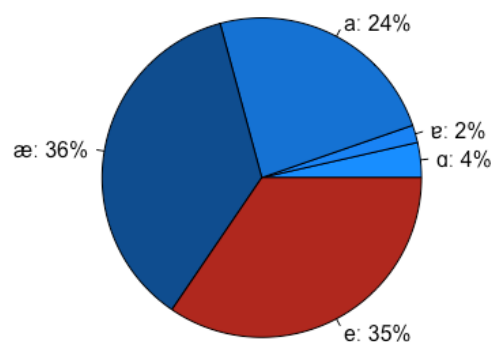


Figure 9.2: Collated Realisation Counts for / æ :/

The mean formant values for the four qualities that occur the most as realisations of this category are given in table 9.2.

Table 9.2: Mean formant values for alternating vowel’s realisations

Quality	Count	Ratio	Mean F1	Mean F2
[ɑ:]	4	3.60%	753	1178
[a:]	27	24.32%	701	1232
[æ:]	41	36.94%	706	1387
[e:]	39	35.14%	512	2105

Why this variation occurs is probably a matter of historical *imāla* (so it was a vowel that *imāla* could apply to, and the result was then lexicalised into a phoneme æ with free variation). Speakers will presumably have realised some of their low vowels as ‘tilted’ (raised) in the context of closed vowels, brought in by case and morphology as early as Classical Arabic (CMLL does not have case and its first person possessive suffix is $/-e:/$), say for instance in the form of the genitive marker $/-i/$ or the first person possessive $/-i:/$). That case and morphology will not have applied to all possible words that use this vowel can easily be resolved by the principle of analogy in sound changes. That analogy has not taken place in all similar contexts can be resolved by proposing an ongoing progression of the sound changes, as affected by different factors.

Since the Standard Arabic and Syrian forms use the low quality, and since one of the stimuli exclusively shows a low quality vowel, it is not unreasonable to consider the older form of this category of sounds a low vowel. Going from there, if we consider the number of occurrences of realisations in the collated data shown in table 9.1 representative of the state of things in CMLL, it is possible to order the stimuli used from the most conservative (most realisations as a low vowel) to the least conservative (most realisations as a high-mid vowel) for analytical purposes. This would propose the order, from most conservative to least conservative, to be: $/\text{ʕæ:m}/$; $/\text{ʕæ:b}/$; $/\text{ʕæ:f}/$.

9.1 Interpretation of the results from each stimulus

The word $/\text{ʕæ:m}/$, which I gloss as ‘*general*’, was elicited in the context $/l-\text{ʕæmn} l-\text{ʕæ:m}/$ ‘*The General Security Directorate (literally General Security)*’. The term is the name of an intelligence agency and will expectedly be heavily influenced by the orthography الأمن العام

and MSA broadcast media rendering, typically heard on the news: $/\text{ʔæ}l\text{-ʔæmni}l\text{-ʕæ:m(i)}/$. The reason this word was transcribed with a hypothetical underlying $/\text{æ:}/$ (rather than $/\text{æ:}/$) is that it also occurs in other contexts, such as the Lebanese expression $/\text{ʕæ:m.m(i)t} \text{ə} \text{ʕʕæb}/$ ‘*the general public*’ in which its realisation would expectedly vary (ie. $[\text{ʕæ:m.m(i)t} \sim \text{ʕe:m.m(i)t}]$). The elicitation sentence chosen is however a grammatical sentence in CMLL, which portrays the word in (one of) its most frequent uses, and the hope was to obtain the word in CVC form (rather than suffixed with the feminiser $/\text{-t}/$).

The word $/\text{ʔæ:b}/$ ‘*August*’ seems to be less conservative in its realisation than $/\text{ʕæ:m}/$. In Central Mount Lebanon, month names are usually codeswitched-in from English or French in practice for younger generations, except in official settings like the classroom, at work, or in broadcast media. As a general rule, however, official settings tend to favour MSA, which uses a low vowel in the word. MSA influence could be the reason for the realisation in this case, and this theory is supported by the fact that the older generation favoured a low realisation of the vowel in this word: the older generation watches news broadcasts (in MSA) and the younger generation usually gets its information online. More importantly, the fact that young people are likely to codeswitch their way around this word into French or English (eg. at home or with friends because it’s a summer month) means that it is not as often used as, say, LB $/\text{ke:nu:n}l\text{-ʔæw:æ}l/$ (MSA $/\text{kæ:nu:n}l\text{-ʔæw:æ}l/$) ‘*December*’ (a school month). It is important to note that this is speculation on the basis of small amounts of data. Of 3 realisations from people over 24, all are low, and of the rest, realisations are mixed. All speakers stick to their openness of quality (just one speaker alternates $[\text{a:} \sim \text{æ:}]$).

The word $/\text{ʕæ:j}/$ is the perfect tense (used to indicate actions completed in the past, and used as the citation form/infinite in Lebanese) form of a verb meaning ‘*to live*’. Although related to the MSA $/\text{ʕæ:jæ}/$, in the CMLL data it occurs more often with a high-mid vowel than with a low vowel. A likely explanation is that the word would be more often used in informal settings than in formal ones, because the Lebanese word has come to mean (see (19)) ‘*to survive*’ (for which MSA uses a different form, $/\text{næ} \text{ʒæ:}/$) more often than just ‘*to live*’ when used in the perfect tense, probably because ‘*to live (somewhere), to inhabit*’ can more accurately be translated as $/\text{sækæn}/$.

- (19) Manne 2akide 2eza [3 SH] men ba3d l3amaliye.

mæn:ɛ ʔæki:de ʔəzæ ʔæ:ʃ mæn bæʃd l-ʔæmælije
 NEG.1S certain-F if live-PERF.1MS after the operation

‘I am unsure whether he survived the operation.’

9.2 Note on the Variability in Low Qualities

Only 4 of the 111 realisations (3.60%) of $/\text{æ}:/$ were transcribed as $[\text{ɑ}:]$, which makes $[\text{ɑ}:]$ a rare realisation of $/\text{æ}:/$, more likely to be a mistake than a quality well-established in the free variation. On another hand, as seen in table 8.1 on page 59, $[\text{ɑ}:]$ is almost exclusively a realisation of $/\text{æ}:/$ and the short version, $[\text{a}]$, is exclusively a realisation of $/\text{æ}/$.

Since, as per all of this and the discussion in chapter 8, the low central vowel does not contrast with the low front vowel, we can speak of $/\text{æ}:/$ as being realised in free variation from low to high-mid frontal qualities (in practice, to say that $/\text{æ}:/$ is realised as $[\text{ɑ}: \sim \text{a}: \sim \text{æ}: \sim \text{e}:]$, while more accurate and detailed than to say that it is realised as $[\text{æ}: \sim \text{e}:]$, is more cumbersome than it is useful).

9.3 The Status of Imāla in CMLL

I would disagree with Fleisch (2012)’s statement that vowels historically affected by unconditioned imāla have acquired a distinctive value, in that the words he uses to exemplify the process (which I cite in (6)) use a vowel that has consistently merged with the front high-mid $/\text{e}:/$ in realisation.

That being said, a historically low vowel now shows some degree of free variation (in realisation) consistent with the effect traditionally termed ‘imāla,’ which, I hope to have convincingly argued, is progressing from mostly being realised as low qualities to increasingly being realised as high-mid qualities. It becomes apparent from my analysis of the data that a process of unconditioned imāla is very much active in the synchronic phonology of CMLL, but that, beyond simply being a category of vowels, unconditioned imāla seems to be an active sound change process, which is only active on a phoneme $//\text{æ}://$.

Chapter 10

On High Vowel Qualities

According to Watson (2002, p. 21-22), all modern dialects of Arabic have the long high front and back vowels, and certain dialects of Arabic have lost the contrast between short front and back high vowels (the literature on Lebanese — discussed in chapter 4 — seems to reject this idea). Gairdner (1925) claims that [ɪ]^o is an allophone of the long front high vowel which occurs when said vowel occurs before a consonant ending a syllable, and that, similarly, [ʊ]^o is an allophone of the long back high vowel.

Of the modern dialects of Arabic which have not fully lost contrast between front and back high vowels, Watson adds, the contrast only still exists ‘in certain contexts,’ and there is a more centralised, neutral phoneme emerging.

10.1 Long Front and Back High Vowels

The data shows that the long front and back high vowels are consistently realised as expected. There is no overlap in realisation whatsoever, as the realisations sit at opposite ends of the long high vowel space (except for the odd outlier¹, see figure 10.1). This is in line with all of the literature, both on Lebanese and on related varieties, and there is thus little else to be added about /i:/ and /u:/ to benefit the current discussion, beyond listing

¹There are 3 outliers from the /i:/ category, showing formants that place them in relatively central positions of the vowel space, and 2 outliers from the /u:/ category, showing formants that place them in frontal positions of the vowel space. The /i:/ outliers are likely tokens that were difficult to measure, the /u:/ outliers were both transcribed as [u: + closed] which indicates at least a marked pronunciation. 3 outliers of 355 for /i:/ and 2 outliers of 372 for /u:/ are 0.845% and 0.538% of the total number of measurements respectively, which is to say they are insignificant.

the mean formant values for these categories, which I do in table 10.1, and synthesising what I have just said to confirm that they are, indeed, the underlying phonemes //i:/ and //u:/.

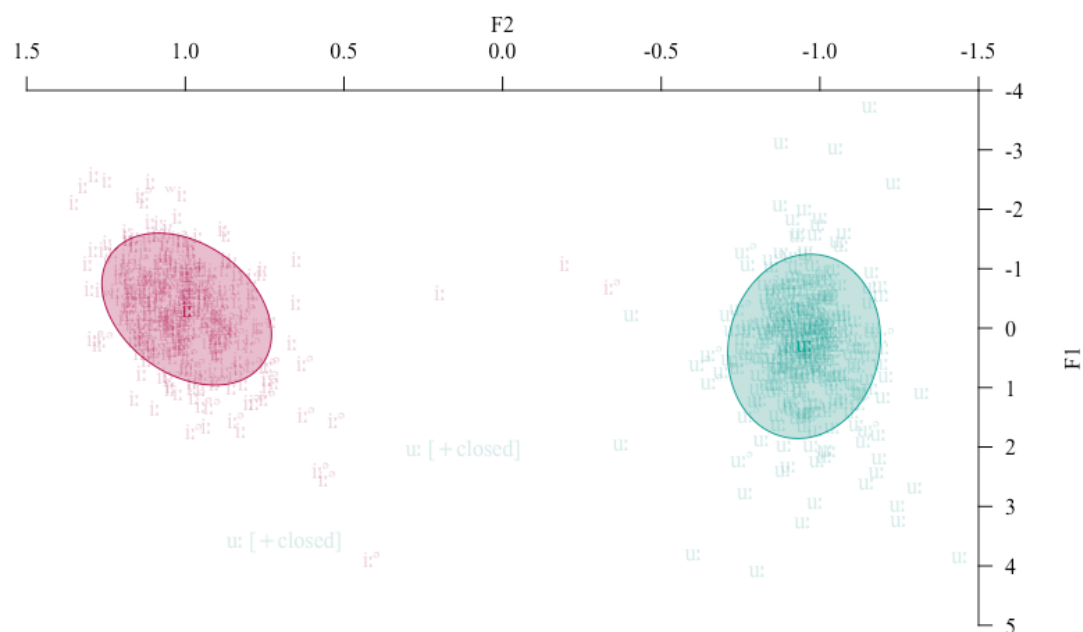


Figure 10.1: Long high phonemes' vowel space, as determined by formants and corrected for intra-speaker variation by z-transform; ellipses show 1 standard deviation around the mean

Table 10.1: Mean formant values for long high vowel phonemes' realisations

Phoneme	Count	Mean F1	Mean F2
//i:/	355	342	2349
//u:/	372	368	813

By using the same procedures described in subsection 8.1.1, I obtained clear acoustic evidence for at least two distinct categories of realisation in short high vowel qualities: the realisations were consistent with the expected, hypothesised qualities, and the categories's realisations occupy clearly distinct areas of the vowel space², as can be seen in figure 10.2. The mean formant values for these categories are given in table 10.3. As far as the phonetic data is concerned, there are two distinct short high vowel categories being produced (realisations impressionistically transcribed as [ɪ] and [ə], detail level reduced, overlapped to a great enough degree in terms of formant values that it would have been overkill to consider them separate; the mean formant values for the three main impressionistically transcribed qualities are given in 10.2).

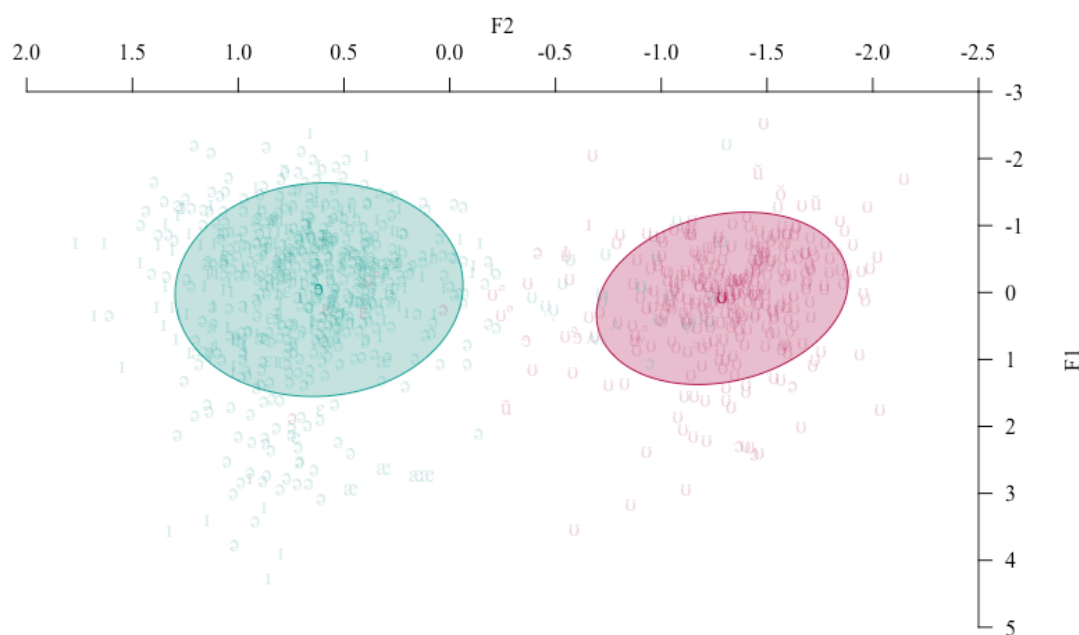


Figure 10.2: Short high categories' vowel space, as determined by formants and corrected for intra-speaker variation by z-transform; ellipses show 1 standard deviation around the mean

²Except for very rare exceptions probably due to errors in measurement or in speaker performance at the time of the experiment.

Table 10.2: Mean formant values for short high vowel impressionistically transcribed categories' (occurring more than 10 times) realisations

Quality	Count	Mean F1	Mean F2
[ə]	485	480	1791
[ɪ]	163	477	1868
[ʊ]	311	485	1121

Table 10.3: Mean formant values for (acoustically determined) short high vowel categories' realisations

Quality	Count	Mean F1	Mean F2
/ə/	920	478	1786
/ʊ/	327	487	1134

Three words proposed as stimuli for /ə/ in the data set, /rəb/ ‘*pulp*’, /ʃərb/ ‘*the drinking*’ and /sʰər/ ‘*insist!*’, show at least some realisation as [ʊ] (see table 10.4³, the three stimuli are highlighted).

³The realisation tier yielded [æ], [e], [ɛ], [ɛ], [ə], [o], [ɔ], [ʊ], [ʊ], [ʊ^ə], [ʊ^ə], [ʌ], and [ʊ^o]; of these, the rare occurrences of [ə] were merged with [ə] and the rare occurrences of [ʊ, ʊ^ə, ʊ^ə, ʊ^o] with [ʊ]. [æ], [ʌ], [ʊ], [o], [ɔ], [ɔ], [e], [ɛ] were considered ‘Others’.

Table 10.4: Short high categories' stimuli and realisations with a separator before stimuli containing emphatics

Stimulus	[ə]	[ɪ]	[ʊ]	Others
/dəʔ/	38			
/nəʔ/	36	2		
/ʒəld/	34	4		
/bəɫ/	34	3		1
/rəmʃ/	32	2		3
/məsk/	31	7		
/ʃərb/	31	5	2	
/kəm/	29	7		2
/ħən/	28	10		
/kəls/	27	11		
/sər/	27	9		2
/bəkr/	26	12		
/rəb/	25	1	12	
/kəzb/	24	12		2
/dəb/	22	2		
/məɳ/	20	16		2
/səb/	9	27		
/bəɖ/	7	31		
/mʊr/			37	1
/ħʊsʕ/	2		36	
/sʕʊb/	2		34	2
/sʕʊr/	2		22	2
/ɣʊɖʕ/		2	30	4
/dʕʊɖʕ/			37	1
/sʕʊf/			36	2
/lʊsʕ/			36	2
/dʕʊb/			36	2
/sʕər/			8	3

If we dismiss the latter for now, considering that it contains an emphatic, we are left with two words with MSA cognates that use an underlying $//\text{ʊ}//$: rəb (LB) is related to rɔb : (MSA) and fərb (LB) is related to fɔrb (MSA). One possible explanation would be that the participants have code-switched into MSA during the experiment. Another would be that the process Watson describes is now at the end of its occurrence in the history of CMLL, and the stimuli showing $[\text{ʊ}]$ variants are simply a little late (seeing as they are both more frequently realised with $[\text{ə}]$ or $[\text{ɪ}]$). The context in which $[\text{ʊ}]$ would continue to be used is pharyngealisation, which is the phonetic realisation of emphasis (see example (20)).

- (20) a. $/\text{sər}/$ $[\text{sər} \sim \text{sɪr}]$ ‘*a secret*’
 b. $/\text{s}^{\text{f}}\text{ər}/$ $[\text{s}^{\text{f}}\text{ər}]$ ‘*insist!*’

This is supported by the fact that the ʊ -stimuli all contain emphatics — except for $/\text{mɔr}/$ ‘*bitter*’. It would be interesting to see if one or both of the consonants in $/\text{mɔr}/$ is pharyngealised in production (going by the traditional set of emphatic consonants, of which neither $*//\text{m}^{\text{f}}//$ nor $*//\text{r}^{\text{f}}//$ are hypothesised in most of the literature, and since the MSA word $/\text{mɔr}/$ does not contain any underlying emphasis). If the consonants are pharyngealised in production, a case could be made that the speaker is correcting their pronunciation to something like $[\text{mɔr}^{\text{f}}]$ in order to allow the vowel outside of its emphatic preservative.

10.3 The Short Front High Vowel

Given the existence of a short front high vowel in MSA, and given how readily speakers of CMLL codeswitch into MSA, it is not surprising that $[\text{ɪ}]$ occurs generously in CMLL in production. Native intuition suggested that it is at least often centralised to a $[\text{ə}]$, which would further suggest that there exist two high-mid vowels in the front to central area of the vowel space: one which can centralise to a $[\text{ə}]$, and one which cannot. In Sakr, 2018, I avoid the issue for want of space and represent all short central-to-front high-mid-to-low-mid vowels with $//\text{ə}//$.

The counts of realisations of each of the ə -stimuli as each of $[\text{ɪ}]$, $[\text{ə}]$ and $[\text{ʊ}]$ are shown in table 10.4. The proportion of each realisation out of the total number of tokens for each stimulus is shown in figure 10.3.

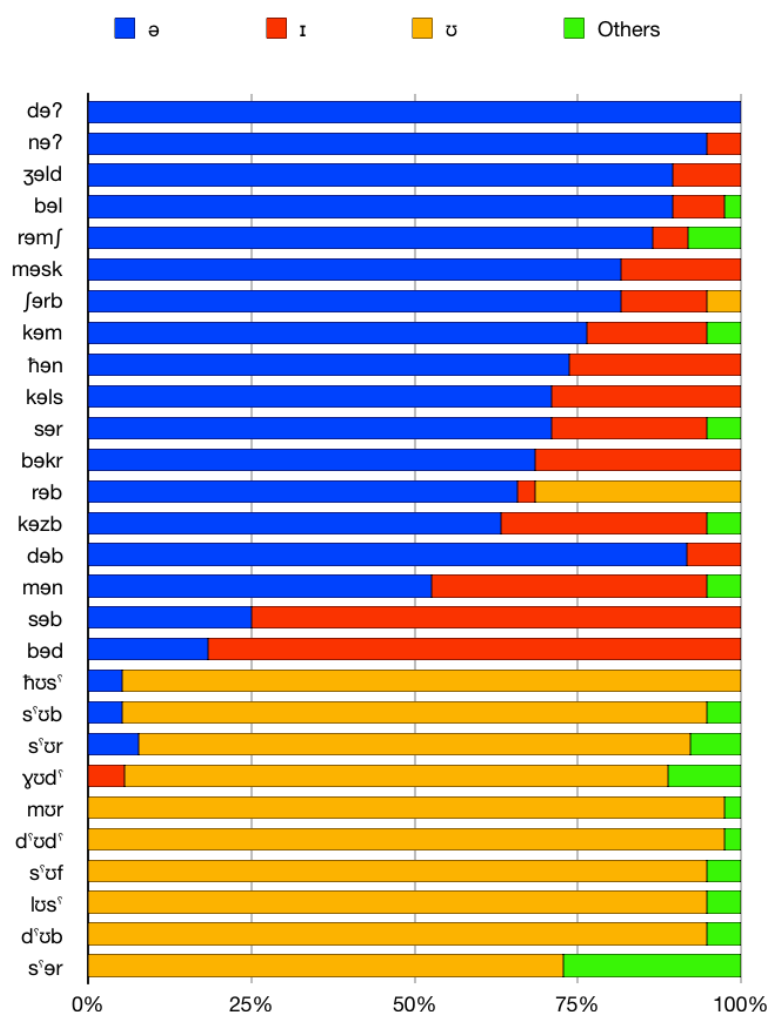


Figure 10.3: Short high categories' stimuli realisations count as a proportion of the whole

/bəd/ 'part of an expression meaning 'at any cost'' and */səb/* 'curse!' were realised with an [ɪ] more often than with an [ə]; */s^ɪər/* 'insist!' was realised with a [ʊ] and never with either [ɪ] or [ə]; and all the other ə-stimuli (that do not contain emphatics) were realised with a [ə] more often than anything else. Out of them, */də?* 'touch!, call!' was the only one to only ever be realised with a [ə].

It seems fair to suggest that, overall, a systematic change is currently taking place in the /ə/ category, with /ɪ/ centralising to /ə/ (since MSA is more conservative, the fact that /ə/ (LB) seems to correspond more or less to //ɪ// (MSA) seems to support this point).

This leaves the two ʔ-stimuli that do not contain emphatic consonants but are realised with [ɪ]:

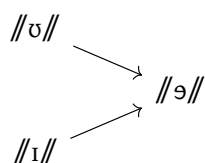
/bəd/ is related to the MSA /bʊd:/. It is rare (if not completely absent) in CMLL outside of the expression /mən kəl bəd/ ‘*at any cost*’, which exists in MSA as مِنْ كُلِّ بَدٍّ /mɪn kʊl:ɪ bʊd:ɪn/. If we trust the Centralised Neutral Phoneme’s historically-inclined hypothesis, it is possible to posit a change from bʊd > bɪd, which would have caused bɪd > bəd to start happening later than most [ɪ] > [ə] changes.

/səb/ is the imperative of the verb /səb/ (‘*to curse*’), itself related to the MSA verb سَبَّ /səb:æ/ (meaning the same). The imperative form of سَبَّ is اسْبِبْ /ʔəsɪbb/; a form which Lebanese has completely supplanted by analogy with other imperative forms (see example (21)). It is important to note that, in MSA, سَبَّ is not very frequently used, with لَعَنَ (/ləʔænæ/ ‘*to curse*’) and سَمِعَ (/sætæmæ/ ‘*to swear*’) both in more common use. It would be interesting to see how often speakers who pronounce /səb/ (LB) with each of the two qualities pronounce other words that have supplanted earlier imperative forms in the transition to CMLL. Until such a time as the prevalence of [ɪ] over [ə] for words like /səb/ can be explained, I advocate going with the overall trend, which would readily be explained by the centralisation discussed in this section.

- | | | | | | | |
|------|----|-------|---------------|-----------------------|---------|---------------------|
| (21) | a. | حَبَّ | /ħæb:æ/ (MSA) | ‘ <i>to love</i> ’ | /ħɪb:æ/ | ‘ <i>love!</i> ’ |
| | | | /ħæb/ (LB) | ‘ <i>to love</i> ’ | /ħəb/ | ‘ <i>love!</i> ’ |
| | b. | دَلَّ | /dæl:æ/ (MSA) | ‘ <i>to point</i> ’ | /dʊl:æ/ | ‘ <i>point!</i> ’ |
| | | | /dæl/ (LB) | ‘ <i>to point</i> ’ | /dəl/ | ‘ <i>point!</i> ’ |
| | c. | حَمَّ | /mæd:æ/ (MSA) | ‘ <i>to stretch</i> ’ | /mʊd:æ/ | ‘ <i>stretch!</i> ’ |
| | | | /mæd/ (LB) | ‘ <i>to stretch</i> ’ | /məd/ | ‘ <i>stretch!</i> ’ |

10.4 Conclusions for High Categories

As it stands now, in CMLL, a systematic change is taking place that is centralising the short high front vowel /ɪ/. This seems to be happening in combination with the occurrence of loss of contrast in short high vowels, which continues to occur independently in some modern varieties of Arabic. Both of these changes are currently active.



At the same time, it would appear that all short high vowels /ə/ are realised with a back quality [ʊ] in the context of phonological emphasis, potentially (until an articulatory study confirms this) more broadly the context of articulatory pharyngealisation.

$$//ə// \rightarrow \begin{cases} [ʊ] / & [+EMPHASIS] \\ [ɪ \sim ə] / & elsewhere \end{cases}$$

My analysis in this section argues in favour of three synchronic high vowel phonemes, one short and two long: //ə//, //i://, //u://, such that the short vowel category varies in realisation from central to front, but is realised more towards the back in the context of emphasis.

In light of the argument that there is only one synchronic short high vowel category, I calculated the mean duration of all of its 1009 realisations to 99.31ms. It would then come after /V_{ep}/ in table 7.1, effectively pushing the epenthetic vowel to the position of shortest mean duration among the hypothesised vowel categories. Interestingly, if we were to consider the category without its 328 realisations as [ʊ], whose mean duration places it second to longest in the short vowel categories hypothesised, the mean duration of the 681 remaining tokens would be of 91.99ms, making the unconditioned realisations of the phoneme //ə// shorter on average than the epenthetic vowel.

Chapter 11

On Historical Diphthongs

In discussing the Classical Arabic diphthongs *ay° and *aw° , Watson (2002) says that, in the Levant, they are now realised as /ē/° and /ō/° respectively. She argues that, since the coalescence of these monophthongs no longer apply in Cairene, the long monophthongs are separate phonemes. This is especially true because diphthongs occur in contemporary forms in contrast with mid monophthongs.

In the case of Lebanese, Nasr (1955) only mentions (synchronic) diphthongs (/ai/° and /au/°). Obégi (1971) presents /e:/° and /o:/° , with for only mention of diphthongs, a few environment-conditioned allophones of monophthongs (eg. [īɜ]° as an allophone of /i:/° before /r/° , [ēɜ]° as an allophone of /e:/° , [ōɜ]° as an allophone of /o:/° before /h/° ...). Abdul-Karim (1980) claims that ‘the long ee° exists only as an optional realisation of underlying ay° ’ (Abdul-Karim, 1980)[p. 6] and ‘long oo° is an optional realisation of underlying aw° as well as a realisation of underlying short u° when it is lengthened in a monosyllable, essentially in the masculine imperatives’ (Abdul-Karim, 1980)[p. 6]. The only mention of diphthongs in Haddad (1984) that I could find is that his examples show underlying /ay/° and /aw/° . Muhaydli (1996) lists long /e:/° and /o:/° and two diphthongs /aw/° and /ay/° as a part of the inventory of Lebanese proper. She also adds two diphthongs /ei/° and /oy/° to her chart due to the frequency with which they occur in English loanwords (which is what her paper focuses on).

Going from the literature in chapters 3 and 4, the stimuli took into account three pairs of hypothesised categories: two long high-mid monophthongs /e:/ and /o:/ with stimuli expected to consistently be realised with them, two so-called ‘synchronic’ raising diphthongs /aj/ and /aw/ with stimuli expected to consistently be realised with them,

and two so-called ‘diachronic’ raising diphthongs / $\widehat{aj}$ / and / $\widehat{aw}$ / with stimuli expected to vary in production (I use ‘diachronic diphthongs’ to speak of a category of diphthongs whose realisation varies freely between the diphthong itself and a corresponding long monophthong). The data collection and processing phases took into account the possibility that the predicted categories may have been inaccurate, and therefore the script that read the Realisation tier and measured formants and durations did so without taking into account the predicted or hypothesised categories. That is, the script first searched the Realisation tier’s label for the glides. If it found a <j> or a <w>, it treated the interval as a realised diphthong, measuring the formants at 25% and 75% of the total duration; otherwise it treated the interval as a realised monophthong and only measured the formants at 50% of the total duration.

Finally, since the stimuli were generated by stringing together all possible arrangements of vowels, consonants and gemination marks which could be glossed by native intuition, / $w\alpha:w$ / ‘*the character ,*’, / $b\alpha:j$ / ‘*bye!*’ and / $n\alpha:j$ / ‘*a Nay (type of flute)*’ were all part of the set participants were asked to say. Since at least in one case / $\alpha:j$ / contrasts with / $\alpha:j$ /, since / $n\alpha:j$ / contrasts with / $n\alpha:j$ / ‘*raw*’ (eg. *meat*), this would suggest one of two phonological realities: either we introduce a fourth and fifth pairs to investigate here (/ $\alpha:j$ / and / $\alpha:w$ /, and / $\alpha:j$ / — and / $\alpha:w$ / for the sake of symmetry¹); or we reanalyse these words as either CVD or CV:G, D for diphthong and G for glide. The main issue with the fourth and fifth pairs is that they would suggest an even larger inventory, which would be typologically marked.

Once collected, the realisation tokens were then associated with the hypothesised categories (the Praat script collected the Hypothesised Category tier interval’s label overlapping exactly with the Realisation tier interval and listed both labels in the data log) and the results are presented in tables 11.1, 11.3 and 11.6.

¹The diphthong / $\alpha:w$ / does not appear in the data, and is being inferred by symmetry. It might be a gap in the system, but it could also be the case that there are simply no examples of it in the CVC lexicon used to elicit data from speakers, and that a borrowing from a language which uses [$\alpha:w$] would fill the gap.

11.1 Long High-Mid Monophthongs

Table 11.1: Hypothetical high-mid categories' realisation counts

Category	Realisation	Count
/e:/	[e:]	142
	[e: ^ə]	7
	[a:]	2
	[ɛ:]	1
/o:/	[o:]	24
	[o: ^ə]	7
	[õ:]	5

As shown in table 11.1, the hypothesised long high-mid monophthong categories were never produced as diphthongs, with an overwhelming majority of tokens realised as monophthongal and only a few realised with a bit of final centralisation [^ə] (but none with a full off-glide [j] or [w]). This on its own seems sufficient to support the claim that //e:// and //o:// exist within the phonology of CMLL as phonemes in their own right, and is also supported by the fact that, conversely, none of the hypothesised synchronic diphthong categories were produced as either one of these (or indeed, any) monophthongs, as shown in table 11.3.

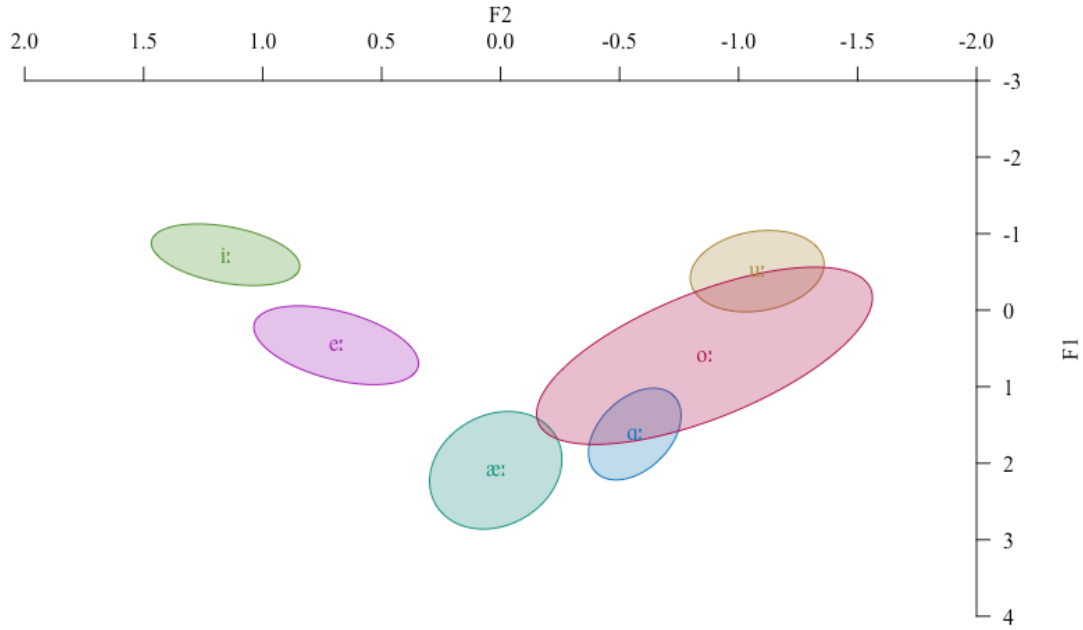


Figure 11.1: Long monophthongal categories' vowel space, as determined by formants and corrected for intra-speaker variation by z-transform; ellipses show 1 standard deviation around the mean

As figure 11.1 shows, [e:] (mean (F1, F2) pair at (483, 2042)) occupies a subset of the long monophthongal vowel space distinct from that of either [i:] (342, 349) or [æ:] (686, 1569). [o:] (502, 954), however distinct from [u:] (368, 813) and [ɑ:] (630, 1169), does overlap a little bit with both; but this is due to a larger standard deviation of both of its F1 and F2, probably due to the scarcity of [o:] tokens (only one stimulus, [tʰo:n] 'tuna', makes use of [o:] ; meaning that we only have 36 realisations of [o:] versus 152 realisations of [e:]). This is therefore more likely a flaw of experimental design than of hypothesis. The mean formant values for these phoneme's realisations are given in table 11.2.

Table 11.2: Mean formant values for high-mid phonemes' realisations

Phoneme	Count	Mean F1	Mean F2
//e://	152	483	2042
//o://	36	502	954

The occurrence of //e:// and //o:// in varieties of CMLL can be attributed to four² factors. A proper discussion of the vowels of CMLL would be incomplete without at least mentioning them:

Syriac and Phoenician First and foremost, a page from history. Lebanon was inhabited by a succession of civilisations, some of which non-Arab Semites, some predating the Arab conquests (see Hitti, 1957).

One such civilisation, the Arameans, left 'pre-Arab Semitic names' to 'a large number of plants,' (Hitti, 1957, p. 244), as well as terms relating to theology. 'The overwhelming majority of Lebanese villages still bear Aramaic or Phoenician³ names,' (Hitti, 1957, p. 244) (in fact, Hitti (1957, p. 244) mentions a list of 530 villages bearing Syriac⁴ names) and both languages made use of /e/° and /o/° qualities⁵ phonemically, see (22)^{6,7} and (23)⁶.

Since these languages left words which are still used in Lebanon today, it stands to reason that, if these words have kept their original pronunciation, they would be using their original phonologies.

²In the case of //e://, four; in the case of //o://, three.

³Phoenician was the regional dialect of Canaanite spoken along the coast of Lebanon (Krahmalkov, 2000, p. 1).

⁴Western Syriac is the dialect of Aramaic that was spoken in Lebanon.

⁵There is no indication of quantitative distinctions in Classical Syriac, says Muraoka & Brock, 2005, p. 6.

⁶I standardised the macron length marking into IPA <: > and the emphatic underdot marking into IPA <ˆ> for improved readability.

⁷Albeit interesting to note that /e:/° and some /o/° in Syriac result from the contraction of /ay/° and /aw/° (Muraoka & Brock, 2005, p. 6), and that others seem to result from dialectal developments from monophthongs (see Muraoka & Brock, 2005, p. 7), it suffices our purposes to say that it had the qualities //e//° and //o//° as part of its phonemic vowel system, discussed in Muraoka & Brock, 2005, p. 7. As a side note, /aw/° is always realised as [o:]° in Biblical Aramaic (Johns, 1982)[p. 6].

(22) Syriac:

- a. /man/° ‘who?’ /men/° ‘from’
- b. /malka:/° ‘king’ /melka:/° ‘counsel’
- c. /be:θ/° ‘the house of’
- d. /yom/° ‘the day of’
- e. Both Eastern and Western Syriac orthographical systems that indicate at least the five vowel qualities /a/° /e/° /i/° /o/° /u/° , with Eastern Syriac additionally marking length for /e:/° and /a:/° .

(Muraoka & Brock, 2005, p. 5-7)

(23) Phoenician:

‘In addition to the twenty-two consonantal phonemes, there were the short vowels a° e° i° o° u° , the long vowels i:° o:° a:° and the contracted diphthongs e:° o:° .’

(Krahmalkov, 2000, p. 19)

One major problem with this factor is the fact that there is some degree of overlap (mostly of a consonantal nature), due to etymological relationships, between some semitic forms (see example (24)); and that with the waves of Arabisation that overtook the area since Syriac was the most widely spoken variety in the area, some modern-day words wound up with unclear origins. As a result, for instance, either or both the Syriac /be:θ/°⁸ and the Arabic /bæjt/ could be etymologically linked to the Lebanese /baj̄t/ ([be:t ~ bæjt]). Since the word survives in city names dating back to Syriac times, the word was probably preserved from Syriac and was infused with the Arabic vowel (the spirantisation would have been dropped from the final consonant whether under the influence of the Arabic form or simply because Lebanese turns all /θ, ð/ to /t, d/), probably through the influence of orthography (as Modern Standard Arabic is the official language of Lebanon, and therefore signs carry the names of towns in the Arabic script, which transcribes both the MSA /æj/ and the non-Arabic /e:/ as a <ع>). So much so that even in his argument that the word for house is Aramaic, Hitti (1957) transcribes <بيت الدين>, the town whose name means ‘House of Judgement,’ as *Bayt al-Dīn* (the town’s name can be pronounced grammatically anywhere on a scale from [be:t.əd.di:n] (LB) to [bæj.tod.di:nɪ] (MSA)).

⁸Spirantization is marked with an underdot <·> in the Syriac writing systems. This seems to indicate that speakers of Syriac were aware of a link between /t/ (<ⲧ>) and /θ/ (<Ⲫ>), despite the fact that spirantisation in Classical Syriac was beginning to lose its allophonic status (Muraoka & Brock, 2005, p. 12).

- (24) a. /man/° (SY) /mæn/ (MSA) /mi:n/ (LB) ‘who?’
 b. /men/° (SY) /min/ (MSA) /mən/ (LB) ‘from’
 c. /malka:/° (SY) /mælik/ (MSA) /mælæk/ (LB) ‘king’
 d. /be:θ/° (SY) /bajtæ/ (MSA) /bajt̪/ (LB) ‘the house of’
 e. /yom/° (SY) /jawmæ/ (MSA) /jawm/ (LB) ‘the day of’

This stands in stark contrast with words such as the Lebanese /be:b/ ([be:b] but *[bæ:b]), which seems to indicate a direct descent from Syriac /be:b/° rather than the Arabic /bæ:b/. That being said, a Lebanese speaker attempting to transcribe Lebanese into Arabic letters would spell /be:b/ <باب> for want of an Arabic letter associated with the high-mid vowel (and probably due to the influence of the Arabic spelling of the Modern Standard Arabic word).

To complicate matters further, Syriac represents both /e:/° and /i:/° as a same character, < , >; and the Western script diacritic < , > is meant to represent an underlying /a/°⁹ which is consistently pronounced [o]° in spoken West Syriac.

Suffice to say for our purposes that at least some modern-day Lebanese (and more particularly CMLL) words can clearly be traced to an etymon that uses the monophthongs in question in a variety of Syriac where they were consistently pronounced as such. It is thus safe to assume that high-mid monophthongs have always had synchronic phonemic status in Lebanese, and therefore the other factors explaining the occurrence of these monophthongs in CMLL are ones that merged other phonemes into the existing ones.

Progression of Diphthongs to Monophthongs In a related vein, since the process also occurs in both languages mentioned above, the diachronic progression from historical diphthongs to long monophthongs is a factor that would explain some of CMLL’s //e:// and //o:// phonemes.

Progression of Historical Unconditioned Imāla The progression of historical unconditioned Imāla as discussed in section 5.1 is another factor that explains some of CMLL’s //e:// phoneme. Fleisch (2012) cites examples I quote in (6) of words that undergo unconditioned Imāla in some varieties of Lebanese, but which, in CMLL, only

⁹The diacritic is called *Zqāṭā*, a name it shares with an older Eastern script diacritic (two diagonally placed dots above a letter) which represents /a/°.

ever occur with a front high-mid [e:] (that is, low realisations of the vowel would be considered marked or ungrammatical to a speaker of CMLL, indicating a complete split from the low vowel that undergoes unconditioned Imāla, which Fleisch notes as / $\tilde{a}$ /° for Kfar Abīda Lebanese and I note as // æ :/ for CMLL¹⁰). Since pairs like the ones in (25) exist in CMLL, the /e:/ they use is its own phoneme.

- (25) a. /re:ʒəŋ/ ‘returning’ v/s /rɑ:ʒəŋ/ ‘revise!’
 b. /ʒe:re/ ‘flowing’ v/s /ʒɑ:r+e/ ‘my neighbor’

Phonologisation of Borrowed Phones The phonologisation of borrowed phones brought into Lebanese or more specifically CMLL by loanwords from languages which have these long monophthongs, such as English (see (26) Muhaydli, 1996, length macron standardized to IPA <: >) and French (see (27) and Sakr, 2018, transcriptions modified to reflect the length discussion in section chapter 7), would be another factor that explains phonemic high-mid monophthongs in CMLL.

- (26) a. /foʊkəs/° ‘focus’ (EN) > /fo:kas/ ‘focus’ (LB)
 b. /kəntroʊl/° ‘control’ (EN) > /kontro:l/ ‘control’ (LB)
 c. /tiʃərt/° ‘t-shirt’ (EN) > /ti:ʃert/¹¹ ‘t-shirt’ (LB)
 d. /pɛtrəl/° ‘petrol’ (EN) > /bɛtro:l/¹² ‘petrol’ (LB) (Muhaydli, 1996, p. 49-55)
- (27) a. /bal.kõ/ ‘balcony’ (FR) > /bæl.ko:n/ ‘balcony’ (LB)
 b. /bis.kõt/ ‘biscuit’ (FR) > /bəs.ko:te/ ‘cookie’ (LB)
 c. /bi.dɛ/ ‘bidet’ (FR) > /bi.de:/ ‘bidet’ (LB)
 d. /o.tɛl/ ‘hotel’ (FR) > /o.te:l/ ‘hotel’ (LB) (Sakr, 2018, p. 51-53)

On one underlying level, each of these two qualities, times four factors for the front

¹⁰The fact that they occur in different words, in different varieties of Lebanese and at different times, makes me want to treat them as separate categories, albeit presumably related at their historical root by the phenomenon of unconditioned imāla. Fleisch’s / $\tilde{a}$ / is a historically low vowel that seems to always be produced with a high-mid quality, and // æ :/ is a historically low vowel that gets produced with a great deal of free variation between low and high-mid qualities.

¹¹She uses ʃ rather than ʒ and calls it a ‘alveo-palatal fricative,’ but also calls ʃf ‘the English alveo-palatal voiceless affricate’ and so, for readability’s sake, I changed ʃ to ʒ in the Lebanese word.

¹²I have changed this transcription from Muhaydli (1996)’s /bɛtro:l/ because as per new analysis CMLL does not have a short version of the underlying long front high-mid monophthong //e:/. A realisation of [e] is, of the phonemic inventory I am presenting here, most likely to be an underlying /ə/.

high-mid quality and three factors for the back high-mid quality, is its own category of vowels in CMLL. On a synchronic, phonological level, each of the front and back high-mid qualities are covered by a single phoneme (which is to say, the seven categories defined by the source of the qualities have merged into two synchronic long high-mid monophthongal phonemes //e:// and //o://).

11.2 Synchronic and Diachronic Diphthongs

As mentioned in section 11.1, all of the hypothesised synchronic diphthong categories were realised as diphthongs, and none of the hypothesised long high-mid monophthong categories were. While the literature on Lebanese (see chapter 4) gives conflicting analyses of what these realisations may be at an underlying level, the literature on Arabic (see chapter 3) informs us that the historical diphthongs *ay^o and *aw^o, in some varieties, have coalesced into long high-mid monophthongs (Watson (2002) says that dialects ‘spoken in much of the Levant’ belong to this category), and in some others have been maintained as diphthongs.

The case of high-mid vowels in Cairene, according to Watson, is more complicated: coalescence has occurred, but it no longer active, and with a ‘massive influx of forms with diphthongs’ that would have occurred after the coalescence stopped being active (so that the original diphthongs would have gotten reanalysed as underlying long monophthongs), currently ‘mid-vowel monophthongs contrast with derived diphthongs’ (Watson, 2002, p. 23). Given the occurrence of diphthongal realisations in the CMLL data, as in table 11.3, can a case be made that there exists a pair of underlying synchronic diphthongs in CMLL, that contrasts with the underlying long high-mid monophthongs?

Table 11.3: Hypothetical synchronic diphthong categories' realisation counts

Category	Realisation	Count	Category	Realisation	Count
/ɑj/			/ɑ:j/		
	[ɑj]	35		[ɑ:j]	24
	[ɒj]	2		[ɑ:j]	10
	[ɑj:]	1		[ɒ:j]	2
/aw/			/ɑ:w/		
	[ɑw]	33		[ɑ:w]	32
	[aw]	2		[ɑ:w]	2
	[æw]	2		[aw]	2
/æj/			/æ:j/		
	[æj]	74		[æ:j]	19
	[ɛj]	2		[ɑ:j]	10
				[ɑ:j]	9
/æw/					
	[æw]	122			
	[ɑw]	17			
	[æ:w]	2			
	[æ̃w]	2			
	[aw]	2			
	[ɔw]	1			

The number of occurrences of at least /æj/ and /æw/ being realised in the data as [æj] and [æw] respectively is in line with expectations. Acoustically, at least, underlying sequences of vowel + glide are realised fairly regularly as the corresponding phonetic vowel + glide, with wide movements of both formants as reflected in figure 11.2. The differentiating factor between the diphthongs is the fronting of the endpoint.

The contrast between //æ// and //ɑ// is suggestive of contrast between /æj/ and /ɑj/ on one side, and /æw/ and /ɑw/ on the other. The fact that monophthongal length is contrastive, in combination with their occurrence in realisation (except for [æ:w], which

does not occur as a realisation of an underlying /æ:w/ in the data¹³), is suggestive of an additional contrast between each of these four monomoraic diphthongs (P₁P₂), and their bimoraic counterparts (P₁:P₂).

In some language varieties, diphthongs are considered single phonemes, while in others they are analyzed as sequences of two vowels, or of a vowel and a semivowel. So which can be argued as the case for Central Mount Lebanon Lebanese? Can we discuss these diphthongs as a monophthong to monophthong or monophthong to semivowel sequence, or should we simply consider each of them a separate complex phonemic unit?

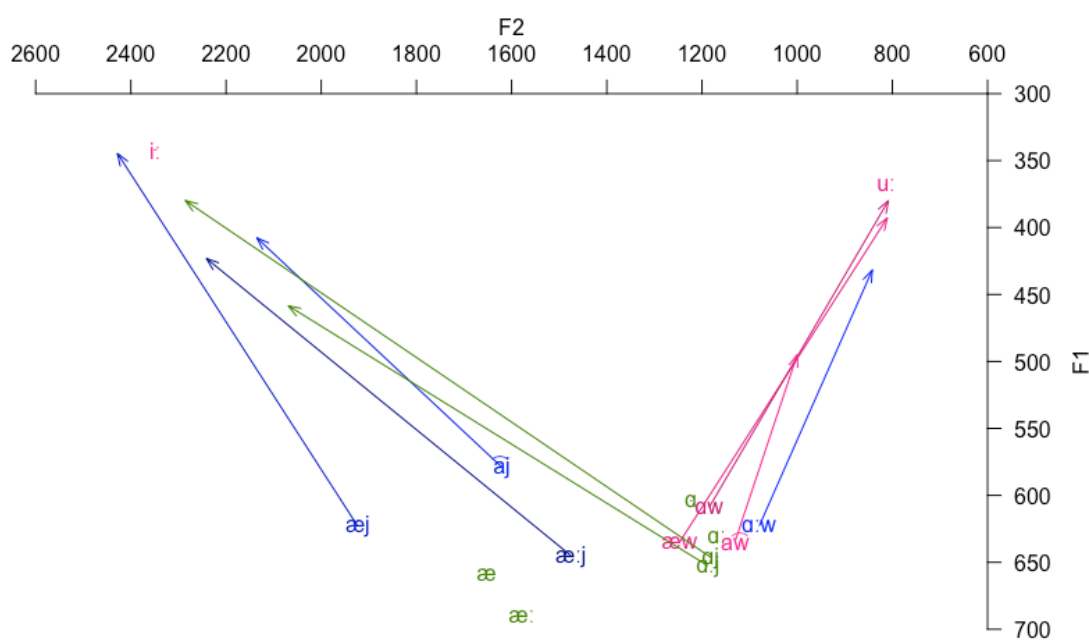


Figure 11.2: Diphthongal categories' vowel space, as determined by mean formants across all speakers at 25% (starting point) and 75% (ending point) of the total duration, shown with the low and high long monophthongs (based on mean formant values) for reference

¹³No stimuli use /æ:w/ to begin with. [æ:w] occurs in two realisations of an underlying /æw/, which amounts to a chance 1.37% (2 out of 146 realisations).

Table 11.4: Mean formant values for synchronic diphthong categories' realisations

Quality	Count	Mean F1 at 25%	Mean F2 at 25%	Mean F1 at 75%	Mean F2 at 75%
/æw/	146	635	1247	393	811
/aw/	38	609	1185	380	808
/ɑ:w/	36	623	1080	432	842
/æj/	76	623	1923	345	2428
/æ:j/	38	645	1475	423	2241
/ɑj/	38	646	1182	380	2286
/ɑ:j/	38	653	1188	458	2069

Note on Notation As far as phonetics is concerned, a diphthong is a complex articulation characterised by the movement of articulators (and by extension, of formants) between two positions. Notationally, to represent a diphthong as $\langle P_1P_2 \rangle$ supposes that the articulators are moving from the position they would be in to articulate the sequence's starting point $\langle P_1 \rangle$ to the position they would be in to articulate the sequence's second (and in this case final) point $\langle P_2 \rangle$. Since the glides [j] and [w] require the articulators to be in similar positions as, and show formants similar to, those of the vowels [i] and [u] respectively, all the while aware that P_1 is always a vowel, I use $\langle V \rangle$ interchangeably with $\langle P_1 \rangle$.

11.3 Sequence or Unit: The Acoustic Perspective

The mean values for [æ]'s first two formants are (660, 1669). Those for [ɑ] are (608, 1230). While [æ]¹⁴ and [ɑ] as the starting point of corresponding diphthongs are higher than [æ] and [ɑ] as the realisations of monophthongs, the endpoints of the theorised monomoraic diphthongs are at the height of the high monophthongs, while the endpoints of the theorised bimoraic diphthongs are lower (see figure 11.2). As mentioned in section 6.4, the diphthongs' starting points were measured at 25% and their ending points were measured at 75%.

¹⁴/æw/ also starts much more back than /æ/.

If, by 25% of the duration, the formants are farther away from their positions at P_1 than they are 75% of the duration through from their positions at P_2 , that must mean the quality of the onset is produced for less of the overall time, and would therefore be less prominent, than the quality of P_2 . Since, in the data, as per subsection 7.2.1, short vowels were often followed by geminated final consonants, and it follows then that $/\text{æ}P_2/$ would have been realised as $[\text{æ}P_2:]$ (a plausible reason for P_2 to be given more time in production), this suggests that P_2 is being treated as a consonant ([j] or [w]) rather than a vowel ([i] or [u]). The acoustics of these diphthongs' realisations therefore seem to support a monophthong + semivowel analysis.

What I have been describing as hypothetical bimoraic diphthongs, in the form of $P_1:P_2$, show the formants (and by extension the articulators) to be closer to the onset at 25% of their total duration than they do at 75% to P_2 . This supports my point further: the durations of the segments making up the articulation are linked to the distance of the articulation at 25% and 75% from the reference monophthongs.

11.3.1 Note on Mono-and-Bi-moraic Diphthong Durations

Table 11.5: Hypothetical diphthongal categories' durations in increasing order

Category	Count	Average Duration (ms)
/aj/	38	292.21
/aw/	38	294.93
/æw/	146	295.62
/æj/	76	308.48
/a:w/	36	316.80
/æ:j/	38	340.44
/a:j/	38	351.21

That being said, as shown by the data in table 11.5 (and discussed in section 7.1), synchronic diphthongs seem to fit an XXX measurement (in terms of duration) at around 300ms. Does that mean that they are all underlyingly XX-long monophthongs (M:) that slide into a single X-long glide (ie. M:G)? The starting and ending positions of the

diphthongs, shown in figure 11.2, push me to disagree.

Although the average durations of the hypothesised bimoraic diphthongs (/a:w/, /æj/, and /ɑ:j/) are slightly greater than the average durations of the hypothesised monomoraic diphthongs (/aj/, /aw/, /æw/, and /æj/), the difference (8.32ms) between the duration of the shortest bimoraic diphthong (/a:w/ at 316.80ms) and the longest monomoraic diphthong (/æj/ at 308.48ms) is much less than the difference (59.15ms) between the shortest (and monomoraic) diphthong (/aj/ at 292.21ms) and the longest pure¹⁵ monophthong (/o:/ at 233.06ms); which would advocate that monomoraic and bimoraic diphthongs belong to a same class (XXX) in terms of durations.

If the average duration, albeit slightly longer in bimoraic diphthongs, can be considered roughly the same across both groups of diphthongs, it is possible to talk of some sort of compensatory lengthening (or complementary quantity) even among diphthongs, so that if monomoraic and bimoraic diphthongs fit the XXX measurement postulated in section 7.1, monomoraic diphthongs do it as P₁P₂ and bimoraic diphthongs do it as P₁:P₂ in realisation.

The sheer number of possible diphthongs shown in the stimuli and the data, and the fact that it appears as though both of the low monophthongal qualities in both of each of their lengths combine (at least in theory, for lack of an attested /æ:w/), with both of the semi-vowels, the economic analysis would be to consider these possible ‘diphthongs’ as sequences of separate elements: one vocalic and one semi-vocalic or consonantal (which is in line with what the acoustics seem to support).

11.3.2 Syllabification

Trask (2004, p. 114) defines a diphthong as being ‘a single syllabic nucleus which begins with one vowel quality and changes more or less smoothly to a second quality, as in [ju]^o and [ai]^o.’

Syllables in CMLL If we take traditional views of syllabification in Lebanese to hold in Central Mount Lebanon Lebanese, according to Obégi (1971, p. 29), ‘there are five basic syllable types in [Lebanese] roots:’ CV, CVV, CVC, CVVC, and CVCC (long vowels being treated as a string of two short vowels here) and a sixth type of syllable resulting

¹⁵I use ‘pure’ to exclude the categories I refer to as ‘diachronic diphthongs’, because in realisation they are vary between monophthongs and diphthongs.

from morphological or syntactic operations: an onset with two consonants, which have to be ‘homogeneous with respect to their pharyngealisation’ (Obégi, 1971, p. 29).

This is to be considered incomplete (if not inaccurate) for Central Mount Lebanon Lebanese, due to the occurrence of morphologically simple monosyllabic words, such as /kte:b/ ‘a book’ (compare the MSA /kita:b/), /kbi:r/ ‘big’ (compare /kabi:r/), or /ħma:r/ ‘donkey’ (compare /ħima:r/) where the syllable type would be CCVVC if we continue to treat long vowels as pairs of short ones; and in the case of the last example, /ħma:r/ has an onset consisting of a voiceless pharyngeal fricative followed by a voiced bilabial nasal stop (that is, they are not ‘homogeneous’ as to their pharyngealisation). Another example of a missing syllable type is exemplified by /ʃwaj/ ‘a bit’ (CCV). There may be other types that I cannot cover here.

Morphological Complications It seems possible to add a consonant at the start of any of the mentioned syllable types, to form morphologically complex words such as /w+fi:/ ‘and there is’, /j+sʔi:r/ ‘to happen (imperfect)’, /l+ʔækl/ ‘the food’ or /l+məʃ.kle:/ ‘the problem’ to obtain such syllable types as C(+)CV, C(+)CVVC, C(+)CVCC, and C(+)CVC. Underlying¹⁶ CCC or even CCCC clusters can similarly occur in C(+)CCVVC or C(+)C(+)CCVVC environments respectively, as in /w+kte:b/ ‘and a book’, /l+kbir/ ‘the eldest’, or /w+l+ħma:r/ ‘and the donkey’. These will almost always be realised with an epenthetic vowel at one and/or the other juncture, to form bisyllabic words in realisation, eg. /l+kbir/ is realised [lək.bi:r] and /w+l+ħma:r/ is realised either as [wləħ.ma:r] or [wə.ləħ.ma:r].

A diphthong is to be fully contained within the nucleus of a syllable, as per the definition of Trask (2004, p. 114) cited above. A vowel + glide, on the other hand, would be treated as a nucleus followed by any other consonant, as far as the syllabification is concerned. Since both CVV and CVC are allowed in Central Mount Lebanon Lebanese, words such as the one spelled <bayy> in chat orthogrpahy, ‘father’, could fit either (as /bæi/ or /bæj/ respectively, see figure 11.3 in which σ stands for ‘syllable’, ω for ‘onset’, ρ for ‘rhyme’, ν for ‘nucleus’, and κ for ‘coda’); making CVC words essentially useless in determining the status of what I hypothesise to call synchronic diphthongs within the phonology of CMLL.

¹⁶My argument for calling these syllable types underlying is that they follow phonological rules (epenthesis occurs to break up consonant clusters) when they are realised.

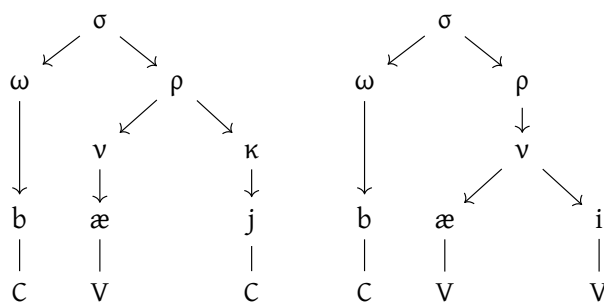


Figure 11.3: Two syllable analyses of the word <bayy> ('father')

CVVC, on another hand, presents an interesting angle. There do not seem to be synchronic diphthongs that fit this syllable type, because all CMLL words of the form $C_1P_1P_2C_2$ (such that C_1 can but doesn't have to be equal to C_2) that I could find, can be realised with a long monophthong instead of a diphthong, as in example (28).

- (28) a. $/s^{\text{f}}\text{awm}/$ 'to fast' $[s^{\text{f}}\text{awm}]$ $[s^{\text{f}}\text{o:m}]$
 b. $/z^{\text{f}}\text{æwz}/$ 'a husband' $[z^{\text{f}}\text{æwz}]$ $[z^{\text{f}}\text{o:z}]$
 c. $/b\text{aj}^{\text{f}}\text{d}^{\text{f}}/$ 'eggs' $[b\text{aj}^{\text{f}}\text{d}^{\text{f}}]$ $[b\text{e:d}^{\text{f}}]$
 d. $/\text{f}\text{æj}^{\text{f}}\text{x}/$ 'a Cheikh' $[\text{f}\text{æj}^{\text{f}}\text{x}]$ $[\text{f}\text{e:x}]$

As far as diachronic diphthongs are concerned, therefore, whether they are realised as diphthongs or as long monophthongs, they are entirely contained within a same syllable, of which they act as the nucleus, as in figure 11.4.

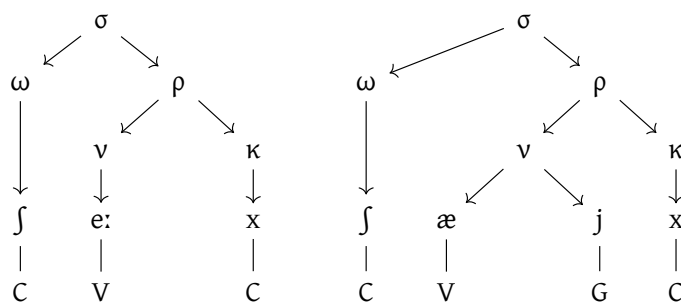


Figure 11.4: Two syllable analyses of the word <sheikh> ('a Cheikh')

If diachronic diphthongs are a class that consists of historical diphthongs on their

way to monophthongisation¹⁷ such that the monophthongisation is conditioned by a succeeding consonant, that would mean that the monophthongisation of diphthongs is governed purely by phonotactics.

Exceptions to the rule I know of a single synchronic morphologically simple exception to this rule: /ʃwaj/ ('a bit') (which I mention in example (2) on page 13) is realised on a continuum from [ʃwæj(:)] to [ʃwe(:)]. My intuition is that, since the word when used as a partitive marker becomes /ʃwajt/ ('a bit of'), where for instance 'a bit of coffee' is /ʃwajt ʔæhwe:/ and is realised as [ʃwæjt ʔæhwe: ~ ʃwe:t ʔæhwe:] (the rule applying), people would have linked [ʃwæjt] to [ʃwæj] and wound up linking [ʃwe:t] to [ʃwe:] by analogy. Since [ʃwe:] would thus be a newly introduced form, rather derived from [ʃwe:t] than from [ʃwæj], [ʃwæj] and [ʃwe:] would therefore be two separate forms at an underlying level and therefore we couldn't speak of */ʃwaj/ as underlying. The final vowel in one form is //e://, and the final vowel in the other form is /æj/.

On another hand, the word /læw/ 'if / though', when combined with /w/ 'and', is produced as [wlo(:)] (/w+law/?), which is used to express frustration. The expression [wæ.læw] is more Standard (as in MSA; Lebanese /w/ 'and' is related to MSA /wæ/ 'and') and is also used to express frustration, with a subtle nuance in meaning ([wæ.læw] conveys more shock, /wlo:/ conveys more anger). Synchronically, this is not an exception, because of the divergence in meaning; the form /wlo:/, though united in etymology to [wæ.læw], seems to have undergone reanalysis, as [wlæw] would be understood as /w/ + /læw/ 'and if' rather than /wlo:/ 'EXPR. exasperation, anger'. This does however suggest that at some point in the diachrony, it would have been an exception to the rule, in the sense that monophthongisation would have applied word-finally.

¹⁷Which they are; this is how I define what I call 'diachronic diphthongs.'

Table 11.6: Hypothetical diachronic diphthong categories' realisation counts

Category	Realisation	Count	Category	Realisation	Count
$\widehat{aj}$			$\widehat{aw}$		
	[e:]	162		[o:]	91
	[e: ^a]	29		[o: ^a]	55
	[æj]	28		[æw]	12
	[ɛ:]	8		[aw]	5
	[aj]	6		[ow]	5
	[ej]	5		[ou]	4
	[^w e:]	4		[ãw]	2
	[ɔj]	4		[ɔw]	2
	[e: ^j]	3		[õ:]	2
	[ə:]	2		[õ: ^a]	2
	[œ:]	2		[a ^w]	2
	[ɛj]	2		[ɔ: ^j]	2
	[ɛ: ^a]	2		[u:]	2
	[e ^j]	2		[aw]	1
	[ɛ: ^a]	1		[Λw]	1
	[^w e: ^j]	1		[Λ ^w]	1
	[ɛ: ^j]	1		[ɔw]	1
	[e:]	1			
	[ãe:]	1			

While, in realisation, the theorised ‘diachronic diphthongs’ were consistently produced with the variation they are defined by (see table 11.6), there would be no reason to consider diachronic and synchronic diphthongs separate phonemes, because they would be behaving as the regular, environmentally-determined allophones of a same phoneme. It would then follow that synchronic and diachronic diphthongs work the same way as one another in terms of phonotactics, and, therefore, since the diachronic diphthongs theorised are all nuclei within syllables, so would the synchronic diphthongs. This would make all of them ‘diphthongs’ as per the phonological definition of Trask (2004) given above, and would signify that diphthongs in CMLL phonology are more than a sequence

of segments. That being said, the mean formant values at 25% and 75% of the total duration of the diachronic diphthongs in their diphthongal realisations, and the mean formant values of the same diachronic diphthongs in their monophthongal realisations, are given in table 11.7.

Table 11.7: Mean formant values for diachronic diphthong categories' realisations (more than 5 occurrences)

Quality	Count	Mean F1 at 25%	Mean F2 at 25%	Mean F1 at 50%	Mean F2 at 50%	Mean F1 at 75%	Mean F2 at 75%
[aj] ¹⁸	45	579	1620			408	2135
[e:]	162			526	2058		
[e:ə]	29			512	2143		
[ɛ:]	8			630	2028		
[aw] ¹⁹	29	634	1130			495	1000
[o:]	91			476	875		
[o:ə]	55			479	893		

If we could show synchronic monomoraic and bimoraic diphthongs to be different in their behaviour within syllables, for instance by showing that C_1ajC_2 is attested but not $C_1a:jC_2$ in C_1VCC_2 syllables, the glide would be filling the coda slot in the case of aj and this would be sufficient evidence to support a compositional analysis of synchronic diphthongs, because aj would include a coda (of a consonantal nature). If such is the case, diachronic diphthongs are separate phonemes from their synchronic counterparts, because the latter would be compositional and the former is a unit (since diachronic diphthongs fit into nuclei), a fact supported by their variability into a single vocalic segment. The problem, as exemplified in (28), is that all CMLL words of the form $C_1P_1P_2C_2$, whether the hypothetical segment in the position of P_2 is a vowel or a consonant, end up allowing variation between a diphthong and a long high-mid monophthong in realisation (which could also be described as ‘using a diachronic diphthong’).

11.4 Conclusion on Diphthongs

For all intents and purposes therefore, what I call diachronic diphthongs cannot occur in CVV environments and what I call synchronic (monomoraic) diphthongs cannot occur in CVVC environments. This is a classical case of complementary distribution, and while the categories can still be defined respectively as ‘a set of diphthongs that varies in production with specific long monophthongs’ and ‘a set of diphthongs that is always realised as the diphthongs themselves,’ the categories in this case do not qualify as separate phonemes, and instead present themselves as allophones of a same phoneme such that (C being a consonant and L being a low vowel):

$$\begin{aligned} //Lj// &\rightarrow \begin{cases} [Lj] / & _ \# \\ /Lj/ = [Lj \sim e:] / & _ C \end{cases} \\ //Lw// &\rightarrow \begin{cases} [Lw] / & _ \# \\ /Lw/ = [Lw \sim o:] / & _ C \end{cases} \end{aligned}$$

There also exists a set of long, bimoraic diphthongs which do not (to my knowledge as per this data) monophthongise. As far as quantity is concerned, monomoraic and bimoraic diphthongs are realised in comparable amounts of time, and the distinction between them is made between which of the two ends that characterise the qualities is given more time in realisation, such that the realisations of monomoraic $[P_1P_2]$ and bimoraic $[P_1:P_2]$ are in fact geminated P_2 $[P_1P_2:]$ and long P_1 $[P_1:P_2]$ respectively.

The diphthongs thus defined are $//æw//$, $//æj//$, $//aw//$, $//aj//$, $//æw̃//$, $//æj̃//$, $//āw//$, and $//āj//$.

Caveat If as per the observation in subsection 7.2.1, I took the fact that all CVC (short V) words among the stimuli were often, but not always, produced with a geminated final consonant, to mean an underlying word-final *consonantal* geminate, the occurrence of realisations such as $[bæj:]$, $[næj:]$, $[læw:]$, $[zæw:]$ and so on would be an argument in favor of an underlying glide consonant (or ‘semivowel’), and therefore of a CVC analysis such that diphthongs would *not* function the same as vowels.

I do not however have the data required to theorise on the underlying length of the final consonant, for example the claim that $[bæj:]$, $[næj:]$, $[læw:]$, $[zæw:]$ and so on have underlying word-final gemination ($/bæj:/$, $/næj:/$, $/læw:/$, $/zæw:/$, ...) rather than the realisation of such a gemination being simply due to word-final lengthening. As a result of underlying word-final *consonantal* geminates, monomoraic and bimoraic

diphthongs would vary in the way they undergo syllabification, and thus the above argument would only apply to bimoraic diphthongs, making monomoraic diphthongs a sequence of segments.

Chapter 12

On Epenthesis in Consonant Clusters

As discussed in section 5.3, Haddad (1984) gives impressionistic descriptions of epenthetic vowels, and Hall (2013) mentions that CCC and CC consonant clusters are frequently broken up by epenthetic vowels in colloquial Levantine Arabic dialects.

Where vowel quality is concerned, Hall (2013) cites Cowell (2005) for a Damascene [ə]^o, Elihay (2004) for a Palestinian [e]^o and Haddad (1984) for a Lebanese [i]^o, all on the basis of impressionistic descriptions. Haddad says that suprasegmental features ‘considerably alter [the epenthetic vowel’s] quality’ (Haddad, 1984, p. 37).

Contrary to what Hall (2006) expects, Gouskova and Hall (2009) finds that some speakers of Lebanese realise epenthetic and lexical vowels differently (epenthetic vowels are shorter and have a lower F2) and that some speakers who epenthesise do so consistently, which would mean the vowel is now lexical and no longer epenthetic in their phonologies.

So what does the CMLL data say about duration, quality, frequency of occurrence and intra-speaker variation for /V_{ep}/ ? Is it a lexical phoneme (/V_{ep}/) in CMLL? Is it one for some speakers of CMLL?

12.1 Duration of Epenthetic Vowels

Table 12.1: Short phonemes' durations in increasing order

Suggested Category	Count	Average Duration (ms)	Duration SD (ms)
/V _{ep} /	516	92.47	33.08
//ə//	1009	99.31	35.75
//æ//	513	108.70	36.77
//ɑ//	188	121.58	28.68

Table 12.1 (which is in part from table 7.1, but which does take into account the findings in chapter 10 to consider categories [ə], [ɪ] and [ʊ] allophones of the phoneme //ə/) shows /V_{ep}/ to be the shortest category in realisation on average, with a standard deviation comparable to that of the other short categories' realisations.

The difference is however of less than 10ms from the second shortest category's mean duration, and less than 30ms from the longest short category's mean duration. Compared to an estimated 100ms difference between long and short monophthongs, the difference is insignificant enough that /V_{ep}/s realisations fit into the measurements for short vowel durations. While the vowel is shorter, a difference of 6.84ms is not significant enough to consider epenthetic vowels 'extra-short' when compared to other, 'short' monophthongs. In other words, albeit true that epenthetic vowels are shorter than so-called short or X-long monophthongs, they are only marginally so.

Additionally, the fact that the standard deviation for epenthetic vowels' durations is comparable to the standard deviations for lexical short vowels' durations means that the durations are as uniformly consistent across speakers as the durations of lexical short vowels. Timewise, when it is realised, the epenthetic vowel is quite uniformly realised overall (across speakers).

12.2 Quality of Epenthetic Vowels

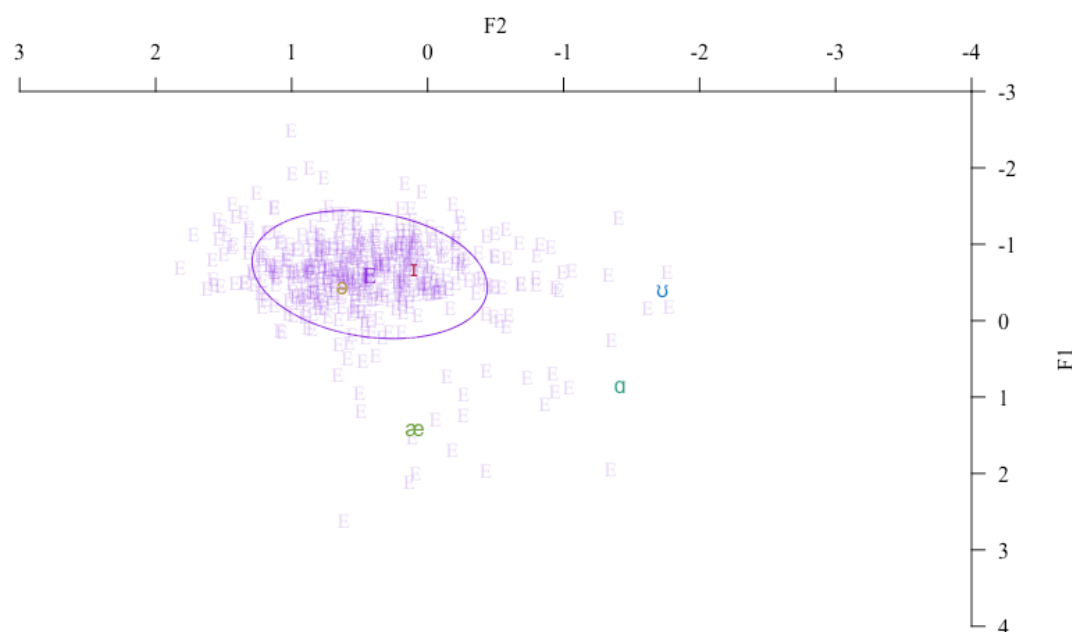


Figure 12.1: Epenthetic vowels’ space, and mean short vowel qualities, as determined by formants and corrected for intra-speaker variation by z-transform; ellipse shows 1 standard deviation around the mean

The 516 realisations of the epenthetic vowel, while they do seem to appear all over the vowel space as shown¹ in figure 12.1, are undeniably more concentrated in the space of [ə] and [ɪ] realisations (in fact, as can be seen in figure 12.2, there is a great deal of overlap in the qualities of these categories as determined by the first two formants).

¹The epenthetic vowel /V_{ep}/ is represented as E on figures for typographic convenience. When the intervals were labelled in Praat, all epenthetic vowels were indiscriminately (regardless of perceived quality) either transcribed as [E] if they were realised in the expected position, or not at all if the consonant cluster was realised as a cluster. Moreover, it was discovered that V_{ep} would not be recognised by the graphing software used to obtain the vowel charts, which is why the notational convention used in labelling epenthetic intervals was kept in graphing the vowel space.

above a value of 1 on the graph) to the word /læhV_{ep}m/ in a combination of 7 speakers (4 male, 3 female; 3 aged below 20, 3 around 20 and 1 above 40). This seems to describe an acoustic quality between [æ] and [a] as per the mean positions of these qualities in the vocalic inventory shown on the graph. This seems to be a case of vowel harmony: the epenthetic vowel is adopting the quality of the lexical vowel in the word.

[v] In the same way, I traced the 9 back realisations (ones with a z-transformed F2 below a value of -1 on the graph) to the words /d^ʃarV_{ep}b/ (5 realisations from 3 male speakers, 1 of each age group), /farV_{ep}d^ʃ/ (1 realisation from a male speaker aged below 20), and /læhV_{ep}m/ (3 realisations from 3 male speakers, 1 aged below 20 and 2 aged around 20, one of which overlaps with [æ] realisations). This seems to describe an acoustic quality of [v].

Table 12.2: Epenthetic realisations in the high-mid vowel space

Stimulus	Count (Speakers)	Spk. Gender	Spk. Age Groups
d ^ʃ arb	5 (3)	Male	1 below 20, 1 around 20, 1 above 40
fard ^ʃ	1	Male	1 below 20
læhm	2 (2)	Male	1 below 20, 1 around 20

Emphasis and Pharyngealisation The epenthetic vowels in /d^ʃarV_{ep}b/ and /farV_{ep}d^ʃ/ seem to follow the rule for //ə// whereby in the context of pharyngealisation the vowel is realised with a backing of the quality to [v].

To explain why there are cases of the epenthetic vowel *not* being dragged back due to pharyngealisation, I would call attention to example (17-e) of subsection 8.1.2, in which I explain that [far(ə)d] is more likely to be understood as /farV_{ep}d^ʃ/ ‘homework’ than [færV_{ep}d] ‘gun’ (because [fɑ.rəd] appears in the data as a relaxed realisation of /fard^ʃ/). In this case, I suggest that the epenthetic vowel would have broken the word up into two syllables all the while *not* being affected by the pharyngealisation at the level of the emphatic consonant. This supports the idea that an underlying //a// distinct from //æ// has been phonologised, and that the emphatics are, in turn, losing prominence in realisation as pharyngeals: if in fact the emphatic is not realised with pharyngealisation, there is no need for the epenthetic vowel to be backed by the now non-existent pharyngealisation.

Lip Rounding The epenthetic vowel in /læhV_{ep}m/ is likely to have been dragged into a realisation of [ʊ] by the word-final bilabial (which is rounded).

[ɑ] The only token that fit both conditions ($F1 > 1$ and $F2 < -1$ on the graph) and is mentioned in both above paragraphs was realised by a male speaker aged around 20 for the word /læhV_{ep}m/. It seems to describe an acoustic quality of [ɑ].

This would mean there are 11 realisations of the epenthetic vowel with a low quality ([æ ~ ɑ]) and 8 with a back mid quality ([ʊ]), leaving a total of $(516 - (11+8) =)$ 497 epenthetic vowels (96.32 % of the realisations) in the [ə ~ ɪ] space.

One final obvious remark to make is that a speaker does not always realise the epenthetic vowel with the same quality (since for example, there are 5 realisations of /dʰarV_{ep}b/ with an [ʊ]-emphatic from 3 speakers).

12.3 Occurrence of Epenthetic Vowels

The most obvious observation to get from table 12.3 is that speakers of CMLL are more likely than not to break up consonant clusters across the board (the rate of epenthesis² is at least about two-thirds).

²I calculate the rate of epenthesis for a word as the number of epenthesised realisations over total number of realisations.

Table 12.3: Epenthesis rate (in decreasing order) in word-final consonant clusters

Stimulus	Description	CC realisations	Epenthesis	Epenthesis Rate
ʃækl	Obs. + Son.	0	38	100.00%
bəkr	Obs. + Son.	0	38	100.00%
ʔækl	Obs. + Son.	0	38	100.00%
ʒəld	Son. + Obs.	1	37	97.37%
kəzb	Obs. + Obs.	1	37	97.37%
læhm	Obs. + Obs.	1	21	95.45%
ʃərb	Son. + Obs.	3	35	92.11%
dʕarb	Son. + Obs.	3	35	92.11%
bærd	Son. + Obs.	5	33	86.84%
færd	Son. + Obs.	5	33	86.84%
kəls	Son. + Obs.	5	33	86.84%
rəmʃ	Son. + Obs.	6	31	83.78%
dərb	Son. + Obs.	10	28	73.68%
kəlb	Son. + Obs.	10	27	72.97%
məsk	Obs. + Obs.	12	26	68.42%
fardʕ	Son. + Obs.	13	24	64.86%

The three words for which epenthesis happens 100% of the time all have /k/ followed by a liquid as word-final clusters. Additionally, this environment doesn't occur in words which undergo epenthesis less than 100% of the time (in the data); so presuming that this data is complete and representative, a word-final /k + L/, L being a liquid {r, l}, always undergoes epenthesis in Central Mount Lebanon Lebanese.

Working on Lebanese, Hall (2013, p.137) finds that 'epenthesis is almost exceptionless in obstruent-sonorant clusters. Sonorant-obstruent and obstruent-obstruent clusters have fairly high rates, even the homorganic clusters /ld/ and /ls/. The lowest rates are for the single voiceless cluster, /sk/, and the single sonorant-sonorant cluster, /lm/.'

All of the data is in line with Hall's findings, except for the voiceless cluster /sk/ in /məsk/ which is still 68.42% likely to epenthesise, and this places it before even the sonorant-obstruent (Hall's most-likely-to-epenthesise) cluster /rdʕ/ in /fardʕ/. That said,

is it possible but unlikely that the obstruent being pharyngealised (or an emphatic) is causing the exception (Hall (2013)’s data doesn’t include emphatics or pharyngeals; Hall, 2013, p. 134).

Table 12.4: Epenthesis rate for each speaker (in decreasing order) in word-final consonant clusters

Speaker	Socio. Data	Epenthesis	Total	Epenthesis Rate
GH01	17, F	32	32	100.00%
GS01	55, M	32	32	100.00%
RK01	21, M	32	32	100.00%
AS01	16, M	30	30	100.00%
JS01	17, M	30	30	100.00%
JS02	20, F	30	30	100.00%
LA01	16, F	30	30	100.00%
LS01	48, F	30	30	100.00%
TB01	19, F	29	29	100.00%
YH01	24, F	29	29	100.00%
AN01	17, F	30	32	93.75%
LI01	22, F	28	32	87.50%
CH01	22, M	26	32	81.25%
MS01	16, M	26	32	81.25%
AA01	20, M	22	32	68.75%
AC01	17, M	21	32	65.63%
NS01	54, F	19	30	63.33%
PN01	22, M	20	32	62.50%
NM01	24, F	19	32	59.38%

Hall (2013, p. 137) found that ‘speakers’ rates of epenthesis vary from 54% to 100%, with two thirds of the speakers epenthesizing over 90% of the time; [...] speakers were not [...] consistent in whether they produced a given word with epenthesis,’ such that, ultimately, ‘speakers [...] fluctuate between different valid pronunciations.’

Table 12.4 clearly shows that age and gender have no impact on epenthesis rate,

since both men and women aged 16 to 55 show 100% epenthesis rates, and men and women aged 16 to 54 show epenthesis rates less than 100%. Of the 19 participants whose recordings make up my dataset, 9 (47.37%) epenthesise 100% of the time, but only 10 (52.63%) epenthesise over 90% of the time (making this less than Hall's 'two thirds' finding).

That being said, the people who show 100% epenthesis rates can be said to epenthesise consistently, which according to Gouskova and Hall (2009) would mean the vowel is now lexical and no longer epenthetic, in their phonologies. While more production data would need to be obtained from these speakers to properly establish such a claim as truthful, a perceptual task should be run as well. If these participants can recognise the stimuli whether or not the final consonant cluster is epenthesised, this would be a strong argument against considering the vowel lexical. Until such a task can be run, Gouskova and Hall (2009)'s claim should be considered cautiously. It may well be that no amount of production data ever obtains these stimuli produced without epenthesis. It may also be that of twenty further realisations, all of them would be produced with consonant clusters instead.

Of all the instances where epenthesis was being elicited, 590 tokens were obtained across all the speakers. Of these, two tokens were of single instances of a word by a speaker (as in, each speaker recorded each word twice; 2 of the 590 tokens were single instances of words, the second recording for which was either deemed unusable during segmentation or simply never obtained, the speaker having forgotten to repeat the word a second time). This means the data, across all speakers, presents 294 instances of words (292 words repeated twice and 2 single instances) where epenthesis could occur. In 283 pairs (96.26%), the speaker either epenthesised or did not epenthesise both instances of the word (that is, the pronunciation used by the speaker was the same in both instances). In 11 pairs (3.74%), the speaker only epenthesised one instance out of two. Hall (2013)'s finding that speakers 'fluctuate between different valid pronunciations' holds true, even given the fact that, by design, speakers produced both instances in a row; it is in fact surprising that not all of the pairs match in the occurrence of epenthesis since they were produced in immediate succession.

Table 12.5: Epenthesis fluctuation in successive realisations of a same stimulus

Speaker	Socio. Data	Stimulus	Realisation #1	Realisation #2
AC01	17, M	kəzb	-	Epenthesis
CH01	22, M	læhm	-	Epenthesis
		rəmʃ	Epenthesis	-
		fard ^ɸ	-	Epenthesis
		ʃərb	Epenthesis	-
NM01	24, F	d ^ɸ arb	Epenthesis	-
NS01	54, F	rəmʃ	-	Epenthesis
		ʒəld	-	Epenthesis
		færd	-	Epenthesis
PN01	22, M	kəls	-	Epenthesis
		bærd	-	Epenthesis

It's interesting to note that only 5 of the 19 speakers produced the pairs with difference in epenthesis (let's call this 'epenthesis fluctuation'), as shown in table 12.5. In these pairs, epenthesis was a bit more likely in the second iteration (5 epenthetic vowels in Realisation #2 versus 3 in Realisation #1), only one word (*rəmʃ* 'an eyelash') was represented twice in the set, and age and gender had no impact on the phenomenon of epenthesis fluctuation (men and women aged 17 to 54 are represented in the set). This supports Hall (2013)'s findings with regards to fluctuation between different pronunciations (one can theorise that if the realisations were not in immediate succession they would probably vary more from one another). For these speakers at least, the vowel in question is epenthetic, and not lexical in nature.

Part III

Discussion and Conclusions

Chapter 13

Discussion: Features, Shapes and Sizes

13.1 Featural Analysis of Vowels in CMLL

According to Sandstedt (2019), because ‘the phonological component of a language L operates only on those features which are necessary to distinguish the phonemes of L from one another,’ (D. C. Hall’s Contrastive Hypothesis, 2007), the shape and size of a language’s sound inventory and the phonological features active in that language are correlated. So what could isolating the contrastive features of Central Mount Lebanon Lebanese tell us about its shape and size?

Since the majority of what this dissertation consists of has been to identify the contrasts that make up the Central Mount Lebanon Lebanese vowel inventory, the same thought process can be adopted here to establish the minimal set of contrastive features required to define the vocalic inventory of CMLL, and then ultimately gain insights into its size and shape.

Dresher (2009) provides two approaches to isolating the features of a set of contrastive segments (what he calls ‘Pairwise Algorithm,’ p. 14, and what he calls the ‘Successive Division Algorithm,’ p. 16), and argues that one of them (the so-called ‘Pairwise Algorithm’) cannot be correct (p. 29). Each approach gives different resulting contrastive features; but the intention is to obtain as restricted a set of features as possible (because typologically, smaller, symmetrical inventories seem to be preferred, and a more restricted set of contrastive features will yield a smaller set of features with fewer axes

around which to draw symmetrical correspondences¹); and so whichever one of the two approaches yields a smaller (but effective) set of features will prove useful to my purposes. To that end, I attempt both approaches.

Common Starting Point: the Full Vocalic Inventory

In Part II of this dissertation, I set out the phonemes that make up the Central Mount Lebanon Lebanese vowel inventory. These phonemes, which I reiterate in section 14.2, are //æ//, //a//, //æ:/, //ɑ:/, //e:/, //o:/, //i:/, //u:/, //ə//, //ɛ:/, //aw//, //aj//, //æw//, //æj//, //ɑ:w//, //ɑ:j//, //æ:w//, and //æ:j//.

That being said, the Central Mount Lebanon Lebanese vocalic inventory, it can be argued, should be split into two or three sets or ‘systems’: diphthongs versus monophthongs, and a possible further distinction in between long and short monophthongs. Because short versus long monophthongs act in very much the same way as one another, the distinction can be at the level of a single feature and I would consider them part of a same system for the time being. Diphthongs, on another hand, are characterised by a change in quality, which makes specifying them with the same features as monophthongs impossible. Monophthongs versus diphthongs will therefore be treated as two different systems, with two different sets of features.

13.1.1 The Pairwise Algorithm applied

The Pairwise Algorithm consists of fully specifying all segments, isolating all pairs of segments, determining which pairs differ by a single feature specification, designating such feature specifications as ‘contrastive’ on the members of these pairs, and then deleting all unmarked feature specifications on each segment once the appropriate feature specifications have been marked ‘contrastive’ (Dresher, 2009, p. 14).

The first step would be to fully specify all of the segments we are working with. A full specification² (mainly inspired³ by Newman, 1997, p. 64-76) of the monophthongal

¹If two vowels can be told apart by using one feature rather than two or more, the feature can be thought of as the mirror along which the vowels are symmetrical.

²For reasons of space I assume that since the segments are all vocalic, I limit my ‘full’ specification to exclusively vocalic features, which are typologically specified as [-CONSONANTAL, +SONORANT, +CONTINUANT].

³I add features to reflect the length distinctions identified in this dissertation and omit tenseness, which is not something I considered in my acoustic analyses.

system is given in table 13.1.

There are also phonemes that differ widely in realisation, and that it would be impossible to judge in terms of their qualities. These phonemes prompt me to define a feature [VARIABLE] (realisation in free variation between otherwise contrastive qualities) and rephrase the definitions of my features to mean that a [+] means *has to be* rather than *is*. This means that //æ:/ (realised as [æ: ~ e:]) cannot be specified as [+LOW], despite the fact that it can be low in some realisations. In the same vein, even though //ə/ can be realised as [ʊ] in certain environments, it cannot be specified as [ROUNDED].

A document from the University of Massachusetts Amherst, accessible at <https://blogs.umass.edu/eba/files/2012/01/Guide-to-Vowel-Features.pdf>, specifies diphthongs as per their starting positions, but gives their roundings values based on their ending positions; which seems a weak choice to me because of inconsistency. I choose to take a cue from there— I can specify diphthongs based entirely on their starting positions and define a direction of quality change feature, such as fronting changes [FC] or fronting remains unchanged [FRU], based on whether the diphthong goes from back to front or front to back. That being said, length cannot be treated the same way, since all diphthongs are roughly the same length which is longer than long monophthongs — so whether the starting position is held for a ‘short’ or a ‘long’ vowel’s length, all diphthongs are [+LONG]. As a result, I need to speak of moraicity, which defines the [BIMORAIC] feature. A full specification of the diphthongal system is given in table 13.2⁴.

⁴The diphthong //æ:w/ does not appear in the data, and is being inferred by symmetry as discussed in section 11.2. I treat it here as though it had been occurred in the data, with a caveat as to symmetry — the specification should allow for //æ:w/, but the existence of the diphthong is only predicted. Thus, from this point, the diphthong when mentioned in tables or diagrams is in gray.

Table 13.1: Full Specification for CMLL Monophthongal Vowels

	//æ://	//ɑ://	//e://	//o://	//i://	//u://	//æ̥://	//æ̃://	//ɑ̃://	//ə://
[FRONT]	+	-	+	-	+	-	+	+	-	-
[BACK]	-	+	-	+	-	+	-	-	+	-
[HIGH]	-	-	-	-	+	+	-	-	-	-
[LOW]	+	+	-	-	-	-	-	+	+	-
[VARIABLE]	-	-	-	-	-	-	+	-	-	+
[INVARIABLE]	+	+	+	+	+	+	-	+	+	-
[ROUNDED]	-	-	-	+	-	+	-	-	-	-
[UNROUNDED]	+	+	+	-	+	-	+	+	+	+
[LONG]	+	+	+	+	+	+	+	-	-	-
[SHORT]	-	-	-	-	-	-	-	+	+	+

Table 13.2: Full Specification for CMLL Diphthongal Vowels

	//aw//	//aj//	//æw//	//æj//	//ɑ:w//	//ɑ:j//	//æ̃:w//	//æ̃:j//
[FRONT]	-	-	+	+	-	-	+	+
[BACK]	+	+	-	-	+	+	-	-
[HIGH]	-	-	-	-	-	-	-	-
[LOW]	+	+	+	+	+	+	+	+
[ROUNDED]	-	-	-	-	-	-	-	-
[UNROUNDED]	+	+	+	+	+	+	+	+
[BIMORAIC]	-	-	-	-	+	+	+	+
[MONOMORAIC]	+	+	+	+	-	-	-	-
[FC]	-	+	+	-	-	+	+	-
[FRU]	+	-	-	+	+	-	-	+

The pairs that differ by a single feature specification are given in tables 13.3 and 13.4.

Table 13.3: Monophthongal pairs that differ by a single feature specification

[LONG]		[HIGH]		[LOW]		[VARIABLE]	
//æ//	//æ:/	//o:/	//u:/	//e:/	//æ:/	//e:/	//æ:/
//a//	//a:/	//e:/	//i:/				

Table 13.4: Diphthongal pairs that differ by a single feature specification

[FC]		[BIMORAIC]	
//æj//	//æw//	//æw//	//æ:w//
//aj//	//aw//	//æj//	//æ:j//
//a:j//	//a:w//	//aj//	//a:j//
//æ:j//	//æ:w//	//aw//	//a:w//

Table 13.3 accounts for all of the [+LONG] and both of the [-LONG,-VARIABLE] phonemes (/ə/ is the only one missing), and 13.4 accounts for all of the diphthongal phonemes. For the 15 phonemes represented, the features causing them to appear on these tables are to be considered contrastive, and all other features can be disposed of, a process the result of which is given in tables 13.5 and 13.6.

Table 13.5: The Monophthongal Vocalic Phonemes of CMLL in Features as Determined by the Pairwise Algorithm, with contrastive features highlighted

	//æ:/	//a:/	//e:/	//o:/	//i:/	//u:/	//æ:/	//æ//	//a//	//ə//
[LONG]	+	+	+	+	+	+	+	-	-	-
[HIGH]	-	-	-	-	+	+	-	-	-	-
[LOW]	+	+	-	-	-	-	-	+	+	-
[VARIABLE]	-	-	-	-	-	-	+	-	-	+

Table 13.6: The Diphthongal Vocalic Phonemes of CMLL in Features as Determined by the Pairwise Algorithm, with contrastive features highlighted

	//aw//	//aj//	//æw//	//æj//	//ɑ:w//	//ɑ:j//	//æ:w//	//æ:j//
[FC]	-	+	+	-	-	+	+	-
[BIMORAIC]	-	-	-	-	+	+	+	+

There is a major issue of underspecification in these tables, however: for example, while it is true that //æ:// and //ɑ:// are both specified as [+LONG, -HIGH, +LOW, -VARIABLE], this description alone does not suffice to distinguish them from one another, and we would have to add a distinction of [FRONT] to achieve this (//æ:// as [+LONG, -HIGH, +LOW, -VARIABLE, +FRONT], //ɑ:// as [+LONG, -HIGH, +LOW, -VARIABLE, -FRONT]). Since the step that would add [FRONT] to the specification in this example is essentially a choice I would have to make (the removal of one of the logically redundant features [FRONT] and [BACK]), making this at its core giving some features (the one I kept) priority over others (that I did not remove from the set), this is what Dresher refers to as feature hierarchy, which he argues is ‘required even in a pairwise approach to contrastive specification’ (Dresher, 2009, p. 25). The feature ordering approach (which establishes a hierarchy of features), is ‘not subject to these difficulties,’ (Dresher, 2009, p. 29) says.

13.1.2 The Successive Division Algorithm applied

To determine contrastive specifications by using successive divisions based on an ordering of features, Dresher (2009, p. 16) favors the Successive Division Algorithm: beginning with no features (such that the entire inventory of sounds are considered allophones of a single undifferentiated phoneme), repeatedly divide the set into as many subsets as a chosen feature allows. Then repeat the division for each subset, until each set is a singleton.

I applied the Successive Division Algorithm to the two sets of phonemes (monophthongs and diphthongs) as presented in figures 13.1 and 13.2.

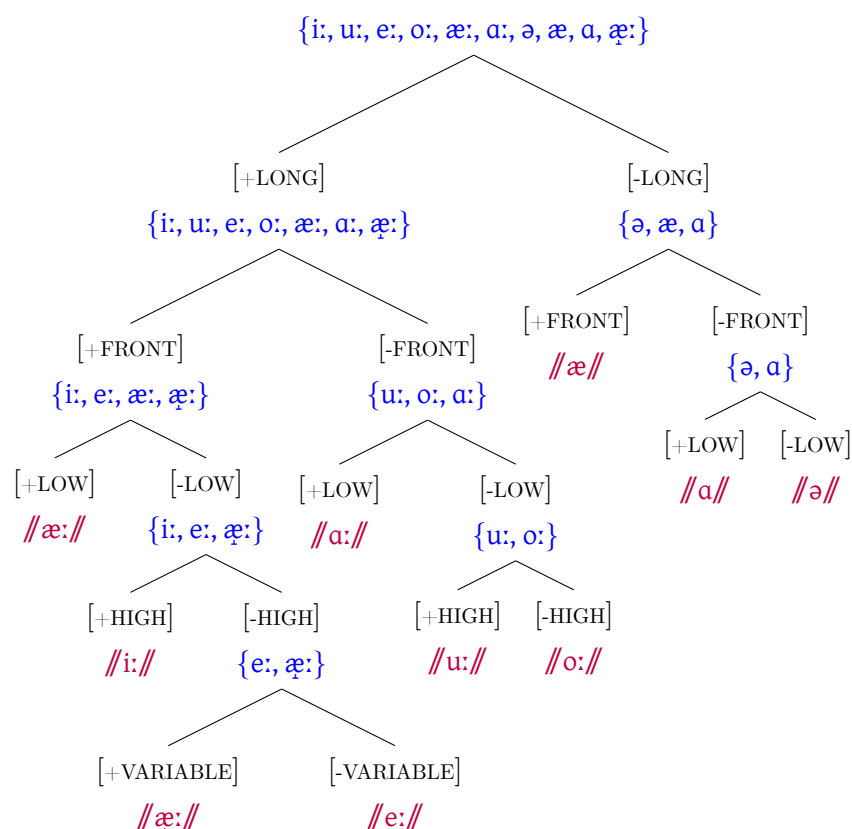


Figure 13.1: The Successive Division Algorithm running used to determine the features of monophthongal vowels in Central Mount Lebanon Lebanese

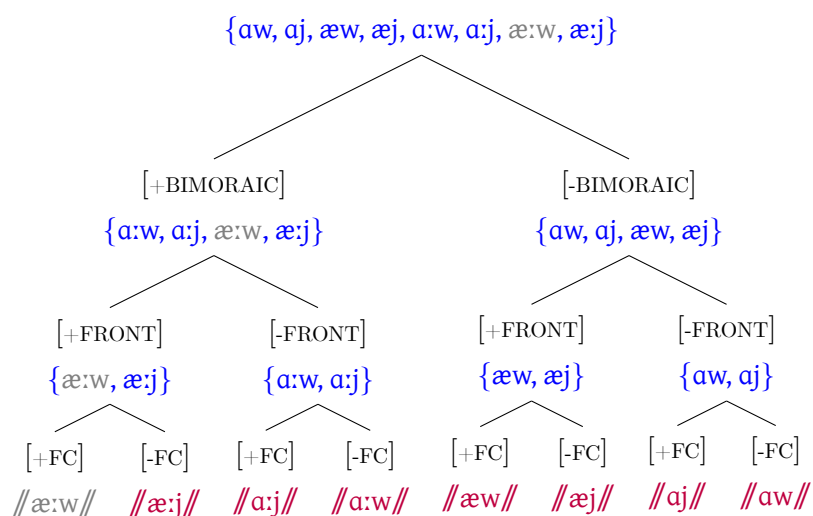


Figure 13.2: The Successive Division Algorithm running used to determine the features of diphthongal vowels in Central Mount Lebanon Lebanese

The features thus deduced, and their order, which is significant, are given in tables 13.7 and 13.8.

Table 13.7: The Monophthongal Vocalic Phonemes of CMLL in Features as Determined by the Successive Division Algorithm, with redundant feature specifications grayed out

	//æ://	//a://	//e://	//o://	//i://	//u://	//æ://	//æ//	//a//	//ə//
[LONG]	+	+	+	+	+	+	+	-	-	-
[FRONT]	+	-	+	-	+	-	+	+	-	-
[LOW]	+	+	-	-	-	-	-	+	+	-
[HIGH]	-	-	-	-	+	+	-	-	-	-
[VARIABLE]	-	-	-	-	-	-	+	-	-	+

Table 13.8: The Diphthongal Vocalic Phonemes of CMLL in Features as Determined by the Successive Division Algorithm, with redundant feature specifications grayed out

	//aw//	//aj//	//æw//	//æj//	//a:w//	//a:j//	//æ:w//	//æ:j//
[BIMORAIC]	-	-	-	-	+	+	+	+
[FRONT]	-	-	+	+	-	-	+	+
[FC]	-	+	+	-	-	+	+	-

13.1.3 On Feature Combination and Economy

x binary features combine at 2^x . This means that there are $2^3 = 8$ possible combinations of three such features, and $2^4 = 16$ possible combinations of four, and $2^5 = 32$ possible combinations of five.

Table 13.9: Feature Combinations in Theory and in Practice

	Monoph.	Long Monoph.	Short Monoph.	Diph.
Features needed	5	4	2	3
Possible combinations	32	16	4	8
Used combinations	10	7	3	8
Unused combinations	22	9	1	0

A vowel system of 8 contrastive segments should thus in theory be fully specifiable with 3 features, and the diphthongal vocalic system of Central Mount Lebanon Lebanese fits this perfectly (note that I am predicting //æ:w// for reasons of symmetry as discussed in section 11.2: it is unlikely that both low vowel qualities in both phonemic lengths combine with both glides in the language, except for //æ:// with /w/, and it is also unlikely that all diphthongs exist in monomoraic and bimoraic versions, except for //æ:w//). Whether CMLL has 7 or 8 diphthongs, both sizes fit within the 8 specifiable segments predicted by 3 features.

As for the variety's monophthongal vocalic system, which consists of 10 contrastive segments, it should in theory fit comfortably within the limit of 16 combinations allowed by 4 features. Why then do the 10 monophthongal vowels of CMLL require 5 features

(a maximum of 32 possible combinations) to fully specify?

Even worse, if we were to consider the short monophthongs (3) and the long monophthongs (7) separate systems, it would take 2 features ([FRONT, LOW]; $2^2 = 4$) to cover the short monophthongs and 4 features ([FRONT, LOW]) to specify the long monophthongs. That is to say, the short monophthongs would specify with just one ($2^2 - 3 \text{ vowels} = 1$) unused feature combination, but the long monophthongs would specify with nine ($2^4 - 7 \text{ vowels} = 9$) unused feature combinations instead!

This could be an argument for splitting the long and short monophthongal systems and also against considering the [VARIABLE] feature with the other monophthongal features. Although, for the most part, [æ] behaves exactly as other monophthongs would, the wide scope it covers in quality because of its realisations in free variation sets it apart from the other monophthongs and indeed diphthongs of Central Mount Lebanon Lebanese. As such, [æ] could be taken out of the long monophthong system. The [-LONG, -FRONT, -LOW] monophthong (or [-FRONT, -LOW] short monophthong) [ə] can be specified just fine without its feature of [+VARIABLE], which then becomes useless to specifying contrasts. As a result, the split at $\{\text{[e]}, \text{[æ]}\}$ in 13.1 would not be needed ([e] would specify as [+FRONT, -LOW, -HIGH]) and there would be three contrastive features ([FRONT, LOW, HIGH]) needed to specify all of 6 the long monophthong vowels in the system, for just $2^3 - 6 \text{ vowels} = 2$ unused feature combinations instead of the current $2^5 - 10 \text{ vowels} = 22$ for a united monophthongal system and $2^4 - 7 \text{ vowels} = 9$ for a long monophthongal system.

On another hand, this establishes four systems in the Central Mount Lebanon Lebanese vowel space, which if nothing else have the benefit of being mostly symmetrical:

- 6 Long Monophthongs
- 3 Short Monophthongs
- 8 Diphthongs
- 1 Long Variable Monophthong whose realisation varies freely between two otherwise contrastive qualities

13.2 Typological Expectations: On Symmetry and Inventory Sizes in Vowel Systems

The four systems that make up the Central Mount Lebanon Lebanese vowel space, which I list in subsection 13.1.3, are diagrammed in figure 13.3.

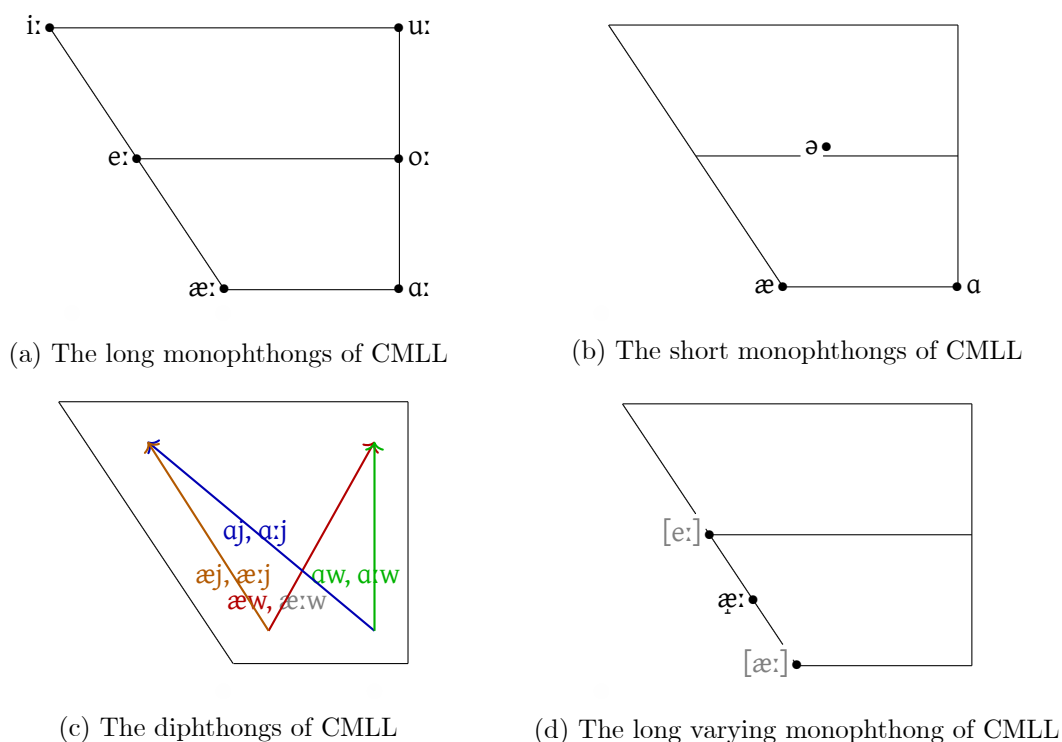


Figure 13.3: The Vocalic Systems of Central Mount Lebanon Lebanese

Figures 13.3a and 13.3c show clear symmetry in systems with even numbers of elements ([æ:w] being proposed but unconfirmed).

The long monophthongs of CMLL are neatly symmetrical along the [FRONT] axis, and the diphthongs of CMLL present symmetry in the fact that it includes diphthongs that cross paths, diphthongs that do not, and both monomoraic and bimoraic versions of all diphthongal qualities.

The short monophthongs and the long varying monophthongs of CMLL, systems with uneven numbers of elements and diagrammed in figures 13.3b and 13.3d, cannot show symmetry by definition. This being said, the short monophthongs of CMLL show a contrast along the [HIGH] axis and a contrast in the [-HIGH] elements, which are symmetrical

along the [FRONT] axis.

13.2.1 An insight from Dispersion Theory

According to Dispersion Theory, vowel inventories are structured in a manner that enhances perceptual contrast by maximally dispersing vowels in the auditory-perceptual space (Becker-Kristal, 2010, p. 10).

A phonological front-back contrast in low vowels is typologically rare⁵, and Dispersion Theory explains this by the fact that the acoustic correlate of this contrast (F2 difference) is at its smallest. Central Mount Lebanon Lebanese, however, has the front-back contrast in low vowels in not one, but three⁶ of the four systems making up its inventory. Where the systems making up the CMLL vowel inventory do align with the typology is non-peripheral vowels. According to Becker-Kristal (2010, p. 10), non-peripheral vowels with intermediate F2 frequencies are more likely to appear between front unrounded and back rounded vowels in the higher regions of the acoustic space, where the range of F2 frequencies is greatest.

But then, neither of the two non-variable monophthongal systems of CMLL fits typological expectations perfectly.

13.2.2 Patterns of the Monophthongal Systems

Maddieson (1984)'s Patterns of Sounds, which looks at the inventories of the 317 languages (Maddieson, 1984, p. 6) of the UCLA Phonological Segment Inventory Database (UPSID), shows a relative statistical rarity of front (81 of 2549 monophthongs, or 3.18%) and back (13 of 2549 monophthongs, or 0.51%) low unrounded monophthongs (Maddieson, 1984, p. 124) out of all monophthongs. To have two of each in a same variety (across two systems) is therefore significant.

Out of the UPSID sample of languages, 91.5% have a front low quality noted /i/° , 88.0% have a back low quality noted /u/° , and 83.9% have a low quality noted /a/° . The mid range vowels are between 34.4% and 43.8% for the back quality noted /o/° and between 31.5% and 37.2% for the front quality noted /e/° . CMLL has all of these qualities (if we merge the front and back low qualities together for the sake of comparison)

⁵Becker-Kristal (2010) goes as far as to merge front and back low vowel phonemes into one central low vowel in his cross-linguistic study.

⁶Long monophthongs, short monophthongs, and diphthongs.

represented in its long monophthongal system.

The most obvious divergence from the typological expectation here is the fact that CMLL's short monophthongal system goes against expectations in shape: typical or 'conventional' 3-vowel inventories are usually /i, a, u/° (Maddieson, 1984, p. 125), and defined by a two-way height contrast a fronting contrast in the high vowels. CMLL's short monophthongal system presents an atypical 3-vowel inventory of //æ, ə, a//, such that while there is a two-way height contrast it is not as maximal as the typologically expected distance (they are expected to 'each lie at an acoustic extreme;' Maddieson, 1984, p. 125) between /i, u/° and /a/° , and while there is a two-way fronting contrast it is in the low vowels (//æ, a//) rather than the high ones (which would be */i, u/).

Another divergence from the typological expectation is in the shape of CMLL's long monophthongal system, specifically because the front-back contrast in low vowels is typologically rare ('usually absent,' as Becker-Kristal (2010, p. 10) would have it). Becker-Kristal (2010, p. 192-193)'s diagrams, however, show a structural configuration for inventories equivalent (disregarding low-level notational differences) to the one I present here, which he calls 6L1⁷. 6L1's component vowel categories are listed as {i, ě, æ, ɔ, ɔ̃, ɔ̄, ɔ̇}° , and it is the configuration of the vowel inventories of Babine, Estonian, Gujarati, Dutch, Occitan, Chichimeca, Albanian and Wolof⁸. This is the only structural configuration for 6 peripheral vowels that exhibits both front and back low vowels.

Yet another divergence from the typological expectation is in the parallels between long and short monophthongal systems. According to Maddieson (1984, p. 127), for languages with multiple vowel systems, vowels in one system can usually be matched with vowels of similar qualities in other systems (such that 'the overall number of vowel phonemes is greater than the number of different vowel qualities'). If one considers only the long versus short monophthongs of CMLL, it is easy to match long and short low qualities across the two systems, but //ə// could not be matched with a single long monophthong.

This is not to say that this imbalance was always the case. As discussed in chapter 10, //ə// emerged due to the neutralisation or loss of contrast between the front and back short high monophthongs //i//° and //u//° suggested by Watson (2002, p. 21-22).

⁷In Becker-Kristal (2010), a designation of 6L1 means the system has 6 peripheral qualities, 1 non-peripheral quality, and is left-crowded — meaning it has more front vowels than back vowels.

⁸These are the varieties listed by Becker-Kristal (2010, p. 192) for this structural configuration. Nothing says there aren't more languages whose vowel inventories exhibit the same configuration.

Historically, when the long monophthongs of the variety were //i, a, u//^o and the short monophthongs were //i, a, u//^o, the systems paralleled each other perfectly and putting each element of one in a one-to-one correspondence with an element of the other would be straightforward. Meanwhile, there can be said to be six long and three short monophthongal qualities in CMLL, with an overlap of two of them, such that there are seven monophthongal qualities in the overall inventory, more than the number found in either of the systems making it up.

13.2.3 On the Number of Monophthongal Vowel Phonemes and Qualities

The table on Maddieson (1984, p. 126), reproduced (with slight modifications) as table 13.10, gives the number of languages with given number of phonemic vowels out of the set of languages the UPSID contains. Although limited in number to 317, the languages in the database are meant to be strategically chosen to be representative of all ‘small [language family] groupings’ (Maddieson, 1984, p. 1), and while the raw numbers presented in the table on page 126 of (Maddieson, 1984) are of little use to us here as such, the percentages are meant to be more or less representative of languages across language families — ‘phonological universals and ‘universal tendencies’,’ Maddieson (1984, p. 1) says. This allows us to say something about how the CMLL vocalic inventory measures up to other inventories.

The table provided in Maddieson (1984, p. 126) is talking about monophthongal vowel phonemes. The way he speaks about diphthongs⁹ and the total number of vowels $\times$ languages (2542 if we presume ‘17 and over’ to just be 17; since there are 83 diphthongs in the set, but only $2549 - 2542 = 7$ vowels unaccounted for if we assume ‘17 and over’ to just be 17) in (Maddieson, 1984, p. 133) leads me to believe they are not included in the table.

⁹‘There are a total of 83 diphthongs recorded in UPSID’ (Maddieson, 1984, p. 133) versus ‘2549 monophthongal vowels’ (Maddieson, 1984, p. 123)

Table 13.10: Number of languages (out of the UPSID set of 317 languages) with given number of vowel phonemes and the corresponding cumulative percentages in ascending and descending orders

No. vowel phonemes	No. languages	% languages	Cumulative ascending %	Cumulative descending %
3	18	5.7%	5.7%	100.0%
4	15	4.7%	10.4%	94.3%
5	68	21.5%	31.9%	89.6%
6	43	13.6%	45.5%	68.1%
7	34	10.7%	56.2%	54.5%
8	24	7.6%	63.8%	43.8%
9	28	8.8%	72.6%	36.2%
10	16	5.0%	77.6%	27.4%
11	11	3.4%	81.0%	22.4%
12	18	5.7%	86.7%	19.0%
13	4	1.3%	88.0%	13.3%
14	7	2.2%	90.2%	12.0%
15	8	2.5%	92.7%	9.8%
16	10	3.2%	95.9%	7.3%
17 and over	13	4.1%	100.0%	4.1%

With 9 monophthongal vocalic phonemes, and assuming that the percentages given here are representative, CMLL has more monophthongal vocalic phonemes than 63.8%, and less than 27.4%, of the world's languages.

The table in Maddieson (1984, p. 127), reproduced (with slight modifications) as table 13.11, is talking about monophthongal vowel qualities.

Table 13.11: Number of languages (out of the UPSID set of 317 languages) with given number of vowel qualities and the corresponding cumulative percentages in ascending and descending orders

No. vowel qualities	No. languages	% languages	Cumulative asc. % languages	Cumulative desc. % languages
3	17	5.4%	5.4%	100.0%
4	27	8.5%	13.9%	94.6%
5	98	30.9%	44.8%	86.1%
6	60	18.9%	63.7%	55.2%
7	47	14.8%	78.5%	36.3%
8	17	5.4%	83.9%	21.5%
9	25	7.9%	91.8%	16.1%
10	15	4.7%	96.5%	8.2%
11	2	0.6%	97.2%	3.5%
12	5	1.6%	98.7%	2.8%
13	2	0.6%	99.4%	1.3%
14	0	0.0%	99.4%	0.6%
15	2	0.6%	100.0%	0.6%

Since there are, as per subsection 13.2.2, 7 monophthongal vowel qualities in CMLL, CMLL has more monophthongal vocalic qualities than 63.7%, and less than 21.5%, of the world's languages. As per Maddieson (1984, p. 128), 'the most common number [of vowel qualities] is 5,' but 'up to 10 is still relatively common.'

Chapter 14

Conclusion

The primary goal of this dissertation was to establish the vocalic inventory of Central Mount Lebanon Lebanese, which it accomplishes on two fundamental levels of representation: the surface level, and the underlying. It also goes beyond these levels into the featural makeup of this inventory, and gives some attention to the vocalic phenomenon of epenthesis as a means to break up a word final consonant cluster.

The findings of this dissertation are summarised in this chapter's sections.

14.1 Recapitulation of the Surface Vowel Inventory of CMLL

A surface representation, or phonetic form, is the 'phonetically more-or-less fully specified representation of a word or a longer sequence' (Trask, 2004, p. 269) and is intended to reflect a phonetic reality rather than a phonological abstraction, since the 'surface level' is the 'level of phonetic representation of words or utterances' (Trask, 2004, p. 344). Surface representations throughout this dissertation (and elsewhere in phonetics/phonology papers) are typically placed between square brackets ([]).

At surface level, a same vowel could be *accurately* represented as any of [æ], [ɐ], [a], or [ɛ]. One possible reason for the choice of a representation over another might be bias due to the expectations of the person transcribing (so if they are expecting to hear an [ɛ], possibly due to an underlying form using /ɛ/ or if the language in question normally uses [ɛ] but not [æ], they might transcribe the sound as an altered ɛ, such as [ɛ̃]). Another difficulty with surface level representations is due to perceptual bias: for a speaker whose native ear does not differentiate aspiration, [p] could be a sufficiently detailed

representation of [p^h] such that they might represent a same sound. When choices had to be made in terms of transcription, I used perception first (being a native speaker of CMLL myself), then I disambiguated between potentially questionable transcriptions by using spectrographic data (formant values observed in Praat typically informed my choices there).

Keeping in mind that when one speaks of representation, one is already abstracting away from the raw utterance, and keeping in mind that even in careful transcriptions, details of the precise utterance will inevitably be lost, I attempt in this section to bring together all the findings which pertain to the surface level of vowels in Central Mount Lebanon Lebanese, that this dissertation brings to light.

14.1.1 Monophthongal Surface Inventory

In the low vowel space, Central Mount Lebanon Lebanese shows a wide range of qualities realised in phonetically long and short versions. Transcriptions going from [æ(:)] to [ɑ(:)] occur in the labeling of the data, with [a(:)] also occurring. Some of the long realisations in the low vowel space do not belong to underlying low vowel categories (see chapter 9). These realisations are not taken into account in table 14.1.

In the high-mid vowel space, Central Mount Lebanon Lebanese shows front and back qualities. Transcriptions of [e:] and [o:] occur in the labeling of the data, with realisation tokens labelled [e:] very distinct in terms of formant values from ones labelled [æ:] or [i:], and realisation tokens labelled [o:] not as distinct from ones labelled [ɑ:] or [u:]. In this latter case, since (1) the mean value of the formants for tokens labelled [o:] is well out of the scopes of the formant values of the realisations of [ɑ:] or [u:], and since (2) there are relatively few realisations of [o:] recorded (less than a third as many as [e:] for example; this is due to a flaw in stimulus selection), the wideness of scope of [o:] realisations on the vowel space can be explained by a larger standard deviation of the formant values, and should not be taken to signify that [o:] belongs to a continuum of realisations between [ɑ:] and [u:]. Some of the realisations in the high-mid vowel space do not belong to underlying high-mid monophthongal vowel categories (see section 11.2).

In the high vowel space, Central Mount Lebanon Lebanese shows clear-cut long front and back qualities. Transcriptions of [i:] and [u:] occur in the labeling of the data. In terms of short vowels, there seem to be three main qualities, [ɪ], [ə] and [ʊ], with the first two being realised on a continuum.

Table 14.1: Mean formant values and durations for monophthongal realisations

Quality	Duration (ms)	Mean F1	Mean F2
[æ]	108.70	659	1653
[æ:]	219.10	690	1579
[ɑ]	121.58	604	1223
[ɑ:]	223.22	631	1169
[ə]	89.94	480	1791
[e:]	203.73	483	2042
[o:]	233.06	502	954
[ɪ]	106.34	477	1868
[i:]	210.15	342	2349
[ʊ]	114.50	485	1121
[u:]	220.68	368	813

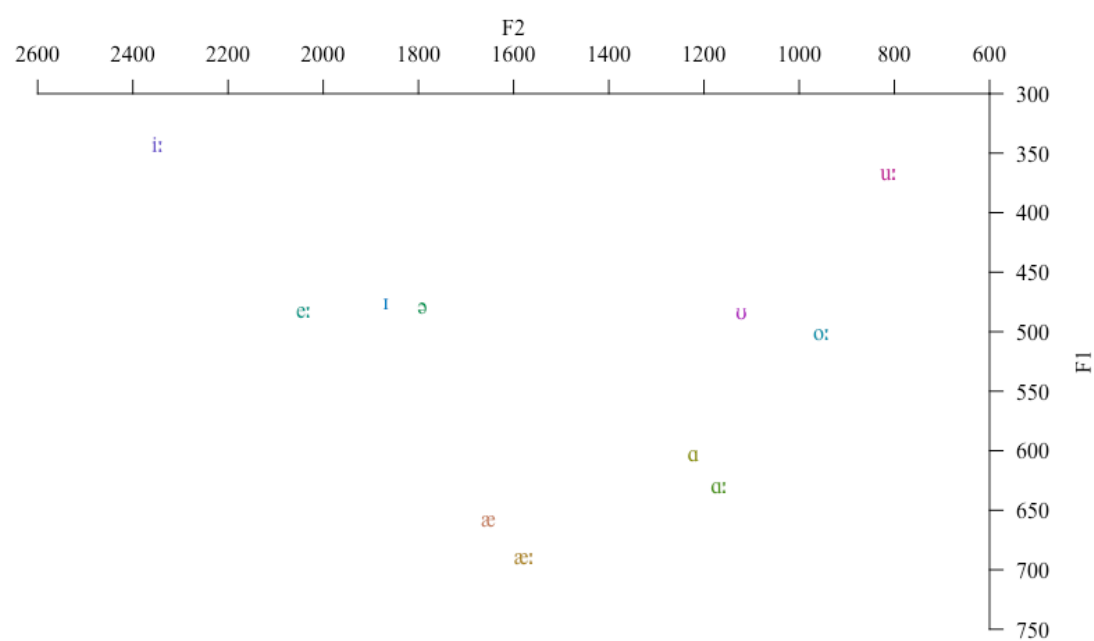


Figure 14.1: Monophthongal qualities in CMLL, plotted by mean formant values

14.1.2 Diphthongal Surface Inventory

Central Mount Lebanon Lebanese shows seven rising diphthongs in realisation, which at the surface, as far as phonetics and acoustics are concerned, seem to operate as sequences of segments, the first of which is vocalic and the second of which is consonantal.

Table 14.2: Mean formant values and durations for diphthongal realisations

Category	Duration (ms)	Mean F1 at 25%	Mean F2 at 25%	Mean F1 at 75%	Mean F2 at 75%
/ɑj/	292.21	646	1182	380	2286
/ɑw/	294.93	609	1185	380	808
/æw/	295.62	635	1247	393	811
/æj/	308.48	623	1923	345	2428
/ɑ:w/	316.80	623	1080	432	842
/æ:j/	340.44	645	1475	423	2241
/ɑ:j/	351.21	653	1188	458	2069

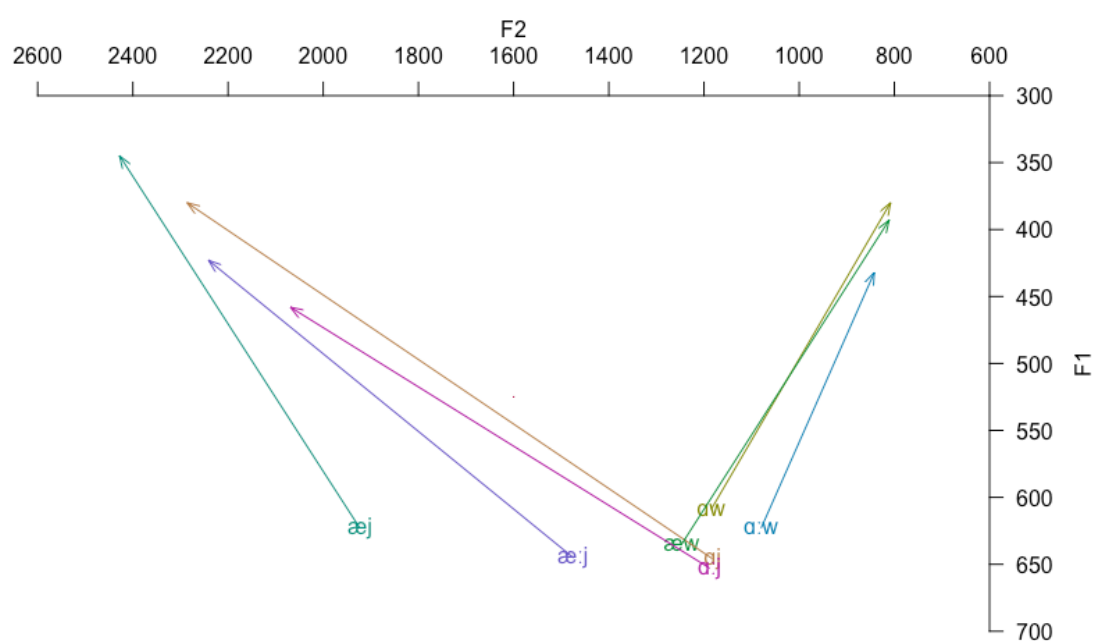


Figure 14.2: Diphthongal qualities in CMLL, plotted by mean formant values

14.2 Recapitulation of the Underlying Vowel Inventory of CMLL

In contrast with a surface form or representation, an underlying form or representation is an ‘abstract phonological representation of [a segment] which is posited by an analyst and from which corresponding surface forms [...] are derived by the application of rules’ (Trask, 2004, p. 366). Underlying forms throughout this dissertation are placed between pairs of forward slashes (*//*) when I have shown them to be underlying at a phonemic level.

Because a representation entails that an abstraction is taking place as it is, and because surface forms will vary widely in how detailed they are, it is useful to make use of underlying forms (once they are determined) to speak of the segmental inventory of a language. The idea that a set of sounds contrast from one another in a way that impacts the meanings conveyed between a speaker and their listener(s) feeds into the notion of a phoneme, a phonological unit that abstracts from the surface level and entails that, regardless of the minute variations between the precise makeup of two similar segments, their production or perception will not alter the meaning. The various possible realisations of a phoneme, whether dictated by their environments (in which case each of these realisations is called an allophone) or not (a case of free variation), can then be bundled together by the fact that they all give the utterance the same meaning. Some analysts consider the phoneme indivisible and minimally abstract. Others consider it a way of bundling distinctive features together (and then speaking of them). In this section, I look at the set of phonemes I postulate and defend in this dissertation as the smallest possible indivisible set of vocalic categories (defined by meaning contrasts) that covers the vowel sounds on Central Mount Lebanon Lebanese. I intend them to be, in Trask (2004, p. 265)’s terminology, a ‘convenient analytical fiction,’ rather than a ‘mental reality’ or ‘physical unit’ (I make no claims as to either of the latter positions).

14.2.1 Monophthongal Underlying Inventory

In the low vowel space, I argue that Central Mount Lebanon Lebanese has four phonemes, *//æ//*, *//a//*, *//æ:~//*, and *//ɑ:~//*, with length being part and parcel of the phonemes themselves. In the vicinity of emphatic consonants, all low vowels are realised with a back quality, so that it becomes difficult to determine what the underlying form of a low vowel

might be if it is in the span of an emphatic consonant (this is, for all intents and purposes, a merger). So while [a] and [a:] are always realised as [a] and [a:] respectively (such that the underlying form surfaces), [æ] and [æ:] present a conditioned allophony such that:

$$\begin{aligned} \text{[æ]} &\rightarrow \begin{cases} \text{[a]} / & [+EMPHASIS] \\ \text{[æ]} / & \text{elsewhere} \end{cases} \\ \text{[æ:]} &\rightarrow \begin{cases} \text{[a:]} / & [+EMPHASIS] \\ \text{[æ:]} / & \text{elsewhere} \end{cases} \end{aligned}$$

There is also a process of de-pharyngealisation happening in CMLL which means that the realisation of emphasis is slowly shifting from a pharyngealisation of the consonant itself to a backing of adjacent (or near-adjacent) vowels. For low vowels, this means that:

$$\begin{array}{ccc} \text{[æ(:)]} & \searrow & \\ & & \text{[a(:)]} / [+EMPHASIS] \\ \text{[a(:)]} & \nearrow & \end{array}$$

In the high-mid vowel space, I argue that Central Mount Lebanon Lebanese has two phonemes, [e] and [o] , the existence of which is due to three (for [o]) or four (for [e]) factors: historical forms that can be traced continuously to originals using these phonemes, a progression from historical diphthongs, an unconditioned progression from a low vowel into a high-mid front vowel, and a phonologisation of borrowed phones.

In the high vowel space, I argue that Central Mount Lebanon Lebanese has three phonemes, [i] , [u] , and [ə] . The short high vowel is realised in free variation on a range from high central [ə] to high front [i] , except when in the context of emphasis, in which case it is realised as a high back [u] . The rise of [ə] can be traced to a merger of historical [i] and [u] , such that historically:

$$\begin{array}{ccc} \text{[u]} & \searrow & \\ & & \text{[ə]} \\ \text{[i]} & \nearrow & \end{array}$$

and synchronically:

$$\text{[ə]} \rightarrow \begin{cases} \text{[u]} / & [+EMPHASIS] \\ \text{[i} \sim \text{ə]} / & \text{elsewhere} \end{cases}$$

Central Mount Lebanon Lebanese also has a phoneme [æ:] whose realisations are

in free variation on a range from low back [ɑ:] to high-mid front [e:]:

$$//\text{æ:}// \rightarrow [\text{ɑ:} \sim \text{a:} \sim \text{æ:} \sim \text{e:}]$$

I argue that this phoneme is the manifestation of a sound change in progress (since it is not affecting all low vowels. The change takes a vowel from low to high-mid qualities. Low realisations of this phoneme are more frequent than high-mid realisations, but this is not sufficient to suggest that the change is still in its infancy, as I only have usable data from three stimuli.

Since additionally, [ɑ:] only occurs as a realisation of $//\text{æ:}//$, and the quality occurs as a valid realisation of $//\text{æ}//$, and therefore, as far as low vowels are concerned, central qualities seem to fit in with frontal qualities where contrasts are concerned, the rule can be reduced to:

$$//\text{æ:}// \rightarrow [\text{æ:} \sim \text{e:}]$$

Table 9.2: Mean formant values for alternating vowel’s realisations

Quality	Count	Ratio	Mean F1	Mean F2
[ɑ:]	6	4.32%	724	1261
[a:]	37	26.62%	697	1258
[æ:]	41	29.50%	709	1376
[e:]	55	39.57%	506	2064

14.2.2 Diphthongal Underlying Inventory

I argue that Central Mount Lebanese Diphthongs, while they act as though they were compositional (sequences of segments) for acoustic purposes, interact with the syllabification as units rather than as a mere sequence thereof. If we consider the data used here complete, diphthongs can be realised as monophthongs as long as they are not word-final (that is, as long as they are in medial position); and therefore the phonetic categories I initially hypothesised as ‘synchronic diphthongs’ and ‘diachronic diphthongs’ are simply allophones of a corresponding set of phonemes.

As such, Central Mount Lebanon Lebanese has four monomoraic diphthongal categories ($//\text{aw}//$, $//\text{aj}//$, $//\text{æw}//$, and $//\text{æj}//$):

$$//\text{aj}// \rightarrow \begin{cases} [\text{aj}] / & \text{— \#} \\ [\text{aj} \sim \text{e:}] / & \text{— C} \end{cases}$$

$$\begin{aligned}
//\text{aw}// &\rightarrow \begin{cases} [\text{aw}] / & _ \# \\ [\text{aw} \sim \text{o:}] / & _ \text{C} \end{cases} \\
//\text{æj}// &\rightarrow \begin{cases} [\text{æj}] / & _ \# \\ [\text{æj} \sim \text{e:}] / & _ \text{C} \end{cases} \\
//\text{æw}// &\rightarrow \begin{cases} [\text{æw}] / & _ \# \\ [\text{æw} \sim \text{o:}] / & _ \text{C} \end{cases}
\end{aligned}$$

CMLL also has four bimoraic diphthongal categories (three of which, $//\text{a:w}//$, $//\text{a:j}//$, and $//\text{æ:j}//$, I direct have evidence for, one of which, $//\text{æ:w}//$, being inferred by symmetry) which to my knowledge as per the data presented here, do not monophthongise medially.

14.3 Notes on Epenthesis

Central Mount Lebanon Lebanese dislikes consonant clusters, and uses an epenthetic vowel to break them up.

The literature finds that some speakers realise the epenthetic vowel to be shorter than similar lexical vowels, and with a lower F2, and that some speakers who epenthesise do so consistently, giving the epenthetic vowel lexical status in their phonologies. Later research however finds that speakers ‘fluctuate between different valid [epenthesized and non-epenthesized] pronunciations’ (Hall, 2013).

While I do find the epenthetic vowel to be shorter than the lexical short vowels, I argue that the difference in duration is not significant enough that the epenthetic vowels be considered perceptibly shorter than the lexical ones (given that the difference between long and short lexical vowels is of about 100ms, and the difference between short vowels and epenthetic vowels is under 10ms). Speakers who use the epenthetic vowel to break up consonant clusters seem to give it a duration as consistent within realisations of the epenthetic vowel as realisations of short vowels are among themselves, which is to say that at a same rate of speech, different speakers will give the epenthetic vowel the same duration.

The epenthetic vowel is mostly realised with a front-to-central low space, which means that it overlaps in quality with the short lexical vowel $//\text{ə}//$. It can also be subject to vowel harmony in vowels whose lexical vowel is low in quality (it can adopt qualities of $[\text{æ}]$ or $[\text{a}]$ in this case), and can be affected by lip rounding due to adjacent consonants that exhibit the feature (in which case the epenthetic vowel can be realised with a quality similar to

that of [ʊ]). A same speaker does not necessarily realise the epenthetic vowel with the same quality in the same word every time. Some speakers epenthesise to break up every possible consonant cluster. Others do it less than 100% of the time. A perceptual study would be needed to test whether or not the epenthetic vowel is lexical for those speakers who epenthesise 100% of the time.

Finally, it needs to be said that the epenthetic vowel, which by definition breaks a consonant cluster and thus the word the cluster belongs to, into two syllables, can sometimes stop the spread of emphasis.

14.4 Notes on Features, Contrasts, Shapes, and Sizes

My featural analyses of the Central Mount Lebanon Lebanese vowel inventory, which aims to establish a minimal set of contrastive features, results in underspecification when the Pairwise Algorithm is used, and in too many features when the Successive Division Algorithm is used. The latter algorithm is however a better alternative.

As a solution to the problem, I suggest to break the inventory down into four subsets I refer to as ‘systems,’ which are:

- The Long Monophthongs system, containing 6 phonemes
- The Short Monophthongs system, containing 3 phonemes
- The Diphthongs system, containing 8 phonemes
- The Long Variable Monophthong system, containing 1 phoneme whose realisation varies freely between two otherwise contrastive qualities

The Long Monophthong system specifies with 3 contrastive features: [FRONT, LOW, HIGH]. The Short Monophthong system specifies with 2 contrastive features: [FRONT, LOW]. The Diphthong system specifies with 3 contrastive features: [BIMORAIC, FRONT, FC], the latter of which referring to whether the diphthong brings about a change in fronting. The Long Variable Monophthong system contains a single element and thus does not require any features to specify.

The Long Monophthong and the Diphthongs systems of the CMLL vowel inventory show symmetry. The Short Monophthongs and the Long Variable Monophthong systems cannot do so by virtue of each having an odd number of members. The fact that the first two show symmetry makes them fit into the typological expectations of vowel spaces.

The Long Monophthongs system of Central Mount Lebanon Lebanese is interesting because it exhibits a typologically rare fronting contrast between two low vowels. The Short Monophthongs system of Central Mount Lebanon Lebanese is interesting because it exhibits the same contrast between low vowels, and as such presents a vertically flipped image of typologically expected 3-vowel inventories.

The expectation on correspondences between the long and short systems of a vowel inventory is not met by the high short monophthong //ə// or by any of the [-LOW] long monophthongs //i:, e:, o:, u://; but this has not always been the case in the history of Central Mount Lebanon Lebanese, as the literature mentions a stage in the development of the language where the long and short monophthongs were respectively //i:, a:, u:// and //i, a, u//.

Central Mount Lebanon Lebanese has 9 monophthongal vocalic phonemes, which places it ahead of 64.8% of the world's languages in terms of the most vocally rich. It also has 7 monophthongal vowel qualities, which places it ahead of 63.8% of the world's languages in terms of the languages with the most vowel qualities. It has more monophthongal vowel phonemes and qualities than two-thirds of the world's languages.

Part IV

Appendices

Appendix A

Participant Information

Reference	Gender	Religion	Age	Area Raised In, Kaza
AA01	Male	Druze	20	Aley, Aley
AC01	Male	Christian	17	Kornet el Hamra, Metn
AN01	Female	Christian	17	Beit Chabeb, Metn
AS01	Male	Christian	16	Brummana, Metn
CH01	Male	Christian	22	Bikfaya, Metn
GH01	Female	Christian	17	Antelias, Dbayeh, Metn
GS01	Male	Christian	55	Douar, Metn
JS01	Male	Christian	17	Awkar, Metn
JS02	Female	Christian	20	Awkar, Metn
LA01	Female	Christian	16	Antelias, Metn
LI01	Female	Christian	22	Jal l Dib, Metn
LS01	Female	Christian	48	Achrafieh, Metn
MS01	Male	Christian	16	Naccache, Metn
NM01	Female	Christian	24	Shayle, Keserwen
NS01	Female	Christian	54	Beirut, Beirut
PN01	Male	Christian	22	Jdeideh, Metn
RK01	Male	Muslim	21	Verdun, Beirut
TB01	Female	Christian	19	Brummana, Metn
YH01	Female	Christian	24	Achrafieh, Beirut

Appendix B

Reclassification of Categories Based on Findings

Monophthongal Categories

Hypothetical Category	Name of Category	Realisations in the data	Phoneme
/æ/	Short Low Front Monophthong	[æ, ɑ]	//æ//
/æ:/	Long Low Front Monophthong	[æ:, ɑ:]	//æ:/
/ɑ/	Short Low Back Monophthong	[ɑ]	//ɑ//
/ɑ:/	Long Low Back Monophthong	[ɑ:]	//ɑ:/
/e:/	Long Mid-High Front Monophthong	[e:]	//e:/
/i:/	Long High Front Monophthong	[i:]	//i:/
/o:/	Long Mid-High Back Monophthong	[o:]	//o:/
/u:/	Long High Back Monophthong	[u:]	//u:/
/ə/	Short Mid-High Central Monophthong	[ə ~ ɪ]	} //ə//
/ʊ/	Short Mid-High Back Monophthong	[ʊ]	
/V _{ep} /	Epenthetic Environment	[ə, Ø]	–
/æ:/	Alternating Long Monophthong	[æ: ~ e:]	//æ:/

Diphthongal Categories

Hypothetical Category	Name of Category	Realisations in the data	Phoneme
/aĳ/	Historical Raising Fronting Diphthong	[æj ~ aj, e:]	} //æj//
/æj/	Raising Monomoraic Front Diphthong	[æj]	
/aj/	Raising Monomoraic Fronting Diphthong	[aj]	//aj//
/aŋ/	Historical Raising Backing Diphthong	[æw ~ aw, o:]	} //æj//
/æw/	Raising Monomoraic Backing Diphthong	[æw]	
/aw/	Raising Monomoraic Back Diphthong	[aw]	//aw//
/æ:j/	Raising Bimoraic Front Diphthong	–	//æ:j//
/æ:w/	Raising Bimoraic Backing Diphthong	[æ:w]	//æ:w//
/a:j/	Raising Bimoraic Fronting Diphthong	[a:j]	//a:j//
/a:w/	Raising Bimoraic Back Diphthong	[a:w]	//a:w//

Appendix C

CVC Stimuli Elicited

CVC stimuli were to measure the formants and durations of the lexical vowels they use.

Stimulus	Gloss	Vowel	Category
bæj	‘father’	æj	Raising Diphthong
bæn	‘coffee grounds’	æ	Short Low Monophthong
bajd ^ɕ	‘eggs’	aj	Historical Raising Diphthong
bajn	‘between’	aj	Historical Raising Diphthong
bawl	‘urine’	aw	Historical Raising Diphthong
ba:j	‘bye (English loan)’	ɑ:j	Raising Diphthong
be:b	‘door’	e:	Long Mid Monophthong
be:s	‘he kissed’	e:	Long Mid Monophthong
bəl	‘make wet!’	ə	Short Mid Monophthong
bi:d ^ɕ	‘white (pl.)’	i:	Pharyngealised Long High Monophthong
bi:r	‘a well’	i:	Long High Monophthong
bi:ɕ	‘null’	i:	Long High Monophthong
bəd	partial ¹	ə	Short High Monophthong
bu:s	‘kiss’	u:	Long High Monophthong
bu:z	‘a mouth’	u:	Long High Monophthong
dæ:l	‘the letter ɣ’	æ:	Long Low Monophthong
dæl	‘he showed’ ²	æ	Short Low Monophthong

¹To the best of my knowledge, bəd is used specifically as part of the expression mən kəl bəd ‘no matter what, at any rate’ in Central Mount Lebanon Lebanese.

²Specifically, someone to something.

Stimulus	Gloss	Vowel	Category
dæwæ ³	‘medication’	æw	Raising Diphthong
dajr	‘convent’	aj	Historical Raising Diphthong
dawr	‘role’	aw	Historical Raising Diphthong
de:b	‘he melted’	e:	Long Mid Monophthong
dəb ⁴	‘bear’	ə	Short Mid Monophthong
dəʔ	‘play (music)!, touch!’	ə	Short Mid Monophthong
di:b	‘wolf’	i:	Long High Monophthong
di:k	‘a rooster’	i:	Long High Monophthong
du:b	‘melt!’	u:	Long High Monophthong
du:r	‘turn around’	u:	Long High Monophthong
dʕal	‘he stayed’	ɑ	Pharyngealised Short Low Monophthong
dʕaw	‘light’	aw	Raising Diphthong
dʕi:f	‘host!’	i:	Pharyngealised Long High Monophthong
dʕi:ʕ	‘get lost!’	i:	Pharyngealised Long High Monophthong
dʕob	‘put ... away’	ʊ	Pharyngealised Short High Monophthong
dʕodʕ	‘against’	ʊ	Pharyngealised Short High Monophthong
fe:ʔ	‘he woke up’	e:	Long Mid Monophthong
fi:d	‘be useful to...!’	i:	Long High Monophthong
fi:dʕ	‘overflow!’	i:	Pharyngealised Long High Monophthong
ɣæ:l ⁵	‘a lock’	æ:	a-e Alternation
ɣu:sʕ	‘dive!’	u:	Pharyngealised Long High Monophthong
ɣudʕ	partial ⁶	ʊ	Pharyngealised Short High Monophthong
ħajtʕ	‘wall’	aj	Historical Raising Diphthong
ħawn	‘here’	aw	Historical Raising Diphthong
ħən	‘get nostalgic!’	ə	Short Mid Monophthong

³The word dæwæ was elicited and recorded for the sake of possible comparisons with the word dʕaw, but was then removed from the data set because it did not fit the CVC pattern.

⁴The word dəb was added to the processing code because the framing sentence aiming to elicit the word di:b (‘wolf’) caused some participants to use it instead. It was not initially meant to be part of the stimuli.

⁵The word ɣæ:l was elicited for the sake of investigating the Alternating Long Monophthong, but was not recognised as a word by most of the participants and was therefore discarded.

⁶To the best of my knowledge, ɣudʕ is used specifically as part of the expression ɣudʕ l+nazar ‘that you turn a blind eye, that you ignore’ in Central Mount Lebanon Lebanese.

Stimulus	Gloss	Vowel	Category
ħu:r	partial ⁷	u:	Long High Monophthong
ħu:sʕ	‘get excited!’	u:	Pharyngealised Long High Monophthong
ħu:t	‘null’	u:	Long High Monophthong
ħu:sʕ	‘a clove (eg. garlic)’	ʊ	Pharyngealised Short High Monophthong
kawn	‘a universe’	aw	Historical Raising Diphthong
kəm	‘sleeve’	ə	Short Mid Monophthong
læ:m	‘the letter lam’	æ:	Long Low Monophthong
læm	‘he picked up’	æ	Short Low Monophthong
læw	‘if / though’	æw	Raising Diphthong
law	‘a colour’	aw	Historical Raising Diphthong
lu:sʕ	‘thief’	ʊ	Pharyngealised Short High Monophthong
maj	‘water’	aj	Raising Diphthong
mən	‘from’	ə	Short Mid Monophthong
mobi:d	‘insecticide’	i:	Long High Monophthong
mør	‘bitter’	ʊ	Short High Monophthong
næ:j	‘a nay (flute)’	æ:j	Other or Extra
næj	‘raw (uncooked)’	æj	Raising Diphthong
næw	‘meow’	æw	Raising Diphthong
nəʔ	‘nag’	ə	Short Mid Monophthong
ræd	‘he answered’	æ	Short Low Monophthong
ræħ	‘will’	æ	Short Low Monophthong
ra:d	‘he wished’	ɑ:	Long Low Monophthong
ra:ħ	‘he went’	ɑ:	Long Low Monophthong
rəb	‘(tomato) concentrate’	ə	Short Mid Monophthong
səb	‘he swore’	æ	Short Low Monophthong
sər	‘null’	ə	Short Mid Monophthong
səb	‘curse!’	ə	Short High Monophthong
sʕa:b	‘he hit (a target)’	ɑ:	Pharyngealised Long Low Monophthong
sʕab	‘he poured’	ɑ	Pharyngealised Short Low Monophthong
sʕər	‘insist!’	ə	?

⁷To the best of my knowledge, ħu:r is used specifically as part of the expression t + ħu:r w t + du:r ‘that you beat around the bush’ in Central Mount Lebanon Lebanese.

Stimulus	Gloss	Vowel	Category
s ^h u:m	‘fast!’	u:	Pharyngealised Long High Monophthong
s ^h u:r	‘Sour (name of a city)’	u:	Pharyngealised Long High Monophthong
s ^h ʊb	‘pour!’	ʊ	Pharyngealised Short High Monophthong
s ^h ʊf	‘null’	ʊ	Pharyngealised Short High Monophthong
t̪ajs̪	‘obstinate, male goat’	aj̪	Historical Raising Diphthong
t ^h ɑ:l	‘he reached’	ɑ:	Pharyngealised Long Low Monophthong
t ^h al	‘he showed up’	ɑ	Pharyngealised Short Low Monophthong
t ^h o:n	‘tuna’	o:	Pharyngealised Long Mid Monophthong
waj̪n	‘where (is)...’	aj̪	Historical Raising Diphthong
wa:w	‘the letter ,’	ɑ:w	Raising Diphthong
zæw	‘atmosphere / spirit’	æw	Raising Diphthong
ʔæ:b	‘August’	æ:	a-e Alternation
ʔæb	‘he raised his head’	æ	Short Low Monophthong
ʔæw	‘or’	æw	Raising Diphthong
ʔæ:m	‘null’	æ:	a-e Alternation
ʔæ:f	‘he lived’	æ:	a-e Alternation

Appendix D

CVCC Stimuli Elicited

CVCC stimuli were to measure the formants and durations of the lexical vowels they use, and to attempt to obtain epenthetic vowels in word-final consonant clusters.

Stimulus	Gloss	Vowel	Category
bærd	‘cold’	æ	Epenthetic Environment
bəkr	‘firstborn, eldest’	ə	Epenthetic Environment
dærb	‘pathway’	æ	Epenthetic Environment
dʰarb	‘punching’	ɑ	Pharyngealised Epenthetic Environment
færd	‘gun’	æ	Epenthetic Environment
fardʰ	‘assignment, imposition’	ɑ	Pharyngealised Epenthetic Environment
kælb	‘dog’	æ	Epenthetic Environment
kəls	‘calcium, whitewash’	ə	Epenthetic Environment
kəzb	‘a lie’	ə	Epenthetic Environment
læhm	‘meat’	æ	Epenthetic Environment
məsk	‘musk’	ə	Epenthetic Environment
rəmʃ	‘eyelash’	ə	Epenthetic Environment
ʃækl	‘appearance’	æ	Epenthetic Environment
ʃərb	‘the drinking’	ə	Epenthetic Environment
ʒəld	‘leather’	ə	Epenthetic Environment
ʔækl	‘food’	æ	Epenthetic Environment

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