The Application of English Theories to Sorani Phonology

AHMED, ZHWAN,OTHMAN

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Zhwan Othman Ahmed

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Abstract

This thesis investigates phonological processes in Sorani Kurdish within the framework of Element Theory. It studies two main varieties of Sorani spoken in Iraq which are Slemani and Hawler.

Since the phonology of SK is one of the least studied areas in Kurdish linguistics and the available studies provide different accounts of its segments, I start by introducing the segmental system of the SK dialect group. I present a list of consonants and vowels and discuss the variation between Hawler and Slemani. I then present an Element Theory analysis of the segmental system of SK which reflects the phonological behaviour of each segment and how it patterns with other sounds. For example, *š* and *ž* are post-alveolar articulatorily while they behave like palatals in phonological processes and hence have a headed |I| element.

I then study processes of place assimilation in SK. The process of palatalization is one area that sets Hawler and Slemani varieties apart. In SK, velar stops, *k g*, are palatalized before front vocoids. However, in Hawler, the output of velar palatalization is an affricate consonant while in Slemani, palatalization is secondary and adds a secondary articulation to the velar stops. Similarly, both varieties have a set of emphatic consonants which have caused considerable debate in the literature as there is no agreement on their distribution in SK. In this study, I present the first detailed account of the emphatic consonants in SK and argue that their triggers differ between Slemani and Hawler and I also argue that they differ phonologically from emphatics in Arabic. Another place assimilation process that is discussed briefly is nasal place assimilation.

Other processes discussed in the thesis relate to laryngeal contrasts in SK. The data show that word-initial obstruents have a typologically uncommon laryngeal contrast that utilizes the extreme points on the VOT continuum. That is, SK has a pre-voiced set of obstruents that contrasts with an aspirated set in word-initial position. In word-final position, however, the pre-voiced set is devoiced, and the contrast is between an aspirated set and a neutral set. I also discuss the process of voicing assimilation that occurs in both Hawler and Slemani.

The study also accounts for such processes as metathesis and deletion and presents data to show variations between Hawler and Slemani. The study ends with an evaluation of

the main findings and asserts the importance of this thesis and how it can be used as a basis for future work.

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To the memory of my father

To my beloved mother and grandparents

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p	p	î	i
b	b	i	ɨ
t	t	ê	e
d	d	a	æ
k	k	â	a
g	g	ô	o
q	q	u	ʊ
ʔ	ʔ	û	u
f	f		
s	s		
z	z		
š	ʃ		
ž	ʒ		
x	χ		
ʁ	ʁ		
ʕ	ʕ		
ḥ	ħ		
č	tʃ		
ǰ	dʒ		
m	m		
n	n		
ŋ	ŋ		
l	l		
ɬ	ɬ		
r	ɾ		
ř	r		
w	w		
y	j		

Chapter One

Introduction

1.1 Aims and Significance of the Study

This thesis provides the first detailed and comprehensive analysis of phonological processes in Sorani Kurdish (henceforth SK), based on data collected from two of its main varieties, namely Hawler and Slemani, within the framework of Element Theory (ET Kaye et al. 1985; Harris 1994; Harris and Lindsey 1995; Backley 2011; Scheer and Kula 2018).

The study has three major aims. First, it presents an analysis of the lexical sound system in SK. The majority of the previous works on the phonology of SK are brief impressionistic descriptions. This is why this study provides analyses of data collected from speakers of SK in order to identify the major phonological phenomena and establish the phonemic inventory of the dialect group of Sorani. For example, vowel quality has been a controversial topic on which different viewpoints have been put forward. This is why an instrumental analysis is conducted in this study in order to precisely describe the quality of vowels in SK.

The second aim of the study is to examine certain phonological processes that occur frequently in SK. These processes have either not been studied previously or only been discussed briefly in a few sources. In order to fill this gap, the present study conducts instrumental acoustic analyses of data collected from Hawler and Slemani speakers. Details of the targets, triggers and outputs of these processes are given with examples extracted from the conversations of the Sorani informants who were recorded for this study. The data reveal some phonological differences between the two varieties that have not been investigated in this way before.

The final aim of the study is to investigate phonological properties of SK based on data from two varieties of SK, Hawler and Slemani which present a more comprehensive view of the dialect group.[1] Most of the previous descriptions and classifications of Kurdish dialects are based on morphological and syntactic differences. Further, studies of the

[1] SK includes other varieties, namely Mukri and Sinaiy spoken in Iran and Garmiyani spoken in Iraq (Haig and Öpengin: 2014: 110). These varieties are not included in this study as collecting data from speakers of these varieties would have required the researcher to travel to the areas where the varieties are spoken which was not easy and the data would have taken a longer time to analyse. See §1.5.

phonology of Sorani varieties spoken in Iraq are mostly based on Slemani, for example McCarus (1958, 1997) and Fattah (2010). The only study that presents a description of the phonology of different dialects of Kurdish is that of Mackenzie (1961b) in which he compares the phonemic system of a number of Kurdish dialects including Hawler and Slemani, although he does not provide a detailed and systematic comparison of the two dialects that enable a broader typological analysis. It is important to notice that the majority of these studies were conducted in the 1950s and 1960s and may therefore be considerably outdated; hence, this study aims to confirm whether the data they provide are still valid or have been superseded. This study provides data collected from adult speakers of Hawler and Slemani in an attempt to present a comprehensive description of the phonology of SK and highlight some differences and similarities between the phonology of the two dialects.

This study not only fills the gap in the study of Sorani phonology; it also contributes to the study of Kurdish dialectology. The distinction between Hawler and Slemani is part of a larger division of the sub-dialects of Kurdish and the data presented in this study can be used as evidence for differences between the sub-dialects of SK; especially because most studies either present general descriptions of Sorani without any distinction of its sub-dialects or use the Slemani variety as a model to represent the phonology of the dialect group as a whole. Moreover, examining these two dialects in detail and providing a theoretical analysis helps to establish some phonological typology, which will provide a basis for analysis of the phonological systems of other dialects of SK.

Finally, the study is also intended to contribute to the development of Element Theory as it presents data that illustrate certain phonological behaviour that distinguishes SK from other languages that have been studied from an ET perspective.

1.2 Theoretical Framework: Element Theory

Element theory is a model of segmental representation that has developed in the framework of Government Phonology (GP; Kaye et al. 1985; Harris 1994; Harris and Lindsey 1995; Backley 1993, 2011, 2012, 2017; Backley and Nasukawa 2009a, 2009b, 2010, Cyran 2010, 2017, Scheer and Kula 2018, Scheer and Cyran 2018). It can be regarded as an alternative to Feature Theory (FT) initially presented by Chomsky and Halle (1968) in *The Sound Pattern of English* (SPE). In the following sections, I will present the main characteristics of ET and discuss how it differs from FT.

1.2.1 Segmental Representation in Element Theory

Both ET and FT agree that phonological segments are made of smaller units; they differ, however, in their view of what these units might be. According to FT a segment is said to be specified for a bundle of features; for example, /p/ is [+consonantal] [+labial] [-voice] [+stop], while ET asserts that a segment is an expression made of a single element, or a combination of elements, and elements are the smallest indivisible units of a language. So as the names suggest, features are the basic phonological units in FT and elements are the basic phonological units in ET.

Although features and elements both make up the internal structure of segments, they differ in a number of aspects. First, SPE features are bivalent while elements are monovalent. The features introduced in SPE have two values: a plus value [+] that refers to the presence of the property and a minus value [-] that refers to the absence of the property. ET, in contrast, refers to the presence of a property, but not its absence (Backley: 2011). That is to say, if a feature does not exist, there is no need to mark its absence. For example, in FT, *m, n, ŋ* are [+nasal], while all other segments are [-nasal] and this, as Backley (2011:7) notes, does not reflect how languages work because this gives both [+nasal] and [-nasal] the same value and hence it affects how sounds are classified into natural groups or participate in phonological processes. The property [nasal] represented by |L|[2] in ET is positive and it is used to represent the [+nasal] of FT, however, ET does not have any element to represent the [-nasal] of FT.

Second, in contrast to features, elements can be pronounced independently, that is to say they can be phonetically realized (Backley: 2011: 11). For a feature to be produced, it should be part of a segment with many other features. This is because a feature does not contain sufficient phonological information to allow it to be pronounced. For example, the feature [+front] cannot be pronounced, while |A| in isolation may map onto a phonetic value, so that an expression containing only |A| that is linked to a nucleus position will normally (in most language systems) be representative of the unround low vowel /a/ and thus be realised as something similar to [a].

[2] Elements are represented by capital letters between | | so they can be differentiated from features.

Third, SPE features are mainly expressed in terms of articulatory phonetic properties.[3] Elements, on the other hand, are auditory-perceptual, thus easily mappable, in many cases, onto acoustic patterns in the speech signal. That is, while FT is based on the speaker only, ET represents the 'neutral' form common to both the speaker and the listener (Backley: 2009: 7).

This study adopts the version of ET presented by Backley (2011) who introduces six main elements (discussed in the following sections). This number, compared to the number of features in FT is very small; and since features have bivalent values and elements have single values, features seem to have the ability to generate more combinations and consequently more segments. However, this results in over-generation, i.e. the ability to generate a large number of universally unattested, and in some cases impossible, combinations of features and/or predict the occurrence of phonological processes that do not exist.[4] So, with its limited number of elements, ET is argued to better represent the phonological structure of languages of the world. As mentioned earlier, FT treats both [+nasal] and [-nasal] equally and this means that both values can equally form natural classes. In ET, only [nasal] can form a natural class, and since it does not have an equivalence to [-nasal], it does not refer to the oral segments as a group. That is to say, in ET oral segments are an arbitrary set of segments that do not fall into a natural class and share similar behaviour based actively on their non-nasalness. This approach gives a more restrictive view of the grammar of languages and thus has more predictive ability, i.e. has greater explanatory adequacy.

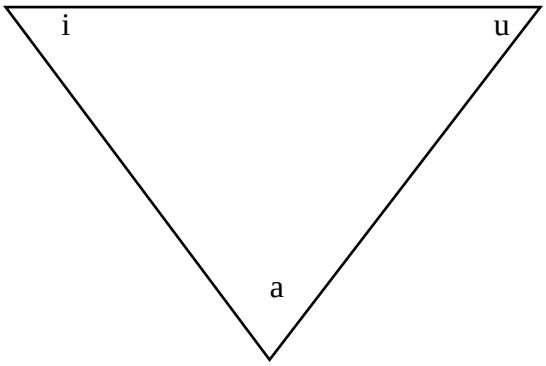
1.2.2 Elements for Vowels (Resonance Elements)

The vowel system in ET is based on three elements, namely |I|, |U|, |A| which in isolation tend to be mapped onto [i], [u], [a] respectively. These are said to be the basic (primitive) elements that correspond to the so-called corner vowels because they occupy the corners of a triangle in the vowel space and are therefore maximally distinct as shown in Figure 1.1 below.

[3] It is important to note that the articulatory approach to features is presented by Chomsky and Halle (1968) while there are other versions of FT that analyse features in terms of acoustic and/or auditory properties. For example, Jakobson et al. (1951) present an acoustic approach to features while others, including Flemming (2002), present an auditory approach to features.

[4] See Kaye (1989).

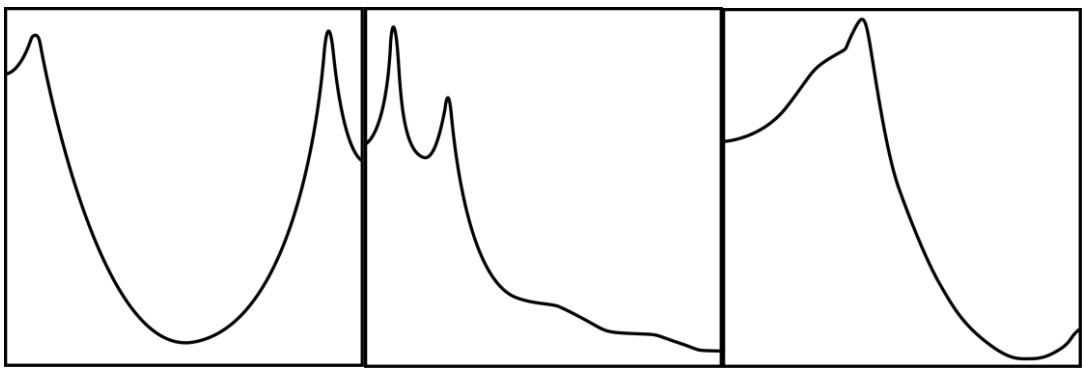
Figure 1.1 The vowel triangle



|I U A| are basic because they cannot be divided into smaller units. According to Harris (1994: 138), |I U A| have the acoustic patterns *dIp*, *rUmp* and *mAss*[5] respectively, as shown in Figure 1.2.

However, in order to represent a larger inventory of vowels, simple elements combine to make compound elements. For example, the vowel [e] is represented by the compound |IA| and the vowel [o] is represented by |UA|. Similarly, the spectral patterns of [e] and [o] are a combination of the patterns of |I| and |A|, as shown in Figure 1.3.

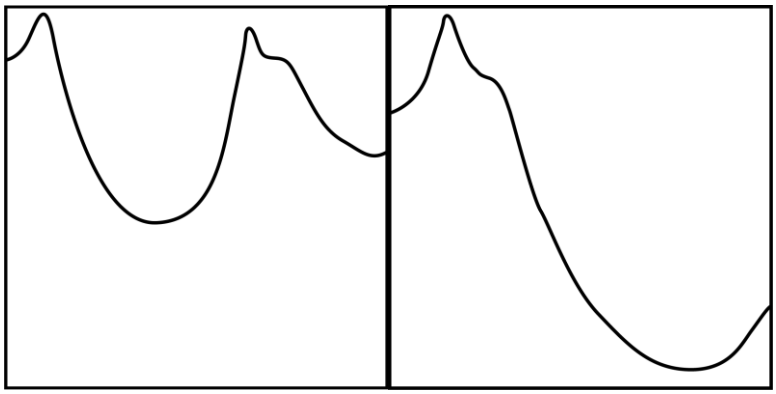
Figure 1.2 The spectral patterns of |I U A| according to Breit (2013: 6)



|I| |U| |A|

[5] These patterns are based on the distribution of energy at different frequencies.

Figure 1.3 Spectral Patterns of |I A| and |U A| according to Breit (2013: 6)



|IA| |UA|

Other vowels are represented by identifying one of the elements as the head in the combination. Backley (2011: 41) states that in an element compound, one of the elements (the head) is more predominant than the other (the dependent) and this functions to show contrasts between such vowels as [o] and [ɔ].[6]

[o] |U̲A|

[ɔ] |UA̲|

1.2.3 Elements for Consonants

In the early version of ET, Kaye et al. (1985, 1990) presented ten elements as shown below.

Table 1.1 The original ten elements presented by Kaye et al. (1985)

Element	Consonants	Vowels
A		a-colour
I	palatality	i-colour
U	labiality	u-colour
ɬ		ATR
R	coronality	
H	aspiration	high tone
L	voicing	low tone
N	nasality	nasalization
h	frication	

[6] See §1.2.4.

?	stopness

Later versions of ET reduced the number of the elements as the combination of ten elements leads, once again, to over-generation; i.e. producing a number of segments that have not been attested and predicting phonological processes that do not occur in any languages.[7] As explained earlier, the version used here includes six elements, the three vowel elements |I|, |U|, |A| and the consonant elements |H|, |L|, |ʔ|. In FT, vowels and consonants have different sets of features as the theory is based mainly on articulatory features and consonants and vowels differ fundamentally in the way they are articulated. Nevertheless, since ET is based on acoustic rather than articulatory characteristics, it adopts an opposite view on the shared elements between vowels and consonants which allows consonants to have vowel elements in the same way it allows consonant elements to appear in vowel representations. For example, the vowel elements represent place of articulation in consonants and the consonantal element |L| represents voicing in consonants and low tone in vowels.

1.2.3.1 Glides

Backley (2011: 64) states that consonant-vowel unity occurs only on the segmental level, while on the syllabic level they remain profoundly split as they occupy different slots in the syllable structure, i.e. vowels occupy the nucleus while consonants occupy onsets. This is fundamental to distinguish vowels from glides since the glides [j] and [w] are represented by the vowel elements |I| and |U| respectively. Phonetically and even phonologically, vowels and glides are remarkably similar, and they can only be differentiated by their position in syllable structure, as shown below.

(1)

[i]	[j]	[u]	[w]
N	O	N	O
x	x	x	x
|I|	|I|	|U|	|U|

Glides are the only consonants that are represented by vowel elements only, i.e. they do not have consonant elements in their segmental representations.

[7] See Backley (2011,2012) and Scheer and Kula (2018).

1.2.3.2 Resonance (Place) Elements

Glides are not the only example of vowel elements occurring in non-nucleus positions in the syllable. In fact, the vowel elements |I U A| can also occur in consonant compound expressions to represent place properties. |I| represents palatal and dental properties (coronal), |U| represents labial and velar properties while |A| represents pharyngeal and alveolar properties (Backley: 2012: 68-69).[8] Once more, headedness plays a crucial role in identifying the property of each element. Backley (2012: 67) gives the following list. Headed elements are underlined.

(71)

Element	Category
|I|	coronal
|<u>I</u>|	palatal
|U|	velar
|<u>U</u>|	labial
|A|	alveolar
|<u>A</u>|	pharyngeal

For other categories, a combination of these vowel elements can be used. For example, |<u>U</u> A| represents labiodentals.

1.2.3.3 Manner Elements

While in FT the properties of manner and voicing are accounted for by different sets of features, ET does not separate between them and they are both driven by the three basic consonant elements |H L ʔ|. The distinction is made by using headed and non-headed elements (Backley: 2012: 75). One should not forget, however, that ET has different versions that employ different numbers of elements. In earlier ET, Harris (1994) employs a distinct element to mark nasality, namely |N|. Similarly, Kaye et al. (1990), Harris (1994) and Cyran (1995) use |h| to refer to noise while they use |H| to refer to voicelessness. Finally, |ʔ| represents stop. Later versions of ET, often called Revised ET, use |L| to represent both voicing and nasality and |H| to represent both frication and voicelessness (See chapter 4).[9]

[8] This is true for a number of languages only; as discussed in §2.3.2.2, coronals are represented by |A| in some languages and by |I| in others.

[9] Similarly, FT has different versions as Chomsky and Halle (1968) present an articulatory approach to features while Jakobson et al. (1951) present an acoustic approach to features and the features presented by Flemming (2002) are auditorily analysed.

In summary, ET employs six main elements which are used as simplex or compound expressions to represent the internal structure of segments. These elements are shared between consonants and vowels. That is, vowel elements are used in the structure of consonants to represent resonance properties. Similarly, consonant elements appear in vowel structure to represent properties such as nasalization. In the following sections I give further details of ET where I discuss the lexical segments of SK from an ET perspective.

1.2.4 Headedness

ET employs simplex expressions that contain one element and complex expressions that consist of more than one element. The elements in complex expressions are said to have an asymmetrical relation as one of them becomes the head of the expression and the others act as dependants (operators). As Harris (1994) points out, the head of the expression is more prominent than its dependants and it maintains its full elemental patterns it displays in isolation while the dependants display a reduced effect of their elemental pattern. For example, an expression that has a headed |A| and a dependent |I| has a more salient *mAss* pattern with a less salient *dIp* resulting in [æ], while an expression with a headed |I| and a dependant |A| has a more salient *dIp* pattern and a less salient *mAss* pattern resulting in [e]. Further, the head of the expression is said to licence its dependants.[10]

The manifestation of such an asymmetrical relation between the head and the dependants expands the capacity of ET to represent more attested phonological processes. Not all phonological processes require the addition or deletion of elements; some processes, such as vowel lowering [e] →[æ], involve an alternation between the head and the dependent elements (Harris and Lindsey: 1995).

Most works in element-based phonology agree that an expression can have one head and one or more dependents (among others, Harris 1994; Harris and Lindsey 1995). Backly (2011, 2017), however, proposes a contradicting view of headedness and argues that a phonological expression can have more than one head because he, unlike the standard view of headedness, treats headedness as a property of individual elements rather than the property of the whole expression.

This entails that phonological classes can be identified by referring only to the head. That is to say, a consonant is palatal if it contains a headed |I| regardless of its dependants.

[10] See Brockhaus (1995b) for a detailed discussion of licencing and governing relations in GP.

Backley (2017) argues that certain segments require 'double-headed structures'; for example, a labial aspirated stop consonant should have a headed |U| to represent labiality, a headed |H| to represent aspiration and a dependent |ʔ| (Backley: 2017: 4).

In this study, I subscribe to the standard view of headedness and treat melodic expressions as having one head only. It is important to note that ET also allows expressions to have no head. For example, I argue that the consonants *r* and *l* in SK have no head.

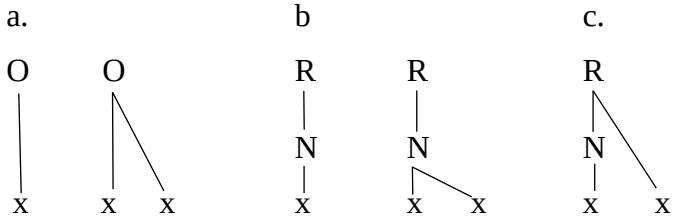
In conclusion, the version of ET adopted in this thesis utilizes six elements to represent the structure of segments. Since these elements are monovalent and have only one value, unlike the features used in FT which have binary values, the theory can be criticized for its restricted ability to represent all the possible segments of world languages and how they participate in phonological processes.[11] However, ET uses other mechanisms such as headedness and complex structures to generate more combinations and represent more segments than expected from the six elements introduced in the previous sections.

Moreover, elements can provide information about the behaviour of SK segments in phonological processes. For example, I argue that palatal consonants in SK have a headed |I| and hence they can never be velarized as the process of velarization involves the spreading of an |A| element.

1.2.5 Syllable Structure in Government Phonology

GP does not recognize the syllable as a phonological unit, therefore the term syllable in this study is used informally. GP employs three prosodic constituents: the onset (O), the nucleus (N) and the rhyme (R) which behave as independent nodes and are maximally binary, as shown below.[12]

(1)



[11] See Chen (2010).
[12] See Kaye et al. (1990).

(1a) represents non-branching and branching onsets, (1b) represents short vowels and long vowels (or heavy diphthongs) and (1c) represents a vowel followed by a consonant. As apparent, in GP, there is no prosodic constituent formally known as 'coda', and word-final consonants are regarded as either part of the rhyme or as onsets which in turn need to be licensed by a following empty nucleus.[13]

1.3 Language and Dialects under Study

Kurdish is a term used to refer to a group of closely related language varieties spoken in Kurdistan. This region covers parts of each of Iraq, Iran, Turkey and Syria. A small number of Kurds also live in Armenia and Azerbaijan as well as the large Kurdish diaspora in Europe and the United States. Kurdish is a member of the Indo-Iranian branch of the Indo-European family of languages. It belongs to the North-West Iranian languages (Mackenzie 1961b; Campbell and Poser 2008).

1.3.1 Kurdish Dialects

A scientifically accepted definition of 'language' as opposed to 'dialect' is lacking because it is not easy to distinguish between the two. There are no clear boundaries between the notions of language and dialect and the distinction may not be purely linguistic; this is why linguists often choose to avoid the use of both terms in any technical sense and use a more comprehensive, uncontroversial term such as 'variety' which refers to language, dialect and even accent.

Chambers and Trudgill (2004: 5) define 'language' as a variety that is a collection of a number of dialects. This definition suggests that language is bigger than dialect and has more speakers. This is a too general definition and does not reveal much about either term. Then Chambers and Trudgill (2004: 5) state that dialects are mutually intelligible while languages are not. In other words, if speakers of two varieties understand each other, they are speaking two dialects of the same language. Difficulties arise, however, when an attempt is made to define mutual intelligibility since 'understanding' is a vague concept and it is not easy for a linguist to decide on the level of understanding between two speakers or on how similar two varieties should be in order to be mutually intelligible. Moreover, the degree of intelligibility may also vary, as Gooskens (2007: 446) explains, depending on the listener's exposure to the other variety, the willingness to understand

[13] See Harris and Gussmann (1998).

and linguistic distance to the other variety. For example, the Sorani dialect, and more specifically the dialect of Slemani, has been the formal language in the Kurdish speaking areas in Iraq since the early 20th century and the most prestigious among all (Mackenzie: 1962), so speakers of the other dialects, such as Hawrami, have learned to speak Sorani while Sorani speakers did not have to learn Hawrami.

Another problem facing the assessment of mutual intelligibility is that it does not successfully apply to all languages and dialects. The Scandinavian languages, for example, are mutually intelligible while certain dialects of German are not (Gooskens: 2007: 445). Chambers and Trudgill (2004: 5) discuss how geographical separation plays a great role in mutual intelligibility. They state that it is quite normal for dialects on the outer edges of a geographical area not to be mutually intelligible, but be linked by a chain of mutual intelligibility, i.e. a continuum. Bloomfield (1933: 51) calls this a dialect area which is an area between two main dialects or languages whose speakers understand each other because the differences between their varieties are slight and moving in any direction results in further differences. Consequently, the speakers of two languages who share a border are expected to understand each other. That is to say, the change between two languages occurs gradually. Dialect continuum in Kurdish is discussed later in this section.

Therefore, there is no precise definition of language as opposed to dialect and the notion of mutual intelligibility cannot fully justify the dialect continuum. Further, defining an understudied language like Kurdish and identifying its dialects and their classifications proves to be even more difficult. Linguists, nevertheless, have tried to seek other answers for the question of dialect and language differences. Max Weinreich (1894-1969) suggested that ‘a language is a dialect with an army and a navy’. This claim clarifies how the socio-political conditions can distinguish between what are officially designated dialects and languages. When it comes to Kurdish, the distinction is even more challenging because of the socio-political conditions discussed in §1.3.3. Moreover, these socio-political situations correlate with Kurdish nationalism, as Hassanpour (1992) states. As a result, Kurdish linguists sometimes fail to objectively discuss the issues of the Kurdish dialects; in some cases, the classification of the dialects is not based on linguistic features, while foreign linguists have focused on certain areas of Kurdistan or have based their analysis on a very few number of participants who speak one dialect only. Thus, the problem of language and dialect has not yet been solved in Kurdish.

The following section discusses the classification of the Kurdish dialects. I will, for now, assume that there is one language, Kurdish, that has a number of dialect groups which are at certain degrees of mutual intelligibility, depending on the claim that the Kurds make, and taking into account that the differences come from the political boundaries that have forcefully divided the language.

1.3.2 The Classification of Kurdish Dialects

In the old sources, Kurds were described as a nation who spoke different languages; for example, Bedlisi (1860 cited in Hasanpoor: 1999:34) states that Kurds have four languages, not dialects, viz. Kurmanji, Luri, Kelhuri and Gorani. In later sources, these are all labelled as dialects of the Kurdish language. In the last century, Kurdish dialects drew more attention and linguists (foreigners and Kurds) have been trying to investigate the dialects and their relationship with one another and they have come up with different classifications. However, the existing studies have failed to provide a detailed accurate classification of the dialect groups of Kurdish, their geographical distributions and the sub-dialects that belong to each group. This may be due to the fact that, in these classifications, linguists have largely focused on geographical and socio-political criteria and, except for a few studies, have ignored linguistic features. Consequently, these classifications are different in a number of respects.[14]

Firstly, they differ in the terminology they use. For example, Ahmad (1986:8) recognises Northern Kurmanji (used in Turkey, Armenia, Syria, north-west Iraq and north-west Iran) and Southern Kurmanji (used among Kurds in Iraq and Iran). However, Hasanpoor (1999) uses 'Sorani' instead of 'Southern Kurmanji' which is a more acceptable term among contemporary Kurdish scholars. It is not deniable that Kurmanji has the largest number of speakers among all the Kurdish dialect groups, yet, some other dialects have developed so substantially that it would be better to treat them as separate dialect groups that can be subdivided into other varieties. Some other linguists use Northern, Central and Southern Kurdish as an alternative.

Secondly, there is disagreement about the geographical classification of the Kurdish dialect groups. For example, McCarus (1958: 1) identifies Eastern Kurdish and Western

[14] Matras et al. (2016) have led a project of Kurdish dialectology in Manchester University which focuses in particular on morpho-syntax and lexicology, and less on phonology. They have created a large online database which compares Kurdish varieties in 50 areas and provides transcriptions, sound files and maps. This database has made a considerable progress in furthering knowledge of Kurdish dialect classification.

Kurdish separated by the Tigris. Skjaervo (2006: 265), on the other hand, remarks that Kurdish can be divided into Northern Kurdish (Kurmanji) used in Turkey, Armenia and Kazakhstan, Central Kurdish (Sorani) used in Iraq and Iran and Southern Kurdish used in Kermanshah (Western Iran). These classifications neither present a comprehensive description of the dialects, nor give linguistic evidence on how these dialects are different.

Mackenzie (1961b: xviii) divides Kurdish into: Northern Kurdish, Central Kurdish and Southern Kurdish. However, in his study, he investigates a number of dialects spoken in northern Iraq which he classifies into two ad hoc groups: Group 1 which includes varieties from Central Kurdish such as Slemani and Hawler[15] and Group 2 which includes dialects that belong to Northern Kurdish in his study such as Akre and Berivan. These two groups are separated by the Zab river. It is worthy of mention that Mackenzie provides linguistic evidence and makes comparisons (phonological and morphological) to draw the isoglosses between his dialect groups.

This study follows a more recent classification of Kurdish dialects given by Haig and Öpengin (2014); they identify five dialect groups of Kurdish which are: Northern Kurdish (Kurmanji), Central Kurdish (Sorani), Southern Kurdish, Gorani, and Zazaki. The distribution of these dialects is shown in Figure 1.4.

In what follows, I briefly discuss what are now broadly accepted as the major dialect groups of Kurdish. To begin with, according to Khorshid (1983: 5), the Kurmanji dialect group embraces the largest area and has the largest number of speakers among all the other dialects of Kurdish. It is spoken in Turkey, Syria, Armenia and Iraq. Sorani is spoken in areas that lie south to Kurmanji areas in Iraq and Iran (See Figure 1.4).

Similar to Mackenzie (1961b), Haig and Öpengin (2015) identify the Zab river to be the dividing line between Kurmanji and Sorani. This view is also supported by Matras (2017) who draws on data from Manchester Database and provides linguistic evidence that show the division between the two dialect groups on either side of the Zab river. Matras (2017) argues that there are substantial phonological, morphological and syntactic differences between the two groups. So, this area can be regarded as the contact area between Kurmanji and Sorani.

[15] Mackenzie (1961b) uses ‘Arbil’ instead of ‘Hawler’.

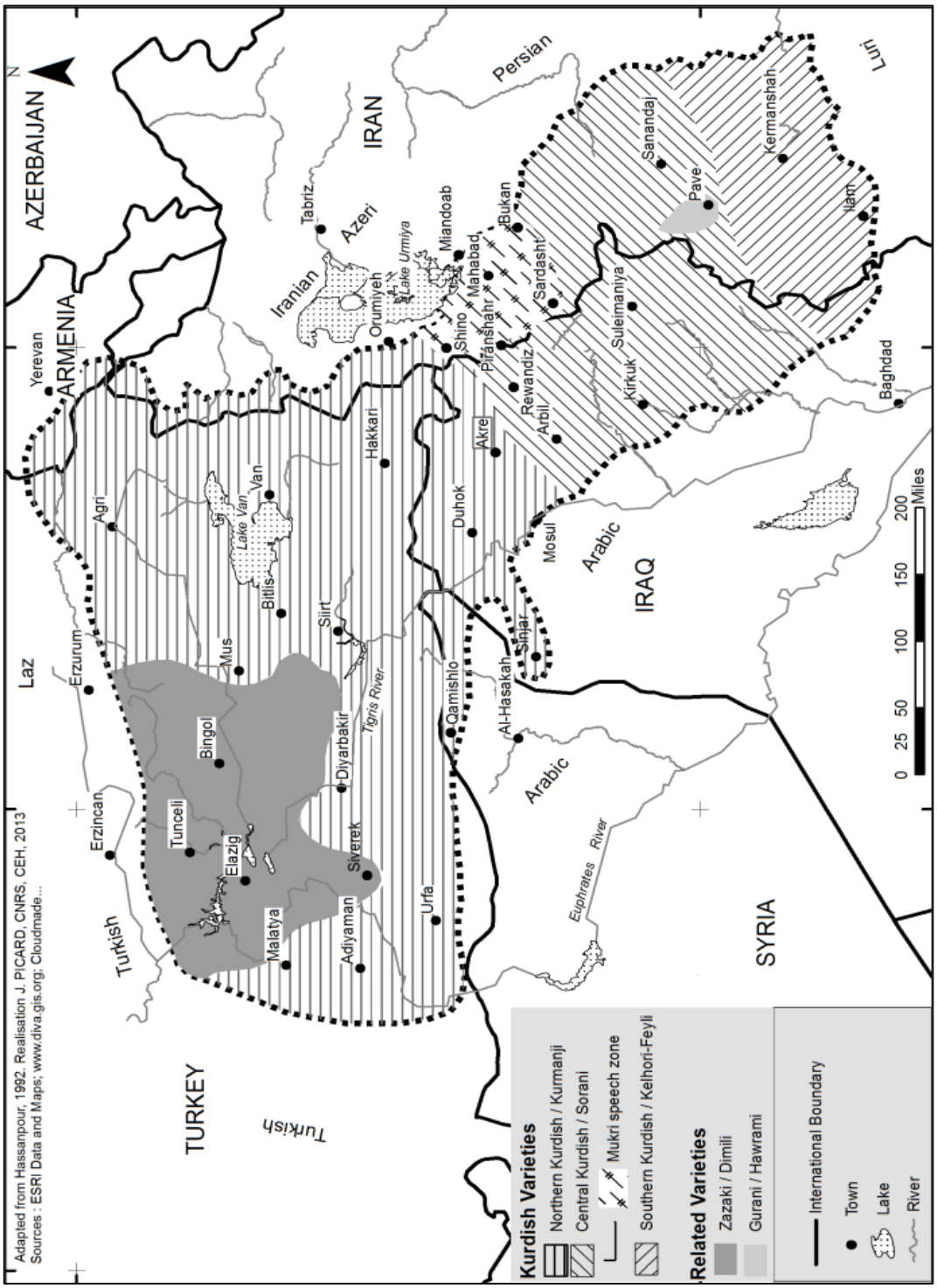
In this regard, Jügel states:

> …some areas in between Kurmanji and Sorani might be contact areas, while in other areas we could detect a continuum of gradual dialectal changes, assuming the-se two varieties have a common ancestor at all. (2014: 129)

Mukri[16] dialect (See Figure 1.1), for example, has features from both Kurmanji and Sorani (Mackenzie 1961b; Jügel 2014). So Mukri can be regarded as a transitional area that connects the two dialects groups. Matras (2017) argues that Kurmanji and Sorani share features that go beyond the contact areas which indicate that there are no clear-cut boundaries between the two groups. Hence the two varieties are regarded as two dialect groups that belong to the Kurdish language.

[16] Mukri is a variety of Sorani spoken in the city of Mahabad in Iran (See Mackenzi: 1961b).

Figure 1.4 Map of Kurdish dialects according to Öpengin (2013 cited in Haig and Öpengin: 2014)



This study is based on data from Sorani Kurdish. Sorani Kurdish is a cover term for many sub-dialects that cover a large portion of the Kurdish speaking areas in Iraq and Iran. Most studies of this dialect group are based on the Slemani variety (McCarus 1958, 1997; Amin 1979; Mahwi 2008a, 2008b). Mackenzi (1961b) divides Sorani into Northern Sorani

which is mainly centered in the city of Slemani and Southern Sorani which includes areas to the north of Slemani including Hawler and its surrounding on the south of the Zab river. Data in Matras (2017) supports this division. This division also corresponds to the division of the Sorani dialects in Iran (See Matras (2017) for details).

In this study I provide data from Slemani and Hawler varieties.[17] One further point needs clarification. As I mentioned earlier, the names of the dialect groups remain a topic of controversy and linguists have been using different terminology. This also applies to the sub-dialects in each group, especially because most of these varieties are named after the cities or areas they are being used at. For example, the names (of the cities) of the two varieties discussed in this study, Al Sulaimaniyah and Erbil, have entered English through Arabic. This is why most studies use the Arabic names to refer to the language varieties. What adds to the confusion is that the spellings of these names also differ from study to study: Arbil and Suleimani (Mackenzie: 1961b), Arbil and Sulaimaniya (McCarus: 1958) and Erbil and Suleimaniya (Matras: 2017). In this study I use the Kurdish names Hawler (for Erbil) and Slemani (for Al Sulaimaniyah) for both the cities and the language varieties.

Southern Kurdish is spoken in western Iran and eastern Iraq to the south of the Sorani Kurdish areas and it includes Kelhuri, Faili, Kirmashani and Laki. These dialects have caused disagreement among linguists since the geographical position of this group and its relation with the other Kurdish dialect groups and even other Iranian languages has not been fully recognized. Some studies do not differentiate between Southern Kurdish and Luri, such as Khal (1960) who considers Laki and Faili to be two dialects of Luri, while others define Luri as a distinct west Iranian language.

Gorani is spoken in areas throughout western Iran and northern Iraq. According to the descriptions given in Bailey (2018), Gorani is used in several separate areas that lie within the Sorani and Southern Kurdish speech zones. Gorani is spoken in areas including Hawraman (In Halabja/Iraq and Paveh/Iran) and Khanaqin (Iraq).[18]

Zaza (also Zazaki or Dimili) is spoken in south-eastern Anatolia in an area that lies to the west north of Kurmanji. The degree of relatedness between Zaza and other dialects of Kurdish is even more controversial. Some linguists consider Zaza to be a dialect of Kurdish. For example Fossum (1919: 8) describes Zaza as the northernmost Kurdish

[17] See §1.4.
[18] See Bailey (2018) for details.

dialect used in Turkey. Other sources discuss the relationship between Zaza and Gorani despite the distance between the two varieties, the former being used in Turkey and the latter in Iraq (Khorshid:1983). Speakers of Zaza consider themselves to be Kurds. This view seems to be motivated by the urge among the Kurds to be speaking one language and being one nation.[19]

However, linguistic facts suggest that this variety shows too many differences to the rest of the Kurdish dialects that it should only be treated as a separate language and some recent studies have started to describe Zaza as a distinct North-West Iranian language although the speakers of these varieties consider themselves to be Kurds (Todd: 1985: vi).

It is worth mentioning that Kurdish does not have a generally agreed on standard dialect; Kurmanji and Sorani have developed separate standard forms (Kreyenbroek: 1992: 56) and all attempts to choose a dialect to become the standard form used by all Kurdish speakers have failed so far.

1.3.3 A Historical and Socio-political Background

The boundaries of the Kurdish speaking area cannot be accurately established as Kurdistan was divided between Iraq, Iran, Turkey and Syria after World War I and these states do not provide adequate information about the sociolinguistic situation of the Kurdish speaking areas. In this regard, Hassanpour states:

> The boundaries of Kurdistan cannot be exactly defined since they do not coincide with international borders or internal administrative divisions. The central governments refuse to provide ethnic or linguistic maps of the country on which the Kurdish speech areas can be properly identified. (1992: 1)

Thus, it is difficult to provide accurate population estimates of Kurdish speakers, especially when considering that a large number of Kurdish speakers live in diaspora. Estimates of the total number of Kurdish speakers varies between 15-30 million (Hassanpour: 1992; Haig and Matras: 2002; Simons and Fenning; 2017). McDowall (2004) states that around 24-27 million Kurds live in the Middle East, while up to 2 million others live elsewhere in the world.

In Turkey, despite being the second language, next to Turkish, with more than 13 million speakers, Kurdish does not have an official status. When the Turkish Republic was

[19] See Ludwig (1995) and Haig and Öpengin (2015)

founded in 1923, Turkish was made the only official language spoken by all the citizens deleting any linguistic diversities as part of Turkey's policy to create an indivisible united nation-state (Haig: 2003; Gunter: 2008; Zeydanlioğlu: 2012). Throughout the 20th century the existence of Kurds and their language was denied by successive governments in Turkey. In 1982, the use of the language was banned effectively and speaking Kurdish in public led to prosecution (Haig: 2004); the word 'Kurd' was banned and Kurds were referred to as 'Mountain Turks'. The ban on speaking Kurdish in public was repealed in 1991; however, education and broadcasting in Kurdish were still prohibited by law (McDowall: 2004: 431). Although the restrictions on the use of Kurdish seem to have been lifted, the policies of linguistic assimilation have continued and Kurds do not have the right of learning their mother tongue or using it in official contexts.

Similarly, Kurds of Syria have long been marginalized and the policy of linguistic assimilation was carried out against them. Under the French mandate (1920-46) Kurdish was allowed to be spoken but was not allowed in education. Towards the end of World War II, Kurds enjoyed more freedom to use their language in writing and broadcast. This, however, changed when the Ba'ath party took power in 1963 as strict restrictions were put on the use of the Kurdish language. Kurds were not allowed to speak their native language, to give Kurdish names to their children or to start businesses with Kurdish names. After the uprising in 2011 and the civil war inside Syria, the Kurdish regions have started to use their language more freely (Skutnabb-Kangas et al.: 2012:184) and for the first time Kurdish was taught in schools in 2012.

In Iran, the language policy towards the Kurds can be described as a case of 'restricted and controlled tolerance' (Sheyholislami: 2012: 37). The Kurdish language is not banned; however, it is considered the language of a minority which has no official status and the Kurds are obliged to use the official language of the state, Persian. The Pahlavi Dynasty (1925-1979) adopted the assimilation policy of all language minorities and Persian was the only official language of the state (McDowall: 2004). After 1979, the Islamic Republic of Iran started to ease the restrictions on the minority languages. Nevertheless, the state's language legislations did not entirely come to effect and there remained restrictions on the use of the minority languages. Kurdish students, in the Kurdish regions, in high schools and colleges have been given the choice to take a course in Kurdish, while education is still in Persian in the Kurdish regions and writing and broadcasting in Kurdish have limited freedom (Sheyholislami: 2012).

The case is different in Iraq, where Kurdish is the second official language after Arabic. In 1922 the Kurds announced an independent state for themselves which was called the Kingdom of Kurdistan and used Kurdish as an official language, but it collapsed after two years[20]. Later in 1926, the Kurds were given further rights in Iraq and Kurdish became an official language that was used in the media and taught in schools. In this regard, Robson states:

> The medium of education in Iraqi schools is Arabic, the national language. In northern Iraq, however, public education has been intermittently available in Kurdish, at least on the primary level, since the formation of Iraq as a country… In 1926, the initial Iraqi local-language law provided for the teaching of Kurdish in schools in Kurdish-speaking areas, and for the publication of Kurdish-language books. In addition, there was Kurdish representation in the government. (1996: 7-9)

In 1958, when the Republic of Iraq replaced the monarchy, the Kurds were taken as part of this new state. However, when the Ba'ath regime took control of the country in 1963, it started to arabize the Kurdish areas in an attempt to weaken the Kurds. Arabic was the language of the majority and Kurds had to speak Arabic in certain official contexts. The Kurds, on the other hand, did not give up on resisting these attempts to suppress their nationality and language. Finally, in 1991 the Iraqi government withdrew from the Kurdish cities and the Kurds established an independent Kurdish state in northern Iraq. The language has ever since been used as the official language of the Kurdish Regional Government in Iraq and as the language of media and education; after 2005 Kurdistan was recognised as an autonomous entity in Iraq and the Kurdish language is now used even in the Iraqi passport along with Arabic and English.

To sum up, Kurdish is the mother tongue of up to approximately 30 million people who live in an area that they themselves call Kurdistan, but it is divided among neighbouring countries whose governments have, throughout history, tried to undermine the language.

1.4 Previous Works on Kurdish Phonology

The early studies of the Kurdish language, mainly conducted by missionaries and orientalists, can be described as broad vocabulary and grammar outlines. Garzoni's *Grammatica e vocabulario della lingua kurda* published in 1787 is considered the first

[20] The same experience was repeated in Iran when in 1946 Qazi Muhammed established the short-lived Kurdish Republic of Mahabad. This republic failed to survive and vanished in less than a year. See McDowall (2004).

scientific description of the Kurdish language. Towards the end of the 19th century and the beginning of the 20th century, many other European scholars and missionaries started to publish dictionaries, e.g. Jaba and Justi (1879), and general grammar books, e.g. Mann (1906). Each source investigates a particular dialect of Kurdish. For example, Garzoni (1787) studies the dialect of Amadia, Rhea (1869) studies the dialect of Hakari, Soane (1913) studies the dialect of Slemani and Fossum (1919) studies the dialect of Kirmanshah.

Some studies provide general descriptions of the phonology of the dialect in question. Hence the number of the phonemes differs from one study to another as they describe a variety of dialects across the Kurdish speaking area. Justi (1880) gives 15 vowels, 3 diphthongs and 29 consonants with a description of their features as well as examples of how they are pronounced with translations into German, Arabic and Persian. Makas (1900) gives 14 vowels and 26 consonants, while Fossum (1919) states that Kurdish has 32 consonants and 4 vowels only. Wahby (1929) tries to develop a phonemic alphabet using the Arabic script for Sorani Kurdish where he assignes a letter for each phoneme. However, the system he suggested has not drawn much attention.

McCarus (1958) applies the American linguistic approach to the Slemani sub-dialect. His chapter on phonology includes discussions of non-linear phonemes, stress and intonation. Mackenzie (1961) gives an account of the phonology, morphology and syntax of 'two *ad hoc* groups' of Kurdish dialects. The dialect of Slemani has been taken as the basis of description in the first group and the dialect of Akre for the second group. In the first part of the book, Mackenzie gives a detailed description of the phonemes and their phonetic realizations in the chosen dialects.

Wais (1984) gives an outline of the phonemes of Sorani along with a precise overview of stress and intonation. Both Amin (1979) and Fatah (2010) give a brief description of the phonology of Sorani taking the sub-dialect of Slemani as the basis of their study. They, however, do not give much detail of the phonology as their studies deal with other areas of Kurdish linguistics such as morphology and syntax. Mahwi (2008b) also provides an outline of Sorani Kurdish phonemes.

Most of the abovementioned studies provide general descriptions of Kurdish phonology which focus on the phonemes and some of their distributions. The prosodic features are tackled briefly in a few studies. Phonological processes in Sorani, on the other hand, have drawn almost no attention. As it will be clarified in the following chapters, the study of

the phonological processes such as palatalization, velarization and metathesis is restricted to brief descriptions of a few examples only. The phonemic inventory of Sorani Kurdish remains a controversial topic that divides linguists. The foreign scholars and orientalists mostly collected their data from a limited number of speakers who do not necessarily represent the dialects accurately. The native linguists, on the other hand, were probably motivated by nationalist views to the language which resulted in excluding certain phonemes from the Kurdish phonemic inventory with no linguistic justification, that is they are mostly prescriptive in nature. The phonemic inventory of Sorani Kurdish is discussed in chapter 2.

This thesis attempts to answer the following questions:

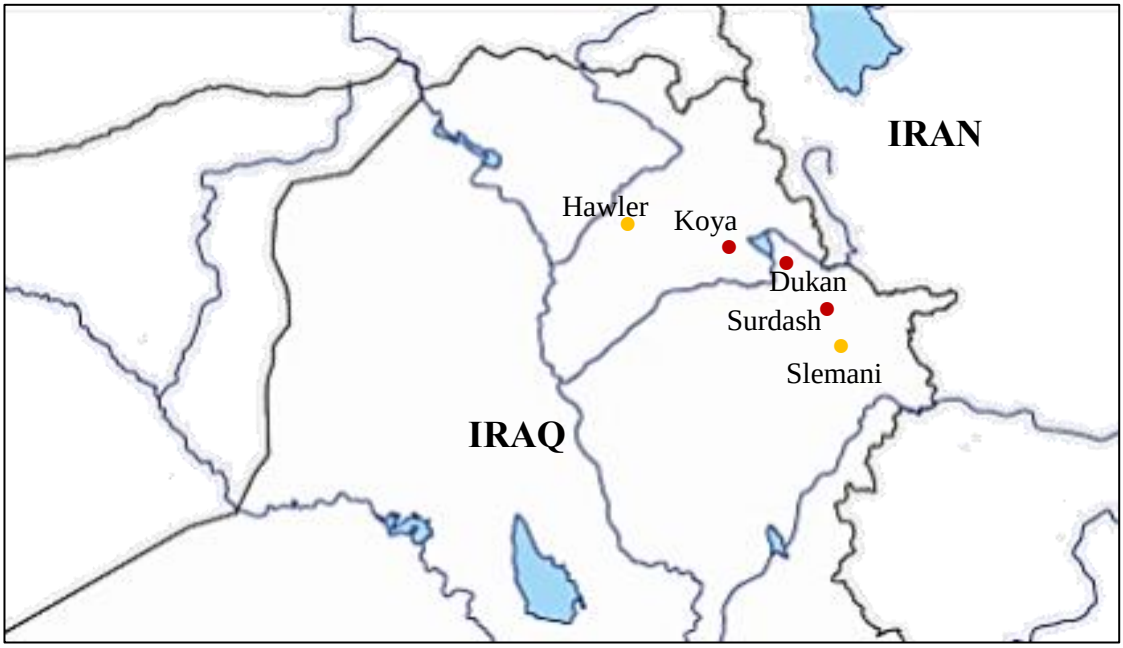
1. What are the lexical segments of SK?
2. What are the differences between the targets and triggers of the process of palatalization in Hawler and Slemani?
3. What are the targets and triggers of emphasis spread in SK?
4. What are the laryngeal properties of SK?
5. Is the process of final devoicing partial or complete in SK?

1.5 Methodology

1.5.1 Data Collection

For the purpose of this study, the researcher collected data from the city of Hawler which is the centre of the dialect of Hawler and the city of Slemani which is the centre of the dialect of Slemani. However, the boundaries between the two cities do not necessarily correspond to the boundaries between the two language varieties and therefore there must be some areas of contact where features of both varieties are shared. Hence, data was also collected from three other areas: a) Koya (also Koy Sanjaq), b) Dukan and c) Surdash. Further, data was also collected from a few villages between Dukan and Koya. See Figure 1.5.

Figure 1.5 Sorani speaking areas where data was collected for the purpose of this study



In the classification of Kurdish dialects, Hawler and Slemani are regarded as two distinct varieties of SK (Haig and Öpengin: 2014). As both Hawler and Slemani are varieties of the Sorani group of dialects, it would be reasonable to suppose that they share phonological properties. However, even among varieties of the same language there are some differences that set them apart which might be a result of different historical development or the influence of contact languages. The difference between Hawler and Slemani is briefly mentioned in a few studies. For instance, Mackenzie (1961b) studies Hawler and Slemani as two separate varieties and discusses data that shows phonological, morphological and syntactic differences between them. Other studies, including Fatah (2010), discuss how the nasal velar *ŋ* and the and the lateral *ɬ* occur only in Slemani. Hence, the main purpose of this study is to investigate phonological processes in SK based on data from Hawler and Slemani.

Hawler and Slemani are part of a dialect continuum that extends to the Sorani varieties in Iran. Matras (2017) argues that Sorani can be divided into Northern Sorani which includes an area starting from Hawler, Rawandiz, Khalakan and Mawat in Iraq to Mahabad, Oshnavieh and Urmia in Iran, and Southern Sorani which starts from Slemani and extends to the Sorani speaking areas that lie to the south of Lake Urmia. Matras mainly uses morpho-syntactic and lexical criteria; he also includes some phonological criteria, such

as pharyngeal substitution *ḥ > ʕ and ʕ > ḥ* and substitution of liquid consonants *ɬ > r* (See Chapter 2), to capture the differences between these varieties.[21]

Other varieties of SK in Iraq have been investigated. For example, Mackenzie (1961b) studies Warmawa, Bingird and Pishdar.[22] However, in this study only three areas between Hawler and Slemani were chosen in order to provide further evidence for the differences and similarities between the two varieties. The variety of Koya is regarded as part of the Hawler dialect and the variety spoken in Surdash resembles Slemani dialect. This was noticed in the data collected for this study. The variety spoken in Dukan was also included as it lies between Koya and Surdash which officially belongs to the Slemani governorate.

It is important to notice that between the centres of the two cities, Hawler and Slemani, one can take different routes where they can encounter slightly different varieties of Sorani spoken. Further, there are numerous villages and smaller towns that lie between the two cities which contribute to the language continuum between the two sub-dialects of SK. However, the main purpose of this study is to investigate some phonological processes in SK based on data collected from Hawler and Slemani and the dialectal distinctions require a larger sample of data collected from speakers in a larger area which is beyond the scope of this study.

All the data used in this study were collected from speakers of the abovementioned areas. The researcher travelled twice to Iraq, in 2016 and 2017, to collect the data. Finding native speakers in the two big cities was easy. However, the situation in the towns and villages was different and a few problems were encountered. First, due to the socio-political situations discussed in §1.3.3, people were displaced from their villages and towns. Some people had left their homelands because of war and others had left for social (such as marriage) and economic reasons. This has resulted in bringing new language varieties to these areas. This is why it was difficult to find native speakers of the areas who were not affected by other varieties. For example, one family who lived in Dukan, the husband was originally from Hawler and the wife was from a village outside Slemani. For this reason, other varieties of SK such as Garmiyani and varieties spoken in Iran were not included in this study as it would have been difficult to collect data from all these varieties especially since the study was conducted in the UK.

[21] See Matras (2017) for further discussion and detailed maps.

[22] See Mackenzie (1961b: xvi) for map.

Another problem was the influence of Slemani dialect on the other varieties. Mackenzie (1961b) argues that Slemani dialect, being the language of education and media, has greatly affected the purity of the other neighbouring dialects. This was also noted in the speech of my informants. Some informants who had been to university in Slemani had picked up some features of Slemani. For instance, some of my Koya and Hawler informants used *l* in words where *r* would usually be used in Hawler dialect (See §2.1.1.5) or deleted the *d* in words like *dakam ~ akam* 'I do' which is a feature of Slemani dialect. However, none of my Slemani informants used any features from Hawler.[23]

1.5.2 The Informants

For each area, five informants were recorded. The age of the native speakers had to be above 30. This is a synchronic study of certain phonological features and processes to show differences and similarities between to neighbouring varieties of SK. This is why the younger age groups are excluded since they mostly go to school and university in the bigger cities and get exposed to different varieties of Kurdish and other languages such as Arabic and English. Moreover, they have access to the Internet which also affects their language. The older informants chosen for this study had either gone to school for a very short time or had gone to university a long time ago and returned to their hometowns and lived there for some substantial time.

Although this study does not discuss the effects of the speaker's sex on phonetic and phonological variation, the study includes data from both female and male informants. It is important to notice, however, that, especially in the villages, the older female speakers were less likely to travel or go to school and had spent most of their life in the same areas and did not have contact with speakers of other varieties of SK or other languages, hence their speech was less likely to be affected by the other varieties. The men, on the other hand, were more exposed to other varieties of Kurdish.

The informants can be grouped into three educational groups:

1. The first group were educated: higher education.
2. The second group had some education (went to primary or secondary school) and could read and write.

[23] This statement is based on the data collected for this study. Any Slemani speaker who has lived in Hawler for some time would have picked up some features of Hawler as the influence is mutual and I do not argue that Slemani speakers are never influenced by other varieties or languages.

3. The last group, only 2 informants, could not read or write and had never gone to school. Another informant, 75 years old from Dukan, did not go to school and could not read and write. However, he spoke good Arabic and English which he had learned, as he explained, from foreign engineers and workers who had worked in Dukan dam in the second half of 20th century.

The data from one woman, 75 years old, who was from Koya and had never gone to school was excluded as she was too shy to speak and her answers were very short.

1.5.3 The Data

Before starting the recordings, the researcher gave a brief introduction about the process and clarified to the informants that the recordings would be used for the purpose of a linguistic study. As most of the informants were unfamiliar with scientific fieldwork, and they were hesitant to participate due to the socio-political situations discussed earlier, it was important to briefly clarify how the data would be used and reassure them that their conversations would not be published in the future. After getting the permission from the participants, the recordings started.

The recordings started with a number of questions, as listed below.

1. What is your name?
2. How old are you?
3. Where do you live?
4. Where are you from?
5. Have you ever lived elsewhere?
6. Have you ever gone to school/university?
7. Have you ever lived in Hawler or Slemani?
8. Do you speak any other languages?

Then the informants were asked to narrate a story that they could never forget or choose any topic to talk about. Most of the informants talked about their childhood, their parents, how they left home to join Peshmerga forces in the late 20th century, their education or how they got married.

They were then asked to describe traditional dishes in their area, clothes items that are specific to their area, funeral and wedding ceremonies and any other old traditions that are still upheld in their area. This did not only allow the informants to express themselves and speak comfortably but also resulted in using certain words and expressions which

were repeated in most of the conversations. Hence, they could be used to compare certain phonological features or processes in the different varieties. That is, although the conversations were spontaneous and the informants were allowed to speak the way they wanted, the data was controlled in the sense that they were directed to use a specific language. For example, in describing a dish, they used the almost the same ingredients with slightly different methods of cooking.

The participants were then asked if they have anything else to say. This is when I started to have a conversation with them about their lifestyles, villages and farms. I also asked them about their dialects and whether they think that there are any differences or similarities between their dialects and the other language varieties of the area that they are aware of. Some of the informants made comparisons between Hawler and Slemani. Although most of the examples they gave were lexical differences, this still gave me a chance to get some more natural data from the informants as they tried to give as many examples as they remembered.

The recordings were sometimes interrupted or paused as some of the informants were recorded with other people in the room, especially children, who were not always easy to control. So, I had to make sure that when the conversations were recorded, the background noise was kept to the minimum. Having said this, 85% of the recordings are good quality and clear enough to be used for the phonological analysis.

The length of the interviews ranged from 20-45 minutes. Some informants were more capable to give detailed answers to the questions, while others were too worried about making mistakes that they kept their stories and descriptions very short and they took a longer time to forget about the microphone and speak naturally. Consequently, although all the conversations were recorded, some part of them had to be excluded as they did not represent the varieties spoken by the informants. For example, one Hawler speaker, spoke Slemani at the beginning and pronounced words like *muḥammad* ‘proper name’ and *mâł* ‘home’ (these are used in Slemani) which were replaced by *muʕammad* and *mâr* (these are the Hawler realizations of the words), respectively later in her conversation.

Another set of data were recorded to analyse certain features such as vowel quality and VOT of stops which required the informants to read a list of single words. Seven speakers in total were selected who were aged between 30-42. They were all educated (the majority had gone to university).

The speakers were recorded in a quiet room with a microphone placed approximately 20 cm away from their mouth as they read a list of words as clearly and naturally as they could. They were instructed to read the list twice and leave pauses between the words. If they made mistakes, they were asked to repeat the words. Two speakers had to be excluded since they were recorded in a crowded place and the quality of the recordings was not good enough to be used for the required measurements.

In total, 8 hours of data were recorded for all the informants excluding the data that was not used.

1.5.4 The Instruments

The data was recorded using Zoom H6 portable recorder. A lapel microphone was used in the beginning which was later replaced by a microphone attached to the recorder as the informants felt restricted and could not move comfortably with the lapel microphone attached to their clothes. The data was then downloaded to a computer and analysed using Praat (Boersma and Weenink: 2018). As mentioned earlier, I travelled to the areas where the data was collected and most of the recordings were natural conversations. Hence, no advanced laboratory facilities were used to collect the data.

As recording and filming is a sensitive issue none of the informants were filmed during the conversations and the recorder was first shown to the informants, so they had full idea that only their voice would be recorded. The recorder was then either put on a table in front of the informant or held by the researcher in order to keep it within a consistent distance from the informant's mouth. The data was then transferred to an external hard drive and saved to be analyses later.

1.6 Overview of the Thesis

The rest of the thesis is organized as follows. Chapter two is an introduction to the phonemic system of SK. Since the phonemic inventory of SK is not established yet and Kurdish scholars disagree regarding the number and quality of consonants and vowels, the chapter presents an analysis of the lexical phonemes in SK based on data from Hawler and Slemani. The chapter presents acoustic analyses of vowel qualities as this is the most controversial topic in SK phonology. Then an introduction of the phonological theory, Element Theory (ET), adopted in this study is presented. Finally, the phonemic system of SK is analysed in terms of ET.

Chapter three discusses three types of place assimilation in SK which are palatalization, emphasis spread and nasal place assimilation. Previous studies discuss palatalization and nasal place assimilation very briefly; emphasis spread, however, has not been discussed except for a few sources which give some examples without giving any details about the targets and the triggers of the process. This is why this chapter gives a detailed discussion of the targets, triggers and outputs of the processes and provides examples to show areas of similarities and differences between Hawler and Slemani varieties.

Chapter four is about laryngeal contrasts in SK. The chapter starts with an introduction to laryngeal contrasts and then provides acoustic analyses from Hawler and Slemani speakers to show how word-initial laryngeal contrasts are manifested in SK. The chapter also discusses word-final laryngeal contrasts in SK. The chapter ends with voice assimilation processes in SK.

Chapter five deals with two types of syllable structure processes: Metathesis and deletion. The final chapter presents a number of conclusions to the thesis.

Chapter Two

The Phonology of Sorani Kurdish

The literature on the phonology of Sorani Kurdish presents varying accounts of the sound system of this dialect group and the inventory of its lexical segments remains one of the most controversial topics in the study of the Kurdish language. This is why the main aim of this chapter is to identify the lexical segments of SK. In §2.1, I discuss the consonants and vowels of Sorani and provide relevant examples of the distribution of each segment. In §2.2, I briefly discuss some suprasegmental features and phonotactic rules; namely, syllable structure, gemination and stress. Then, in §2.3, I present an element analysis of the sound system of SK. Finally, a brief summary of the chapter is given in §2.4.

2.1 The Segmental System of Sorani Kurdish

The segmental system of SK has caused considerable controversy among Kurdish scholars and most of this controversy is related to loanwords from other languages, such as certain varieties of Arabic and Neo-Aramaic, which appear to have resulted in new, perhaps marginal, consonants in SK. For instance, there is disagreement regarding the phonemic status of ʕ in SK since it occurs only in loanwords. Some Kurdish scholars consider it a lexical segment while others argue that it has limited distribution and should not be included in the segmental inventory of SK. Sorani may also have historically developed new consonants due to language contact with other Iranian languages, with which it shares a common root, such as Persian and Kurmanji Kurdish. Many scholars, among others Fattah (2010), do not consider *v* to be a lexical segment in SK as it occurs only in loanwords from KK.

Scholars disagree about the phonemic status of these non-native sounds and hence they provide different views on the segmental inventory of SK. For example, McCarus (1958, 1997) gives 31 consonants, Mackenzie (1961b) gives 29 consonants, Wais (1984) gives 27 consonants while Fattah (2010) identifies only 25 consonants because he does not consider such sounds as ʕ and ʁ to be lexical segments in Kurdish. The controversial consonants of SK are *ʔ ʕ ɣ v ŋ* and the emphatic *ṣ*.[24] Similarly, there is disagreement over the vowel inventory of SK since some linguists argue that SK has a set of diphthong vowels while others do not include diphthongs in the vowel inventory of SK.

[24] These consonants are discussed in §2.1.1 except for *ṣ*, which is discussed in chapter three.

Furthermore, the number of the monophthong vowels varies from study to study. For instance, Mackenzie (1961b) and Fattah (2010) identify 9 vowels, while Amin (1979) identifies only 8.

Nevertheless, one should not forget that some of this lack of consensus might also be a result of variation between the dialects of Kurdish, i.e. it is normal to have segments specific to one dialect that do not exist in the other related dialects. For instance, *v* is a very common consonant in Kurmanji, while it rarely occurs in Sorani. This is reflected in the literature on Kurdish phonology since each study focuses on an area or on one Kurdish speech community. Furthermore, sociolinguistic factors can be another reason for the lack of consensus as the studies are based on speakers of different ages, socioeconomic backgrounds and education levels which are reflected in their accents. For example, Fattah (2010) argues that older women from the city of Slemani replace *ɫ* by *r*, which was, at some point in the past, used by women from rich families to differentiate themselves from the poor.[25]

The rest of this chapter will present a discussion to establish the lexical consonants and vowels of SK, based on empirical evidence, and focusing on contrasting the Slemani and Hawler data; this is followed by a detailed analysis of the segmental representations of the SK sound system(s), within an ET framework.

2.1.1 Consonants

In this section, I discuss the consonants of SK and give examples to show their possible distributions. I will also discuss how besides the uncontroversial consonants of SK, i.e. the consonants that occur contrastively in native Kurdish words and produce minimal pairs, there are a few consonants that have caused controversy among linguists. This is either because they occur only in loanwords or because they have limited distribution in SK. In the rest of this section, I argue that SK has 29 lexical consonants, some of which have marginal distribution; these consonants are shown in Table 2.1, below.

[25] See §2.1.1.5 for a more detailed discussion.

Table 2.1 Consonants of SK

	Bilabial	Labio-dental	Dental	Alveolar	Post-alveolar	Palatal	Velar	Uvular	Pharyngeal	Glottal
Stop	p b		t d				k g	q		
Fricative		f (v)[26]		s z	š ž			x (ʁ)	ḥ ʕ	(h)
Affricate					č ǰ					
Nasal	m		n				(ŋ)			
Lateral				l (ɬ)						
Tap				(r)						
Trill				ř						
Glide	w					y				

2.1.1.1 Stops

SK has seven stop consonants, four of which are voiceless *p t k q* and the remaining three are voiced *b d g*. The voiceless stops *p t k q* are aspirated before vowels and word-finally (see Chapter 4). All stops in SK occur in word-initial, medial and final positions as shown in the examples below.

(1) *p*

pat ‘rope’

kapû ‘nose’

[26] ( ) indicates limited distribution.

qâp ‘plate’

(2) *b*

bard ‘stone’

bûz ‘ice’

sêbar ‘shadow’

b occurs in word-final position in loan words only and it is devoiced,[27] such as in:

kâsib ‘merchant’ (from Arabic)

qasâb ‘butcher’ (from Arabic)

ḥab ‘pill’ (from Arabic)

(3) *t*

tarza ‘hail’

hatâw ‘sun’

lat ‘piece’

(4) *d*

dast ‘hand’

dîdâr ‘interview’

qad ‘stem’

(5) *k*

kôn ‘old’

âkâm ‘result’

čâk ‘good’

(6) *g*

gôř ‘grave’

agar ‘if’

řag ‘root’

(7) *q*

qîn ‘spite’

šaqâm ‘street’

řaq ‘hard’

[27] See Chapter 4 for details of final devoicing of *b d g* in SK.

Some previous studies have argued that *q* has become lexicalised in SK through historical language contact with Arabic (Hasanpoor 1999: 70; Mahwi 2008b: 167) due to the intensive contact between the two languages. However, this sound also occurs in words of Indo-European origin, such as *qâz* 'goose' and *čaqô* 'knife'. These words have either existed in Kurdish as they exist in other IE languages, or they have entered Kurdish through contact with other neighbouring languages such as Neo-Aramaic, Turkish and Persian. Unfortunately, there are no comprehensive studies on the etymology of Kurdish words and the exact status of this sound remains unclear, so I will leave this topic for future research. However, this sound has now become part of the consonant inventory of SK and it occurs in native Kurdish words (or at least words of Indo-European origin) as shown in (7). Moreover, it forms minimal pairs with other consonants as shown in (8). Therefore, in this study *q* is considered a lexical segment in SK.

(8)

quř	'mud'	vs	*kuř*	'boy'
qôł	'arm'	vs	*čôł*	'desert'
bôq	'frog'	vs	*bôn*	'smell'
qurig	'throat'	vs	*gurig*	'wolf'
qinǰ	'upright'	vs	*linǰ*	'sticky'

The phonemic status of the glottal stop *ʔ* has caused substantial disagreement among Kurdish scholars. Since SK does not allow empty onsets,[28] a glottal stop is usually inserted before vowels in the word-initial position, as is the case in many languages, including Arabic. This has led some linguists, including McCarus (1958), Mahwi (2008b) and Rahimpour and Dovaise (2011), to consider it a phoneme in SK. So, the words in (9a) are said to start with a glottal stop as shown in (9b).

(9)

a.		b.	
âłâ		*ʔâłâ*	'flag'
êra		*ʔêra*	'here'
amřô		*ʔamřô*	'today'

Nevertheless, I do not consider *ʔ* to be a lexical consonant because of two reasons: first, it only occurs in the initial position in the word and does not occur word medially or finally.[29] Consider the examples below.

(10) *sûr + ʔâw* → *sûrâw*

[28] See §2.2.1.

[29] Mahwi (2008b: 168) states that *ʔ* occurs word-finally only in one word: *naʔ* 'no'. The glottal stop in this word is sometimes deleted which results in a compensatory lengthening of the preceding vowel: *nâ*.

red + water		lipstick
řôž + ʔâwâ	→	*řôžâwâ*
sun + set		sunset

The examples in (10) show that the glottal stop is deleted when it occurs word-medially, as a result of compounding. Secondly, the occurrence of *ʔ* is predictable and it functions as an epenthetic segment that is inserted to fill an empty onset position as SK does not allow empty onsets in the word-initial position. Hence, in SK the glottal stop is inserted before a vowel-initial word that serves as a boundary marker. So, I do not consider the glottal stop as a lexical consonant in SK, but as the result of a phonological process.

2.1.1.2 Affricates

Slemani dialect has two postalveolar affricates, viz. *č* and *ǰ* for which the blade of the tongue touches the back of the alveolar ridge. In Hawler dialect, on the other hand, affricates are alveopalatal, /tɕ/ and /dʑ/, which are articulated in a position further forward than postalveolar.[30] My Dukan informants produced postalveolar affricates similar to those produced by my Slemani informants.

(11) *čatir* 'umbrella'
kačał 'bald'
qâč 'foot'
ǰiwân 'beautiful'
panǰa 'finger'
marič 'condition'

SK treats affricates as a single segment rather than a sequence of stop+ fricative. This is because a) in SK such consonant sequences as /t/+/ʃ/ or /d/+ʒ/ do not occur in any position in the word, b) as Mahwi (2008b: 203-5) points out, in SK /tʃ/ and /dʒ/ act as one segment in the process of syllabification where they become the onset of the following syllable as shown in the examples in (12), c) both affricates occur initially, medially and finally in the word and form minimal pairs with other segments as shown in (13).

(12) *mû.ča* 'salary'
ka.čał 'bald'
han.ǰîr 'fig'

[30] *č* and *ǰ* are also realised as alveopalatal in other Sorani sub-dialects such as Pižḏar (Iraq) and Mukri (Iran) which both lie to the east of Hawler dialect. See Mackenzie (1961b).

an.ǰâm ‘result’

(13)

kič	‘girl’	vs	*kip*	‘silent’
čâ	‘tea’	vs	*kâ*	‘hay’
ǰût	‘pair’	vs	*lût*	‘nose’
ǰâr	‘time’	vs	*dâr*	‘tree’[31]

2.1.1.3 Fricatives

SK has ten fricative consonants, six of which are voiceless *f s š x ḥ h* and the rest are voiced *v z ž ʕ*. All SK fricatives occur in word-initial, medial and final positions except for *h* which does not occur word-finally, as shown in the examples below.

(14) *f*

fênik ‘cool’

âfarîn ‘well done’

kaf ‘foam’

The voiced labiodental fricative *v* does not occur frequently in SK. Except for a very few onomatopoeic words (15a), it mostly occurs in words borrowed from Kurmanji (15b) where it occurs very frequently. It can be found in word-medial and final positions mainly after back vowels, such as in:

(15) a. *givvagiv* ‘whizz’

viřavař ‘vroom’

b. *gôvâr* ‘magazine’ (from Kurmanji)

mirôv ‘human’ (from Kurmanji)

Historically, Kurmanji and Sorani Kurdish deviated from the other Iranian languages in that the labial stop *b* and the nasal stop *m* in word-medial and final positions were lenited to *v* in Kurmanji and *w* in Sorani. Other Iranian languages such as Persian and other Kurdish dialects such as Hawrami have preserved the labial nasal and stop labial in these words. That is, the *v* in KK most often cognates with *w* in SK.[32] Consider the examples below.

[31] The affricates in Slemani *č ǰ* (and to a less degree in Hawler) and the fricatives *š ž* in both Slemani and Hawler are produced with visible lip protrusion. See Appendix A.

[32] Also see Mackenzie (1961b: 220) and McCarus (1997: 693).

(16) a.

Kurmanji	Sorani	Persian	
sêv	*sêw*	*sîb*	‘apple’
šav	*šaw*	*šab*	‘night’

b.

Kurmanji	Sorani	Hawrami	
hâvîn	*hâwîn*	*hâmîn*	‘summer’
havîr	*hawîr*	*hamîr*	‘dough’
čâv	*čâw*	*čam*	‘eye’
nâv	*nâw*	*nâm*	‘name’

In SK, *v* can also occur as a result of assimilation processes in a few words, as in (17) where the voiceless fricative *f* assimilates in voicing when followed by another voiced sound.

(17) *ḥaft* ‘seven’
ḥavda ‘seventeen’

Consequently, linguists disagree over the status of this sound in SK. Fattah (2010) does not consider it to be a lexical segment while McCarus (1958), Mackenzie (1961b) and Mahwi (2008b) consider it to be a lexical segment of limited distribution as the sound is naturally realized by children and illiterate speakers in words such as those in (15), above, and this is the view adopted in this study.

(18) *s*
sêw ‘apple’
y*âsâ* ‘law’
kas ‘person’

(19) *z*
zard ‘yellow’
ârazû ‘wish’
hêz ‘force’

(20) *š*
šâr ‘city’
kêša ‘problem’
řaš ‘black’

(21) *ž*
žân ‘pain’

âžał ‘animal’

řôž ‘sun; day’

(22) *x*

xôm ‘myself’

naxôš ‘ill’

nâx ‘interior’

(23) *ʁ*

ʁârdân ‘running’

kâʁaz ‘paper’

dâʁ ‘hot’

Some Kurdish scholars consider *ʁ* to be a lexical segment, such as McCarus (1958) and Mackenzie (1961b), while others do not, such as Fattah (2010), because it mainly occurs in loanwords and it is typically neutralized with *x*.

(24) *bôyâx* ~ *bôyâʁ* ‘shoe polish’

bâxawân ~ *bâʁawân* ‘gardener’

xam ~ *ʁam* ‘sadness’

These examples show that historically *ʁ* was a lexical segment in SK that occurred in native words and it was then neutralized with *x*. However, it seems that this sound has entered the language again through contact with other languages (mainly Arabic) and this is why it occurs only in loanwords. Moreover, it is acquired by small children. So, I argue that *ʁ* is a lexical segment that has limited distribution in SK.[33]

Similarly, there has been debate over the status of *ʕ* because although it has a wide distribution occurring in all word positions, it occurs only in loanwords,[34] as shown in the examples below.

(25) *ʕ*

ʕalam ‘flag’

saʕât ‘hour’

nawiʕ ‘type’

[33] See 4.4 where I discuss neutralization of final obstruents.

[34] Although it is argued in the literature that this sound occurs in Arabic loanwords, such words as those given in (26) are more likely to have been borrowed from Neo-Aramaic. See Hoberman (1985) Khan (2004, 2016) for details about *ʕ* and it is variation with the glottal stop *ʔ* in Neo-Aramaic.

This has led some scholars, among others Fattah (2010), to not consider ʕ as a phoneme while McCarus (1958) and Mackenzie (1961b) regard it as a phoneme in SK. ʕ can be lenited to the glottal stop word-initially in some words, such as:

(26) *ʕâsmân* ~ *âsmân* 'the sky'
ʕariz ~ *ariz* 'the earth'

Another fricative consonant that has caused disagreement is *ḥ*. This consonant also occurs mostly in loanwords.

(27) *ḥ*
ḥaft 'seven'
baḥir 'sea'
řôḥ 'soul'

Mackenzie (1961b: 29) states that the consonants *ḥ* and ʕ 'are almost regularly interchanged by unlettered speakers' in the dialect of Hawler. I have noticed the alternation between *ḥ* and ʕ in the speech of my Hawler informants regardless of their education and/or social status levels. However, it occurs irregularly. For instance, one educated female speaker from Hawler pronounced the word *ḥikûmat* 'government' as both *ḥikûmat* and *ʕikûmat*, while my Slemani informants never interchanged the two sounds regardless of their education and/or social status. My Dukan informants were similar to my Slemani informants in this respect.

(28)	Slemani	Hawler	
	ḥaz	*ḥaz ~ ʕaz*	'desire'
	saʕât	*saʕât ~ saḥât*	'hour'
	sâḥêb	*sâḥêb ~ sâʕêb*	'owner'

Finally, the glottal fricative *h* does not occur in word-final position.

(29) *h*
hâwîn 'summer'
hêlka 'egg'
bahâr 'spring'
nihênî 'secret'

2.1.1.4 Nasals

SK has a bilabial nasal *m* and a dental nasal *n* which occur in all word positions as illustrated in (30) and (31).

(30) *m*

mîwa	'fruit'
hamû	'all'
môm	'candle'

(31) *n*

nôk	'chickpea'
hanâsa	'breath'
nân	'bread'

In addition, SK has a velar nasal *ŋ* which is usually a result of a phonological process. In the context of a back or central vowel, *g* and *d* are deleted in the clusters *n+g* and *n+d*, and the nasal alveolar *n* is realized as the nasal velar *ŋ*.[35] This sound occurs in word-medial and final positions but never in the word-initial position, as shown in (32).

(32) *ŋ*

yâŋza	'eleven'
řaŋ	'colour'

Some studies, such as Fattah (2010), consider this sound to be an allophone of *n* while others, including McCarus (1958) and Mackenzie (1961b), consider *ŋ* to be a lexical segment in SK. I argue that although this sound has limited distribution and only occurs in the dialect of Slemani as none of my Hawler dialect informants produced it, it can still result in differences in word meanings. Compare the following minimal pairs:

(33)

			Slemani	Hawler	
bân	'roof'	vs	*ḅâŋ*	*bang*	'call'
řag	'root'	vs	*řaŋ*	*řang*	'colour'
han	'they exist'	vs	*haŋ*	*hang*	'honey bee'
hanâw	'interior'	vs	*haŋâw*	*hangâw*	'step'

[35] See Chapter 3 and 5 for more details on *ŋ*.

So, it can be considered a lexical segment of limited distribution in Slemani but not in Hawler dialect.

2.1.1.5 Laterals

SK has two lateral consonants: an alveolar *l* which occurs in all word positions and a velarized alveolar *ɬ* which can be found only in medial and final positions in the word and it occurs only in Slemani as shown in the examples below.

(34) *l*

lôka 'cotton'

balam 'boat'

mal 'bird'

(35) *ɬ* (Slemani only)

paɬa 'stain'

hawâɬ 'news'

l and *ɬ* in Kurdish are two different phonemes and they can be found in minimal pairs such as:

(36)	*čil*	'forty'	vs	*čiɬ*	'branch'
	xêl	'crossed-eyed'	vs	*xêɬ*	'tribe'

The dialect of Hawler does not have the velarized alveolar lateral *ɬ* as it is regularly replaced by *r*. Consider the examples in (37).

(37)	Slemani	Hawler	
	haɬmât	*harmât*	'marble'
	ḍiɬ	*dir*	'heart'
	kôɬân	*kôrân*	'lane'

Mackenzie (1961b: 28) describes the occurrence of *ɬ* in Hawler as "a recent borrowing" from the Slemani variety due to radio broadcast which was mainly in the dialect of Slemani at that time. Most of my Hawler informants almost always had *r* and not *ɬ*. For example, one female speaker pronounced *ɬ* in only one word which is *waɬlâhî* 'by God'. Others, especially the educated ones who had been exposed to the dialect of Slemani, used both *ɬ* and *r*. My Dukan informants, which I argue to be a contact area between Hawler and Slemani which shares characteristics of both varieties,[36] produced *ɬ* as well.

[36] See Figure 1.5.

A similar phenomenon is said to have been observed in the speech of older women from the city of Slemani where they would replace *ɬ* with *r* (Mackenzie 1961b; Mahwi 2008b; Fattah 2010). Fattah (2010: 102) maintains that this phenomenon was at some point in the past an indicator of the social status of the speaker as it was exclusively used by the rich families, especially the women.

No studies explain how this phenomenon entered the speech of women from Slemani. It is perfectly reasonable to suppose that it has been borrowed from Hawler as a result of interaction between the two dialects. Fattah (2010), nevertheless, argues that the women who replaced *ɬ* with *r* had never been in contact with speakers of other dialects, so he eliminates the possibility that the occurrence of this phenomenon in Slemani is due to the influence of other dialects. I do not support Fattah's viewpoint because Fattah's analysis is based on synchronic data and does not take into consideration the diachronic aspect of the phenomenon. That is, Fattah's informants might have not been in contact with speakers of Hawler, but their ancestors might have been, and the phenomenon might have been borrowed a long time ago.

It is worth mentioning that Fattah's study was originally conducted in 1985. Earlier, Mackenzie (1961b) briefly mentions that some female speakers of Slemani replace *ɬ* by *r*. Nonetheless, this was not noticed in the speech of any of my Slemani informants, including women above the age of 60. So, I believe that this phenomenon might have been present in the speech of the older women in the past and it seems to have died out.

2.1.1.6 Rhotics

SK has two rhotic consonants, one of which is a tap *r* and the other is a trill *ř*.[37] The tap never occurs in the initial position in the word while the trill occurs in all word positions.

(38) *r*

kara	'butter'
mâr	'snake'

(39) *ř*

řêz	'respect'
âřâsta	'direction'
pař	'feather'

[37] The tap and the trill also differ in phonological behaviour in SK. In Chapter 3, I discuss how the trill *ř* triggers backing while the tap *r* does not.

The following minimal pairs show the contrast these two lexical segments make in word meaning:

(40)	*kar*	'donkey'	vs	*kař*	'deaf'
	brîn	'wound'	vs	*břîn*	'to cut'
	môr-a	'it is purple'	vs	*môřa*	'frowning'
	bara	'front'	vs	*bařa*	'rug'

2.1.1.7 Glides

SK has two glides which occur in all word positions, as shown below.

(41)	*w*	
	wêna	'picture'
	hawîr	'dough'
	čâw	'eye'
(42)	*y*	
	yak	'one'
	bayânî	'morning'
	kay	'when?'

2.1.2 Vowels

Studies on the vowel system of SK mainly differ in two respects. Firstly, they disagree about the number of the simple vowels. For instance, Mackenzie (1961b) and Fattah (2010) identify nine vowels, while Amin (1979) identifies eight and Mahwi (2008b) identifies only six simple vowels. Secondly, there has been considerable debate over whether SK has diphthong vowels or not. In the rest of this section, I will briefly discuss the vowel sounds in an attempt to establish the vowel inventory of SK. In the end of the section, I present the results of an instrumental analysis of the vowels in SK in order to provide an idea of their qualities. Table 2.2 presents a summary of the vowels identified in previous studies; it also includes the vowels identified in this study, for comparison.

Table 2.2 The realization of the Kurdish vowels in previous studies compared to this study

McCarus (1958)	Mackenzie (1961b)	Wais (1984)	Amin (1979)	Fattah (2010)	Mahwi (2008)	This Study
i	ī	i	ī	I	i	î
ɨ	i	ɪ	i	i	ɨ	i
ị						
e	ē	ē	ē	é	e	ê
ə	a	a	a	a	ə	a
a	ā	ā	ā	á	a	â
ʉ	u	u	u	u	u	u
u	ū	ū	ū	ú		û
we	ø			ö	œ	
o	o	o	o	ó	o	ô

2.1.2.1 Simple Vowels

Vowel length is one of the most controversial topics in the phonology of Sorani Kurdish. Some Kurdish scholars, among others Ahmad (1986) and McCarus (1997), argue that vowel length is a phonologically relevant feature; while others, including McCarus (1958), Amin (1979) and Mahwi (2008b), do not consider vowel length to be phonemically contrastive. According to Mackenzie (1961b), length could be the contrastive feature between *â* and *a* as both, he argues, have similar qualities, 'open, front-central'.

Mahwi (2008b: 184) argues that vowel length is predictable from both syllable structure and stress placement. That is, long vowels occur in open stressed syllables and in closed stressed syllables when followed by a voiced consonant and short vowels occur elsewhere. This is why vowel length is not phonologically contrastive in SK. Haig and Öpengin (2015) present a similar analysis of vowel length in Kurmanji. They argue that Kurmanji has five long vowels /i e a u o/ and three short vowels /æ ʊ ɨ/; however, length is not phonemically distinctive.

I adopt Mahwi's (2008b) view in this study and argue that vowel length is phonologically not contrastive and that it is a phonetic mechanism that is used to enhance the distinction between the vowels that have different qualities. Similar to Modern Persian,[38] SK seems to have lost its historical distinction between short and long vowels and length has become phonologically non-contrastive, while a qualitative difference has emerged and become phonologically contrastive. Hence, vowels differ both in quality and quantity, while only the quality is phonologically contrastive.

One of the vowels that has caused substantial controversy is the long vowel *û* which is considered a lexical segment in some studies, for example, McCarus (1958, 1997) and Mackenzie (1961b). Mahwi (2008b), on the other hand, describes long *û* as an allophone of short *u*. However, I consider it to be a lexical segment as it is produced by children as an independent vowel and it occurs in a number of minimal pairs and near minimal pairs with the short *u*.

(43)	*kûř*	'hunchback'	vs	*kuř*	'boy'
	dûrbîn	'visionary'	vs	*durbîn*	'binoculars'
	qûł	'deep'	vs	*quř*	'mud'

Besides the 7 lexical vowels discussed so far, which are *î ê a â o u û*, SK also has another simple vowel *i* [ɨ] which occurs in monosyllabic words as shown in (44a) which is tied to the nucleus position and functions as the only vowel in the word. This is why many scholars, including McCarus (1958), Mackenzie (1961b) and Fattah (2010), consider it to be a lexical segment in SK. Especially because it forms numerous minimal pairs with the lexical vowels as in (44b).

(44)	a.	*kič*	'girl'
		dił	'heart'
		gird	'hill'
		wišk	'dry'

	b.	*dił*	'heart'	vs	*dâł*	'eagle'
		žin	'woman'	vs	*žîn*	'life'
		mist	'fist'	vs	*mast*	'drunk'

[38] Toosarvandani (2004).

Nonetheless, *i* [ɨ] is also used to break illicit consonant clusters in words that have more than one syllable as shown in (45) below.

(45)	Underlying structure	Surface structure	
a.	*âgr*	*âgir*	'fire'
	břyâr	*biřyâr*	'decision'
	ganm	*ganim*	'wheat'
	fênk	*fênik*	'cool'

In the above examples, the underlying structures have consonant clusters that are disallowed in SK, so the vowel *i* is inserted in the surface structure in order to break the consonant clusters. Therefore, Hamid (2016) argues that *i* is epenthetic in SK. An epenthetic vowel is realized to repair any consonant clusters that do not conform to the phonotactic constraints of a given language. Veloso (2010) states that cross-linguistically epenthetic vowels are often, although not always, central vowels, while de Lacy (2006) argues that 'almost any non-round non-back vowel [ɨ ə i e ɛ a] can be epenthetic.' This is the central area of vowel space that is considered neutral as it is far from the main vocalic areas represented by the elements |I A U|. This area covers a number of vowel qualities; therefore, the realisation of epenthetic vowels varies from language to language. For example, Lebanese has [i] (Hall: 2011) and Balochi has [a] (Elfenbein: 1997).

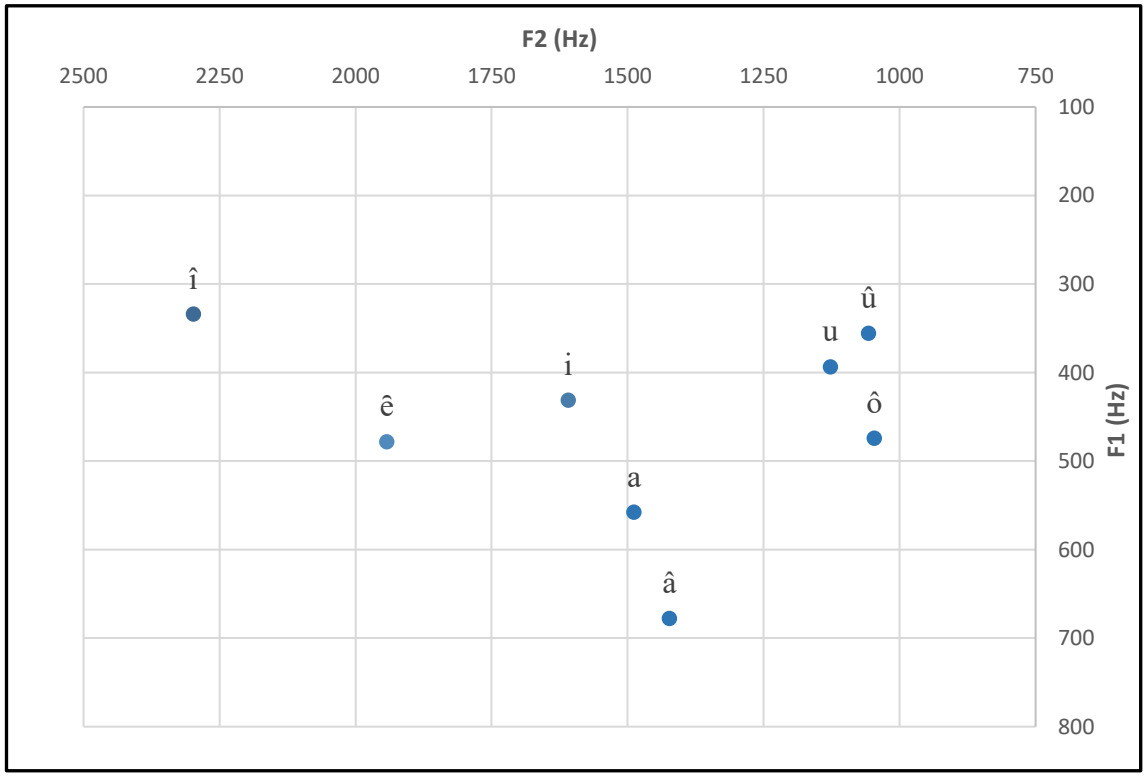
GP, unlike the traditional accounts of epenthesis which involve the insertion of a vowel segment in to the surface structure, views the vowels in (44) as the phonetic realization of an underlying empty nucleus position. That is, the nucleus position already exists in the underlying structure but it does not contain any elements. So, I argue that the vowel *i* [ɨ] is an empty vowel in SK and that it does not contain any elements. This view is also supported by the behaviour of this vowel in phonological processes. For example, as I discuss in Chapter 4, *i* does not cause palatalization of preceding velar stops as the front vowels do, and *i* does not block the spread of emphasis from an emphatic consonant to a preceding consonant. Empty vowels are discussed further in §2.3.1.2.

The vowel *i* has a rounded allophone [ʉ] after the labial glide *w*, as shown below.

(46)	*wird*	[wʉrd]	'little'
	wiša	[wʉʃæ]	'word'
	win	[wʉn]	'lost'

The vowels of SK contrast articulatorily in height, tongue position and lip rounding. *î* and *û* are high, *ê* and *ô* are mid, *a* and *â* are low and *i* and *u* are near-high vowels. In terms of tongue position, *î* and *ê* are front, *i*, *a* and *â* are central and *u*, *û* and *ô* are back. Of these, *u*, *û* and *ô* are rounded and the rest are unrounded. Figure 2.1 shows the F1-F2 plot of the vocalic system of SK. This vowel chart is based on an acoustic analysis of 100 tokens for each vowel produced by 5 native (3 male and 2 female) speakers of SK. Two of the speakers (one male and one female) were from Hawler and the remaining three were from Slemani. The results did not show any significant dialectal variation. This is why I present the results in one chart. The vowel formants were measured using Praat (Boersma and Weenink: 2018). Formant values of the vowels are given in Appendix A.

Figure 2.1 F1-F2 plot of SK monophthong system (n=100)



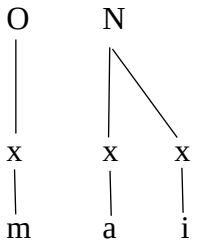
2.1.2.2 Diphthongs

Kurdish scholars disagree about the status of diphthongs in SK. Mackenzie (1961b) identifies 19 diphthongs and Mahwi (2008b) identifies 6 diphthongs, while others, including McCarus (1958) and Amin (1979), argue that SK does not have any diphthong vowels. Consider the examples below.

(47) *mai* 'wine'
lâu 'young'
tôu 'seed'
šau 'night'

Constituent structure solves this problem. As discussed earlier, GP identifies three constituents: onset, nucleus and rhyme, and diphthong vowels are linked to long nuclei (branching nuclei). So the word *mai* will have the representation shown in Figure 2.2.

Figure 2.2 The representation of the word mai

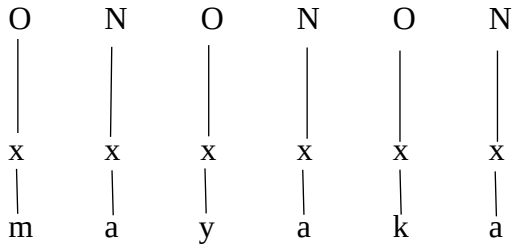


However, when a vowel-initial suffix is added to the word, the second vowel links to the onset position of the affixed morpheme since SK does not allow empty onsets. Consequently, the so-called diphthongs are generally a combination of vowel + glide and hence SK does not have diphthong vowels.[39] The representation of the word *mayaka* is given in Figure 2.3.

(48)	*mai +aka*	*mayaka*	'the wine'
	lâu+êk	*lâwêk*	'a young person'
	tôu+aka	*tôwaka*	'the seed'
	šau+êk	*šawêk*	'one night'

[39] See Windfuhr (1997) for a similar analysis of Persian diphthongs.

Figure 2.3 The representation of the word mayaka



Moreover, the vowel often given as mid-high front rounded *ø* is argued by some scholars to be a diphthong /*øe*/ in SK.[40] It only occurs in middle and final positions in the word (Mackenzie 1961b; Mahwi 2008b; Fattah 2010), as in:

(49) *kø* 'where'
xøn 'blood'
dønê 'yesterday

This vowel has caused considerable controversy among linguists for three reasons: first, it occurs only in the Slemani dialect. Mackenzie (1961b) points out that *ø* is replaced by other vowels in Hawler dialect, such as in:

(50)	Slemani	Hawler	
	xøndin	*xundin*	'study'
	gøz	*gûz*	'walnut'
	sør	*sûr*	'salty'
	xøn	*xûn*	'blood'
	dønê	*dunê*	

Secondly, it has limited distribution, i.e. it occurs in a limited number of words in medial and final positions only. This leads some scholars, for instance Wais (1984), to describe this vowel as a combination of *w+ê* and hence argue that it cannot be considered a diphthong phoneme.

Finally, this vowel, according to Mackenzie (1961b) and Mahwi (2008b), triggers the palatalization of velars in such words as *kø* 'where?' and *gø* 'ear'. McCarus (1958) presents a different analysis and argues that the palatalization is caused by the semivowel

[40] Some scholars, Ahmed (1986) and Fattah (2010) among others, use the symbol /ö/ for this vowel which I argue is misleading as this vowel does not sound like the *ö* in other languages such as German and Turkish.

w when it is followed by a high front vowel, *kwê* [k^{hj}we] and *gwê* [g^{j}we], and therefore he does not consider *ø* to be a separate vowel.

I adopt the view that *ø* is actually a combination of the glide *w* followed by ê not a diphthong because of two reasons: a) it has limited distribution in the dialect of Slemani and if it was a diphthong as argued by Mahwi (2008b) and Fattah (2010), it should have occurred in word initial position as well. However, since SK does not allow empty onsets at the beginning of a word, the *w* fills in the position of the onset in words such as *wêna*, b) as I discuss in Chapter 4, *wê* is often metathesized to *yô* in such words as *giwê* →*gyô* 'ear'. Furthermore, it can be preceded by a limited number of consonants only which is another evidence that it is not a diphthong.

To sum up, SK has 8 simple vowels, 7 of which are lexical and *i* is epenthetic, and it has no diphthongs. These vowels differ in both quality and quantity. However, only the quality is phonologically contrastive. In the following section I discuss some suprasegmental features of SK.

2.2 Suprasegmental Features and Phonotactic Rules

2.2.1 Syllable Structure

The basic syllable structure of SK is CV(C)(C).

(51) CV *la* 'in'
CVC *guł* 'flower'
CVCC *pird* 'bridge'

As noted previously, it is generally assumed in the literature that SK uses the glottal stop *ʔ* as a repair strategy to fill in any empty onset position in the beginning of words. Accordingly, what we might call a minimum syllable has to consist of a consonant followed by a vowel as illustrated in (52).

(52) *ʔa.wa*
CV.CV
ʔa.řôm
CV.CVC

All other consonants can occur in the onset position in the syllable. However, r, ɬ and ŋ cannot form the onset in the first syllable in a word; they can occur in medial and final syllables, such as:

(53) *bâ.rân* ‘rain’
kô.łân ‘lane’
mâ.ŋâ ‘cow’ (Slemani only, Hawler: *mân.gâ*)

There is general agreement among scholars that SK does not allow empty nucleus in word-initial position and that therefore an empty vowel is realized to break any consonant cluster as discussed in §2.1.2.1. All consonants occur in the final position of the syllable VC. Similarly, a cluster of two consonants can follow a vowel in the syllable, such as:

(54) *bard* ‘stone’
čand ‘some’
âst ‘level’

Sometimes the cluster is not produced and the vowel *i* separates the two consonants, for example both *barx* and *barix* ‘lamb’ are used.

2.2.2 Gemination

In SK, only laterals and nasals can form ‘true geminates’ that occur morpheme-internally as shown in (55) below.

(55) *gulla* ‘bullet’
šamma ‘Saturday’
kunna ‘water sack’

The fricative *v* is geminated in one onomatopoeic word which is:

(56) *givvagiv* ‘whizz’

Morpheme-internal geminates are not very common in native Kurdish words and they usually occur intervocalically in adjacency to short vowels. Another type of geminates, ‘apparent geminate’, occurs as a result of assimilation processes mainly in Slemani (57a) or as a result of juxtaposition of morphemes (57b).[41]

(57)	a.	Hawler	Slemani	
		ḥavda	*ḥavva*	‘seventy’
		bâłdâr	*bâłłâr*	‘bird’

[41] See Harris: 1994.

gařândinawa *gařânnawa* ‘to return’

b. *čâk kird* ‘amended’
good+did
atân nâsim ‘I know you’
I+you +know

Geminates can also be found in loanwords which can be preserved as such but are often simplified (McCarus: 1997: 695):

(58) *mirabbâ* → *mirabâ* ‘jam’ (from Arabic)
taŝakkur → *taŝakur* ‘thanks’ (from Turkish)
dukkân → *dukân* ‘shop’ (from Arabic)
fallâḥ → *falâḥ* ‘farmer’ (from Arabic)

2.2.3 Stress

Kurdish has a relatively simple stress assignment system: the final syllable in the word usually takes the primary stress while preceding syllables take secondary stress (McCarus 1958, 1997; Amin 1979; Ahmed 1986; Rahimpour and Dovaise 2011). In Kurdish, the prominence of a syllable is not measured by length; it is, rather, identified by loudness and pitch, i.e. the stressed syllable has greater loudness and greater pitch movement but not necessarily greater length (Rahimpour and Dovaise: 2011). In the word *dû'kał* ‘smoke’ the second vowel is shorter than the first and yet it receives the stress. In what follows I briefly discuss the patterns of lexical stress in SK.[42]

2.2.3.1 Simple Words

In SK, stress falls on the rightmost syllable in simple words. As in:

(59) *tâ'rîk* ‘dark’
panǰa'ra ‘window’
xâ'nû ‘house’
tan'hâ ‘only’

Particles are the only exceptions to this generalization (Amin 1979; Ahmed 1986).

(60) *'čunka* ‘because’
'bôya ‘thus’

[42] For a detailed account of stress in SK see Ahmed (1986) and Hamid (2016).

'bałâm ‘but’

2.2.3.2 Complex and Compound Words

In complex words, the position of the stress depends on whether the affix added is stress bearing or non-stress bearing. Stress-bearing affixes include derivational suffixes (61a), and most inflectional suffixes including the plural morpheme *-ân* ‘es’ and its allomorphs (61b), the comparative morpheme *-tir* (61c), the superlative morpheme *-tirîn* (61d) and the definite morpheme *-aka* ‘the’ (61e). In the derived words, the stress falls on the suffix, i.e. it remains on the rightmost syllable.

(61)	a.	*bâx*	‘garden’	*bâxa'wân*	‘gardener’
		â'zâd	‘free’	*âzâ'dî*	‘freedom’
	b.	*min'dâł*	‘child’	*mindâ'ł̂ân*	‘children’
		dê	‘village’	*dê'hât*	‘villages’
		kič	‘girl’	*kič'gal*	‘girls’
	c.	*bâŝ*	‘good’	*bâŝ'tir*	‘better’
	d.	*gaw'ra*	‘big’	*gawra'trîn*	‘biggest’
	e.	*mâmôstâ*	‘teacher’	*mâmôstâ'ka*	‘the teacher’

Other morphemes that take stress are the imperative *bi-* as in *'bihêna* ‘bring’, the negative *ma-/ na-/nâ-* ‘do not’ as in *'mahêna* ‘do no bring’ and *-am* which is used to make ordinal numbers as in *ya'kam* ‘the first’. By contrast, derivational prefixes do not have any influence on the position of stress, that is, the stress remains on the final syllable of the root of the word (62a). The definite morpheme *-êk* is also non-stress bearing (62b).

(62)	a.	*hâ'tin*	‘to come’	*hałhâ'tin*	‘to escape’
	b.	*pê'nûs*	‘pen’	*pê'nusêk*	‘a pen’

If two or more suffixes are added to a word, the rightmost one is stressed.

(63)	*pâsa'wân*		‘guard’
	pâsawân+aka	*pâsawâna'ka*	‘the guard’
	pâsawân+aka+ân	*pâsawâna'kân*	‘the guards’

Similarly, stress falls on the last syllable of compound words as shown below.

(64)	*řôž+hałât*	*řôžha'ł̂at*

sun	rise	east
gałâ+mêw		*gałâ'mêw*
leaf	vine	vine leaf

2.3 An Element Analysis of Sorani Segmental Representations

In this section I discuss the segmental system of SK from an Element Theory perspective. In §2.3.1, I discuss the representation of vowels. In §2.3.1.1, I discuss the representation of the lexical monophthongs and argue that short and long vowels differ in quantity. §2.3.1.2 is about the representation of the empty vowel. In §2.3.2 I look into the representation of consonants. Both resonance and manner properties of the consonants are discussed.

2.3.1 Vowels

As discussed in §2.1.2, SK has seven lexical vowels and one empty vowel and it has no diphthong vowels. ET has three elements |I|, |U| and |A| that are associated with the representation of vowels.[43] Some vowels are simplex expressions that contain only one element and others are compound expressions containing more than one element.

2.3.1.1 Lexical Vowels

SK has seven monophthong vowels *î ê a â u û ô* and I argue that they are represented in ET as follows.

(65)

î	|I|
ê	|IA|
a	|IA|
â	|A|
u	|U|
û	|U|
ô	|UA|

The melodic representation of each segment reflects how it behaves in phonological processes. For example, *a, â* and *ô* have an |A| element because they are involved in the processes of emphasis spread while *î* and *ê* have an |I| element because they trigger the

[43] As I will discuss later, the so-called vowel elements and consonant elements are actually used in the representation of both consonants and vowels. So, labelling these as vowel elements is oversimplification. However, I follow the majority of ET scholars who use these categories to identify certain qualities in the segments.

process of palatalization, as discussed in chapter 3. The vowels *î â u û* are simplex expressions which map onto simple acoustic patterns, *dIp*, *mAss* and *rUmp* respectively, while the remaining vowels *ê a ô* are compound expressions. *ê* and *a* are compounds of the elements |I| and |A|, i.e. they map onto a compound of the acoustic patterns *dIp* and *mAss*. Finally, *ô* is a compound of |U| and |A| and it is represented by the acoustic patterns *rUmp* and *mAss*.

Since ET identifies three resonance elements only, it makes use of head-dependency relationships to represent a larger number of segments.[44] As shown in (65), in the representation of *ê* the |I| element is headed in this combination which indicates that the *dIp* pattern is more dominant than the *mAss* pattern, while the |A| element is headed in the representation of *a* indicating that the *mAss* pattern is more dominant. In the vowel *ô*, the dominant acoustic pattern is *rUmp* which results in the headed |U|.

I argue that in SK vowel length is not phonologically relevant and hence does not exist in the representation of the vowels. Vowel quality, however, is represented by using headed elements. This is why, the vowel *u* [ʊ] is represented as a non-headed |U| and the vowel *û* [u] has a headed |U| in SK.

2.3.1.2 The EmptyVowel

In the representation of the lexical vowels, the vocalic elements are linked to nuclear positions.[45] However, GP also employs empty nuclei which have no elemental material lexically associated with them. Empty nuclei help explain certain phonological processes such as vowel-zero alternations.[46]

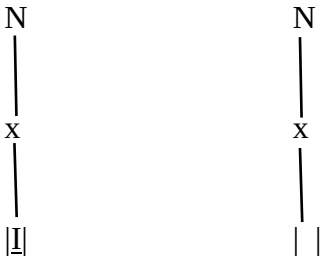
The question is therefore how empty vowels are realised if they do not have any elements? Harris and Lindsey (1995) state that empty vowels have formant structures like the other vowels. Nevertheless, unlike the other vowels, the formants in the empty vowels do not converge. Hence, the formant structure of this vowel can be regarded as 'a base-line on which the elemental patterns associated with [A], [I] and [U] are superimposed' (Harris

[44] See §1.2.4.
[45] See §1.2.5 for syllable structure in GP.
[46] This is organized by means of the Empty Category Principle (Kaye: 1990:314) which asserts that: i. A licensed empty nucleus has no phonetic realisation, ii. An empty nucleus is licensed if (a) it is properly governed or (b) if it is domain final in languages which license domain-final empty nuclei.

and Lindsey: 1995: 57). Whenever, the other elements are absent in an expression, this baseline resonance is realised. [47]

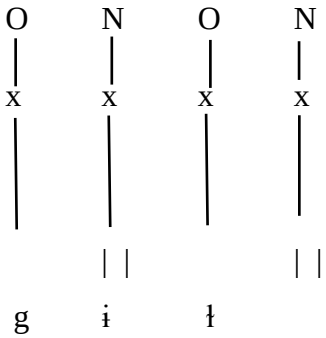
So the representation of the empty vowel *i* in SK is as shown in (66).

(66) a. [i] b. [ɨ]



In GP the coda is not recognized as a formal constituent and it is considered to be either a part of the rhyme or, in the case of final coda, to be an onset which is in turn followed by an empty nucleus. This final nucleus is said to be empty. The word *gił* has, then, two empty nuclei; the first one is phonetically interpreted as [ɨ] and the second one is not phonetically interpreted as shown in (67).[48]

(67) *gił* 'dirt'



2.4.2 Consonants

As ET has a limited number of elements, it allows vowel elements to appear in the representation of consonants and vice versa in order to be able to represent any given sound in any given language. Resonance elements are mainly found in vowels. Nevertheless, they also play a fundamental role in the representation of consonants as they map onto the place of articulation as shown in Table 2.3 below. This is supported by

[47] As noted earlier, Harris (1994) and Harris and Lindsey (1995) identify a neutral element |@| which is associated with the representation of central vowels. Accordingly, in their version of ET, this is the only element that is present in the representation of empty vowels.

[48] SK is a language that allows word-final consonants; this is why the empty nucleus is not phonetically realized. Other languages such as Italian, on the other hand, do not allow word-final consonants and the empty nucleus is always phonetically realized.

the interaction between consonants and vowels in phonological processes when vowel elements spread to neighbouring consonants as discussed in the following chapters.

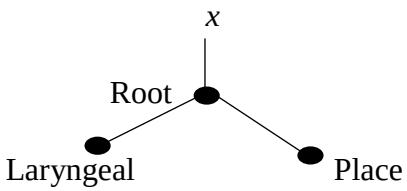
Table 2.3 Phonological characteristics of headed/non-headed elements in consonants according to Backley (2017:3).

		phonological category	
element	**acoustic property**	**non-headed**	**headed**
|I|	high F2 converging with F3	(some) coronals	Palatals
|U|	low frequency energy in F1–F3	velars	Labials
|A|	high F1 converging with F2	(some) coronals	uvulars, pharyngeal
|ʔ|	abrupt drop in amplitude	stops	ejectives, implosives
|H|	aperiodic noise	obstruents	fortis/aspirated obstruents
|L|	periodic murmur	nasals	voiced obstruents

The resonance elements represent the place of articulation in consonants. |I| is present in the representation of palatals, |U| in labials and |A| in pharyngeals and uvulars. The representation of coronals and velars have caused debate among linguists. There have been arguments that these two classes are not specified for place, i.e. they do not have place elements, while others suggest different elements to represent place in these consonants. The following is a discussion of the place elements in consonants supported by the data from SK.

Before I discuss the representation of the consonant segments of SK, I present the melodic geometry proposed by Harris (1994) in Figure 2.2 which shows that melodic expression has three nodes: Root to which manner elements are linked, Laryngeal to which laryngeal elements are linked and Place to which resonance elements are linked.

Figure 2.2 The melodic Geometry by Harris (1994: 129)



2.3.2.1 Palatals

SK has five palatal consonants: the glide *y*, the affricates *č ǰ* and the fricatives *š ž*. As I will discuss presently, the affricates and the fricatives, although they are post-alveolar phonetically, pattern with the palatals in phonological processes. The palatal glide *y* patterns with the front vowels *î* and *ê* in the phonological process of palatalisation which includes spreading an |I| element to a preceding velar. Like the front vowels, the palatal glide contains a headed |I|. However, *y* differs from the front vowels in that it occurs in an onset position rather than a nuclear position. The element |I| is characterised by a relatively low F1 and a relatively high F2 which converges with F3. This is the characteristic of both the vowel *i* and the palatal glide *y*.

The palatalization of the velars in Hawler dialect results in the affricates *č* and *ǰ*. Moreover both the affricates and the fricatives *š ž* are never velarized before back vowels which indicates that they pattern with the palatal sounds in SK. Figure 2.5 shows the representation of the other palatals.

Figure 2.3 The representation of the palatal glide y and the vowel î in SK

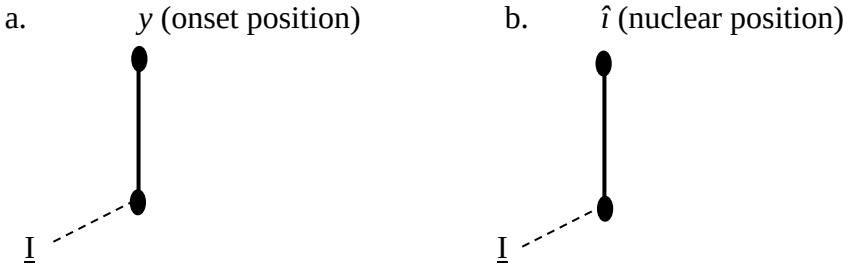
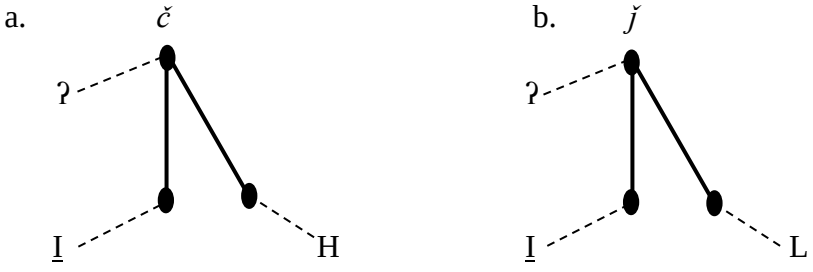
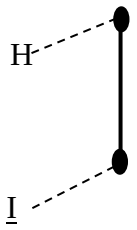


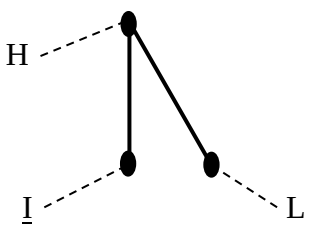
Figure 2.4 The representation of the palatals in SK



c. *š*



d. *ž*



2.3.2.2 Coronals

Coronal is a cover term that includes the dentals *t d n*, the alveolars *s z l ł r ř* and the post-alveolars *š ž č ǰ*. In the early versions of ET, coronals were represented by the element |R| (Kaye et al. 1985; Harris and Kaye 1990; Harris 1994; Harris and Lindsey 1995). In the so called Revised Element Theory (RET),[49] the 10 elements of Kaye et al. (1990) were reduced in an attempt to avoid overgeneration which led to the elimination of the coronality element |R|. Consequently, there has been much disagreement regarding the representation of coronals. Backley (1993) argues that coronals lack resonance elements and that they are not specified for place.[50] Some researchers, among others Broadbent (1991), Cyran (1996, 1997, 2010) and Williams (1998), have proposed that the element |A| represents coronality; while others, including Rubin (2004) and Nasukawa and Backley (2008), argue that coronality is represented by the element |I|.

In this study, I adopt Backley's (2011) view of coronality. He divides coronals into two groups, one represented by the element |A| and the other by the element |I|. Accordingly, languages and dialects can be distinguished on the basis of having |I| or |A| coronals. Backley (2011) argues that one element is not enough to represent 'coronals' because the term describes a number of consonants that belong to different place categories which might be contrastive in a language, therefore they need to be represented by different elements. Moreover, he provides evidence from different languages to show that some coronals behave like |I| segments while others behave like |A| segments.[51]

Since the melodic representation of a sound is determined by how it interacts with other sounds in phonological processes, we should look into the phonological processes that

[49] See Ploch (1999).

[50] See Yoshida (2001) for a similar approach in Japanese.

[51] See Bellem (2007) for the representation of emphatic coronals that have an |A|.

involve coronal sounds in order to realise which element they contain. In Feʔfeʔ Bamileke (Backley: 2011) and Arabic (Bellem: 2007), coronals pattern with sounds containing |I| elements, whereas in Munster Irish (Cyran: 1996) they behave as though they contain |A|. Moreover, as Backley (2011: 89) points out, if a certain coronal in a given language contains the element |A|, it does not necessarily mean that all the coronals in that language should contain |A|. That is, coronals may be represented by different elements within a single language.

In the Slemani variety of SK, the coronal *d* is lenited to *y* in some words as shown in the examples below.[52]

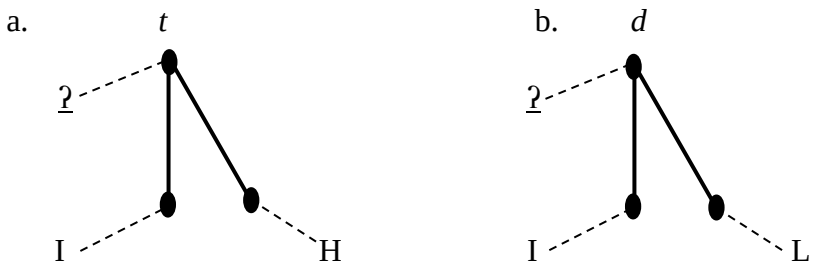
(68)

Hawler	Slemani	
âgâdâr	*âgâyâr*	'aware'
âwadân	*âwayân*	'flourishing'

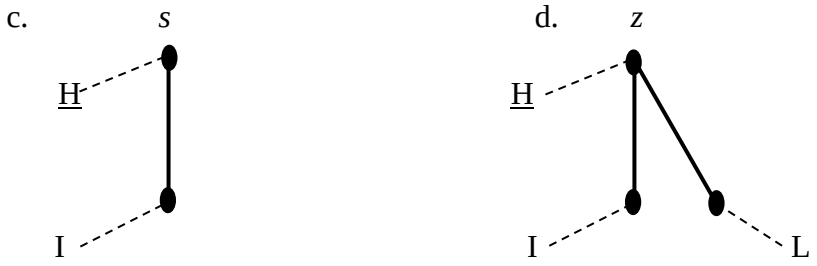
In this process, when the manner element |ʔ| and the laryngeal element |L| in the coronal *d* are deleted, only the place element |I| remains which as shown earlier is the only element in the representation of the glide *y*. This is evidence that coronals in SK have an |I| element.

To differentiate between palatals and coronals, ET uses head-dependency relationships. That is, palatals contain a headed |I| while coronals have non-headed |I|. Palatals are headed because they are articulatorily more prominent than coronals. That is to say, the *dIp* pattern is stronger in palatals than in coronals.[53] Following Bellem (2007), I argue that coronals are manner-headed. Figure 2.6 is the representation of the coronal stops *t* and *d* and the coronal fricatives *s z.*[54]

Figure 2.6 The representation of the coronals in SK



[52] See Chapter 5.
[53] See Nasukawa (2014) and Backley (2017).
[54] The coronal nasal is dealt with the other nasals in § 2.3.2.6.



In the following section, I discuss a group of coronals, namely liquids, that behave differently from the other coronals and have different representations.

2.3.2.3 Liquids

The laterals *l ĺ* and the rhotics *r ř* are grouped together into a phonological class known as 'liquids'. Although laterals and rhotics are different articulatorily, there is phonological evidence that these two groups form a natural class. They, for instance, often participate in phonological processes and have similar distributions across languages (Walsh Dickey 1997; Ballard and Starks 2004; Backley 2011). In English, as Ballard and Starks (2004: 3) note, the liquids *l* and *r* are allowed to occupy the second slot in a branching onset while nasals and obstruents are not permitted in this position. Further, liquids are active in phonological processes such as metathesis in many languages (Backley: 2011). For instance, in SK *l* and *r* participate in metathesis (Chapter 5) and *ĺ* and *ř* spread velarization to preceding vowels and consonants (Chapter 3). In ET terms, this means that liquids share an element which is |U|.

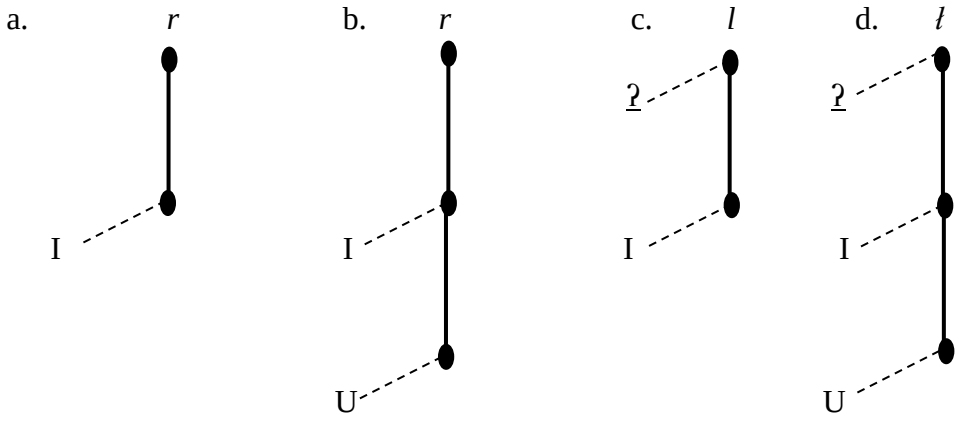
To begin with, the rhotic [r] is represented by a simplex |A| in some languages. Scheer (2004: 53) notes that [r] is reported to cause lowering in adjacent vowels in such languages as English and German. Another evidence of the representation of rhotics as |A| is the intrusive *r* in English where an [ɹ] appears inter-vocalically in an expression that has no historical justification (i.e. it is not present in the spelling), as in *draw(r)ings*. This [ɹ] is represented by an |A| that is spread from the preceding vowel. In SK, however, I argue that the rhotics behave differently and therefore they do not have an |A| element. The trill *ř* and the lateral *ĺ* spread velarization to preceding vowels and consonants and hence they have an |U| element.[55] The other liquids *l r* do not trigger velarization.

So, I argue that since the liquid sounds are coronals, they have a non-headed |I|. The tap *r* is a simplex expression that has a non-headed |I|. It is differentiated from the palatal *y*

[55] See chapter 3.

by headedness. The trill has an |I| and an |U|, while the lateral *l* has an |I| and an |ʔ|, and finally *ɬ* has |I|, an |ʔ| and a |U|. See Figure 2.7.

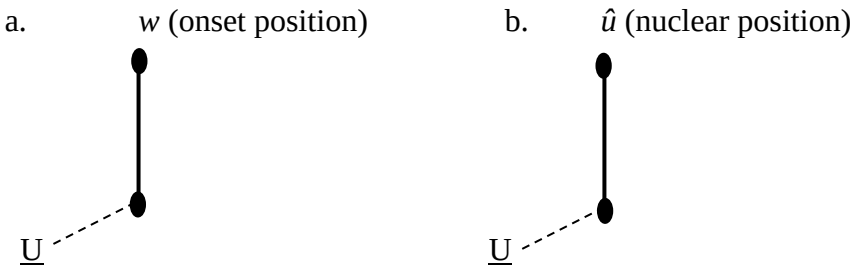
Figure 2.7 The representation of liquids in SK



2.3.2.4 Labials

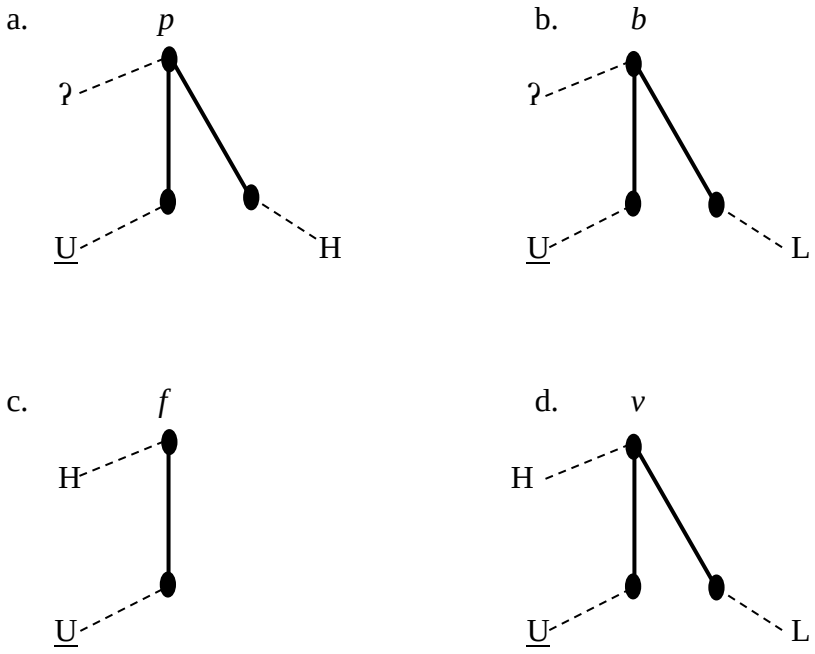
In ET, labials are represented by a headed element |U| as they often interact with round vowels in phonological processes (Kaye et al. 1984; Harris 1994; Harris and Lindsey 1995; Backley and Nasukawa 2009a; Backley 2011). In SK, the empty vowel [ɨ] is realised as [ʉ] when preceded by the labial glide *w* (§2.1.2.1). Hence, the labial glide is represented by a headed |U|. Besides the glide *w*, SK has two labial stops *p b* and two labial fricatives which also have a headed |U| in their representation.[56]

Figure 2.8 The representation of the labial glide w and the vowel û



[56] I discuss the nasal labial *m* with the other nasals in §2.3.2.6.

Figure 2.9 The representation of the labials in SK



2.3.2.5 Velars

In the early versions of ET, velars are represented by a headed |@| which in isolation manifests itself as the approximant ɣ (Harris 1994; Harris and Lindsey 1995). In the revised models of ET that do not have this redundant element, velarity has no resonance element. That is to say, velars are considered unheaded expressions with no independent resonance characteristics.

However, Backley (2011) maintains that velarity is represented by a non-headed |U| since velars and labials interact in phonological processes and form a natural class in some languages. Moreover, Backley and Nasukawa (2009a) argue that although velars and labials have different articulatory features, there are acoustic similarities between these two classes; they share a falling spectral pattern.[57] The element |U| is associated with low frequency energy (F1 and F2); this pattern can be found in labials and velars (Backley: 2017: 4). The difference between them is, however, shown by means of headedness. Labials have headed |U| and velars have non-headed |U|.[58] This is the view adopted in this study. I also argue that although *x* and ʁ are uvulars phonetically, they behave like the

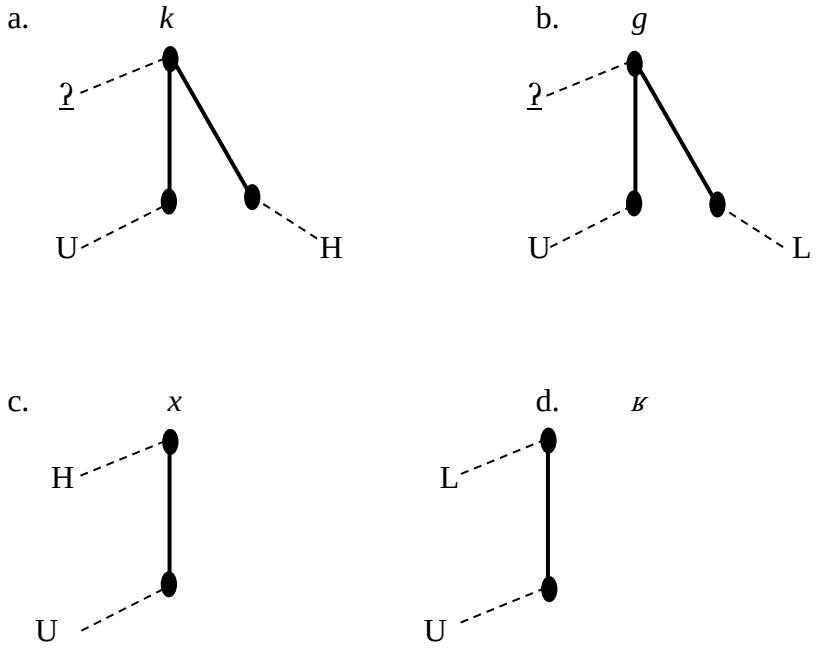
[57] See Backley and Nasukawa (2009a) for a detailed discussion.

[58] Sheer (2004) regards labials and velars as two distinct classes that are represented by different primes. He argues that |U| is present in the representation of velars and in his model he also argues for an element |B| which is present in all labial and rounded segments.

velars phonologically in SK; and since the representation of segments reflects their phonological behaviour, the uvulars have a non-headed |U|. The uvular stop *q* patterns with the pharyngeal sounds as I will discuss in the following section.

SK has two velar stops *k g* and two uvular fricatives *x ʁ* which are all represented by non-headed |U|.

Figure 2.10 The representation of velars and the uvulars in SK



2.3.2.6 Gutturals

The guttural sounds in SK are the pharyngeals *ḥ ʕ* and the uvular *q.* To begin with, the voiceless pharyngeal *ḥ* and the voiced pharyngeal *ʕ* are a feature of many Semitic languages as they occur in most of the Arabic dialects (Bellem: 2007) and Neo-Aramaic[59] (Hoberman: 1985); they also occur in Kurmanji Kurdish (Kahn: 1976).

Jakobson (1957) describes pharyngeals as 'pharyngealized laryngeals' in Arabic. Similarly, Watson (2002) considers Arabic pharyngeals as 'the emphatic counterparts' of the laryngeals *h ʔ.* This indicates that the pharyngeal characteristic of these segments is secondary. However, similarly to Bellem (2007), I argue that in SK pharyngeals have their primary articulation in the pharynx (they are articulated by an approximation of the

[59] According to Khan (1999, 2008), in the Neo-Aramaic dialects of Jews from Hawler (Arbil) and the Neo-Aramaic dialect of Barwar, the voiced pharyngeal *ʕ* has been weakened either to the glottal stop or to zero and it occurs mainly in loanwords.

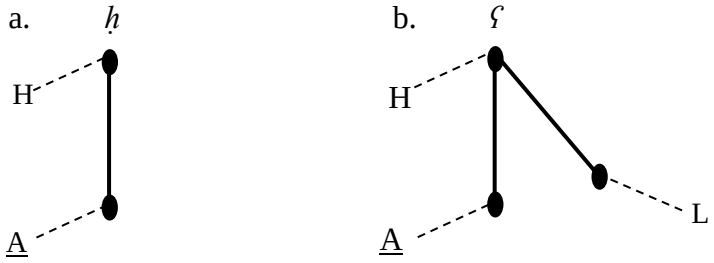
root of the tongue and the pharynx) and they should be differentiated from pharyngealized consonants that have a secondary articulation in the pharynx. This assumption is supported by the fact that the larygeals *h ʔ* are not replaced by the pharyngeals *ḥ ʕ* in back contexts in SK and they do not pattern with emphatics in Arabic in other respects, so the phonological evidence does not indicate that they are 'pharyngealized laryngeals'.

(69) *hała* [hæɬæ] 'mistake'
ařôm [ʔærom] 'I go'

Pharyngeals are reported to have the same effect as pharyngealized consonants on following vowels in KK (Kahn: 1976) and Arabic (Bellem: 2007). That is, a low F2 and a high F1 transition. Similarly, my SK data showed that the F2 transition for *ḥ* and *ʕ* was low while F1 transition was high. This is why this supports the argument that they are represented by |A|.

The pharyngeal *ḥ* is a voiceless fricative while the phonetic realization of *ʕ* varies across dialects and languages (For Arabic see Al-Ani 1970; Butcher and Ahmad 1987; Bellem 2007 and for Hebrew see Laufer and Baer 1988). In SK, both *ḥ* and *ʕ* are fricative and they are represented as follows.

Figure 2.11 The representation of the pharyngeals ḥ and ʕ in SK



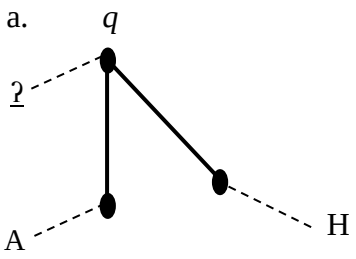
SK also has the voiceless uvular stop *q*. Al-Ani (1970: 32) notes that Arabic *q* lowers F2 and slightly raises F1 in following *i* and *a*. The same result has been arrived at by other studies on uvulars in different dialects of Arabic.[60] In KK of Urmia in north-western Iran, according to Kahn (1976), within one word only one pharyngeal, pharyngealized or uvular consonant is allowed and she analyses this as a dissimilatory process that she terms 'depharyngealization' which is subject to variation. Consider the following examples:[61]

[60] See McCarthy (1994) and Bellem (2007).
[61] Data from Kahn (1976).

(70)	Iraqi Arabic	Kurmanji	
	ṣubuḥ	*ṣibe*	‘morning’
	ṭabaqa	*ṭabak*	‘layer’
	qûṭîyya	*qotî*	‘box’

As the data shows, the uvular *q* forms a class with pharyngeal and pharyngealized consonants in this dissimilation process. Figure 2.13 shows the representation of the uvular stop in SK.

Figure 2.12 The representation of the uvular stop q in SK



2.3.2.7 Glottals

Glottal consonants have no inherent resonance- that is, no auditory-acoustic resonance pattern is associated with glottal consonants - and therefore in ET there is no resonance element associated with purely glottal consonants in the phonological systems of the world's languages. Harris (1994) argues that lenition processes involve a number of stages of information loss that end in segmental deletion and that the weakest sounds are those which remain at the end of these stages before deletion occurs. These processes fall into one of the following trajectories.

(71) a. spirantization > aspiration > deletion
plosive> fricative > h > ø

b. glottaling > deletion
plosive> ʔ > ø

c. vocalization > deletion
non-continuant > resonant > ø

The glottal *ʔ* is the endpoint in the lenition trajectory in (71b). That is when a stop consonant is glottalized (debuccalized), the resonance and the laryngeal elements are delinked and only the manner element remains. ET employs the EDGE element |ʔ| which

is characterised by a sudden sustained drop in acoustic energy. In isolation, the EDGE element is phonetically interpreted as the glottal stop [ʔ].

SK has a so-called epenthetic glottal stop which is realized word initially to occupy the position of the onset whenever this position is empty and therefore it is not a lexical segment. Moreover, in the process of debuccalization when the *d* in such words as *dakam* 'I do' is lenited to a glottal stop in Slemani *akam*, the only element that remains in the representation is the EDGE element which is realized as the glottal stop (see chapter 5). SK also has a glottal fricative *h* which does not occur word-finally. This consonant is represented by the element |H|.

Figure 2.13 The representation of the glottals

2.3.2.8 Nasals

The last group of consonants discussed in this section is the group of nasals which are the labial *m*, the coronal *n* and the velar *ŋ* (in Slemani only). Nasals are grouped together as they all have a headed |L|[62] which is cued by a broad band of low-frequency energy. Harris (1994: 131) argues that besides the nasal element, the nasal consonants also have an |ʔ| element. This is because, according to Backley (2011), in some languages nasals pattern with oral consonants. I argue that nasals in SK have no |ʔ| and that they have the following representations.

Figure 2.14 The representation of nasals in SK

[62] In earlier versions of ET (Kaye et al.: 1985), nasality was represented by |N| and |L| was used for voicing while in the revised version, |L| is used for both nasality(headed) and voicing (non-headed). Backley (2011) uses headed |L| for voicing and non-headed |L| for nasality.

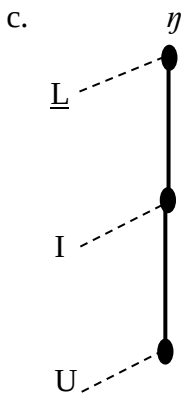


Table 2.4 summarizes the representation of consonants of SK in ET.

Table 2.4 The representation of consonants of SK in ET

Segment	Expression	Segment	Expression
p	U ʔ H	ḥ	A H
b	U ʔ L	ʕ	A L
t	I ʔ H	h	H
d	I ʔ L	č	I ʔ H
k	U ʔ H	ǰ	I ʔ L
g	U ʔ L	m	U L
q	A ʔ H	n	I L
f	U H	ŋ	I L U
v	U H L	l	I ʔ
s	I H	ł	I ʔ U
z	I H L	r	I
š	I H	ř	I U
ž	I H L	w	U
x	U H	y	I
ʁ	U L		

2.4 Summary

This chapter can be regarded as a background to the following chapters. Due to the lack of consistency in the literature on Sorani phonology regarding its segmental system, in the first part of the chapter, I discussed the inventory of lexical segments in SK and argued that there are 29 consonants and eight vowels in SK. I discussed the uncontroversial consonants that occur contrastively in native Kurdish words as well as a set of consonants that have caused considerable disagreement among Kurdish scholars as they either have limited distribution or occur only in loanwords. I also argued that SK has eight simple vowels one of which is an empty vowel and no diphthongs. I also concluded that vowel

length is not phonologically relevant in SK. These arguments were all supported by data that I had collected from speakers of Slemani and Hawler varieties. So, this thesis can be considered as the first study that compares data from both Hawler and Slemani as the majority of the previous studies are based on Slemani only.

The second part of the chapter is an ET analysis of SK sound system in which I showed how phonetic categories can be different from phonological patterns and hence the representation of each segment depends on how it behaves in phonological processes and how it patterns with other categories. I represent the representation of the lexical segments in SK which might be different from the representation of the same segments in another language.

Chapter Three

Processes of Place Assimilation in Sorani Kurdish

In chapter two I discussed the inventory of lexical segments in SK and established the consonant and the vowel segments in this variety of Kurdish and then gave an ET analysis of the lexical segments. In this chapter, I discuss three main processes of assimilation that involve the place of articulation of consonants which are palatalization, emphasis spread and nasal place assimilation. These processes are very common in SK; however, they have not been discussed except for a very few examples in a small number of studies. This is why this chapter provides the first detailed study of the targets, the triggers and the outputs of each process and identifies some differences between the dialects of Hawler and Slemani. In §3.1 I give a brief introduction to place assimilation. §3.2 is about palatalization in SK in which I argue that the output of palatalization differs between Hawler and Slemani. §3.3 deals with emphasis spread in SK and I argue that unlike Arabic and Kurmanji Kurdish which have pharyngealization, Sorani has velarization. §3.4 discusses nasal place assimilation. The chapter ends with a summary of the finndings.

3.1 Place Assimilation

Assimilation can be broadly defined as a phonological process in which one segment, the target, i.e. the assimilee, acquires the characteristics of another segment, the trigger, i.e. the assimilator, so that the sounds become more alike or sometimes identical (Lass 1984; Odden 2005; Pavlík 2009; Fromkin et al. 2014). If the segments are adjacent, the process is called 'local assimilation', which contrasts with 'distance assimilation' in which the assimilatory influence moves across intervening segments when the intervening segments do not show any noticeable effect of the assimilatory property.[63]

In place assimilation, one segment changes its place of articulation to, or close to, that of a neighbouring segment. Consider the following English example.

(1) *te[n] → te[m] boys*

In (1) the last segment of the first word [n] assimilates to the place of articulation of the first segment of the following word. The same process applies in SK when a word-final [n] comes into contact with a [b] in a following word, as shown in (2).

[63] A detailed account of assimilation typology is given in Pavlík (2009).

(2) *řa[ŋ] bû* → *řa[m] bû* ‘could have’
hamâ[n] bû → *hamâ[n] bû* ‘we had’

Place assimilation can also occur within morpheme boundaries as shown in (3) below:

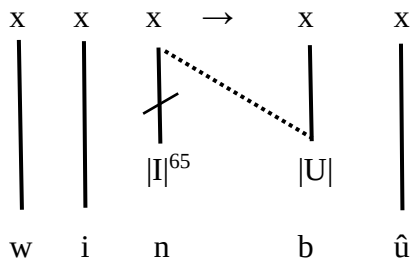
(3) *kê* → [k^{hj}e] ‘who?’
gîrfân → [g^{j}ɪɾfan]

An important difference between the processes in (2) and (3) is that the consonant in (2) changes its place of articulation entirely to assimilate to the following sound, i.e. total assimilation, while in (3) the consonant does not change its place of articulation; it only acquires secondary palatalization from the following vowel, i.e. partial assimilation. The superimposition of secondary palatalization is a typologically common process which normally results from the interaction between the resonance elements of adjacent vowels and consonants, as opposed to the process in (2) which shows consonantal interaction; in this case nasal place assimilation.

In non-linear models of phonology, primes (e.g. elements) are said to be arranged on independent tiers as opposed to the arbitrarily bundled SPE-style features. Each of these elements is linked to a segment by means of association lines. When a phonological process is applied to a segment, it either deletes (delinks) an association line or inserts (links) an association line. Hence the use of the terms ‘linking’ and ‘delinking’ to describe phonological processes in Autosegmental Phonology (Harris 1994; Crystal 2008).[64] Assimilation processes are analysed in terms of linking or ‘feature spreading’ where a feature or a node in one segment (the trigger) can spread to another segment (the target) through adding association lines (McCarthy: 2003: 322; Zsiga: 2006: 556; Crystal: 2008: 40). Accordingly, the place assimilation in (1) and (2) above can be represented as (4) where the association link between *n* and |I|, which represents the place feature, is deleted and a new association line is inserted between *n* and |U|.

[64] This results in ‘composition’ and ‘decomposition’ of segments respectively. Restricting all phonological processes to only two types of operation lies at the core of ET which aims to rule out the unattested and impossible operations to highlight only the operations that are attested across languages. Furthermore, composition processes should have some local source, i.e. the added elements should be present in the representation of a neighbouring segment (Harris: 1994: 98).

(4)



Place assimilation is a common phonological phenomenon in Sorani Kurdish. However, to date there are not comprehensive studies or analyses of these processes. In this chapter, I discuss three main types of place assimilation, namely palatalization, emphasis spread and nasal assimilation, in an attempt to fill the gap in the literature on SK. I provide data from the varieties of Slemani and Hawler to show the differences and similarities between the them. The chapter proceeds as follows: §3.2 is about palatalization in SK which focuses on velar palatalization in both Slemani and Hawler varieties. In this section, I argue that the output of palatalization differs between Slemani and Hawler although the triggers and the targets are similar. In §3.3 the second type of place assimilation, emphasis spread, is dealt with which again shows differences and similarities between the two varieties of Slemani and Hawler. Finally, the last section of the chapter is about nasal place assimilation in SK.

3.2 Palatalization

The term 'palatalization' refers to any phonological process in which a non-palatal consonant assimilates to become more palatal under the influence of a palatal sound which is usually either a front vowel or a palatal glide. Depending on the output, the process can be described as primary or secondary.

Primary palatalization (also called full or strong) shifts the primary articulation of the target consonant so that it becomes more palatal whereas secondary palatalization (also called weak) adds a secondary palatal articulation to the target consonant without changing its primary place of articulation (Bateman: 2007: 25; Crystal: 2008: 347; Kochetov: 2011: 1668). (5a) is an example of primary palatalization in English which shows the coronal *d* alternating with the palato-alveolar *ǰ* in the context of *y*. Here, not only the place shifts from alveolar to palatal but also the manner of articulation changes from stop to affricate. Moreover, the palatal glide which causes the palatalization may be

[65] According to Backley (2011) coronals in English have the element |A|. This is a controversial topic in ET which I discuss in detail in §2.4.2.2.

deleted. (5b) shows secondary palatalization in SK and (5c) shows primary palatalization in SK.

(5) a. d → dʒ

[dɪd juː] → [dɪdʒjuː] ~ [dɪdʒuː] 'did you'

b. k → k^j

yakam	[jæk^{h}æm]	'the first'
yakêk	[jæk^{hj}ek^h]	'someone'
kêw	[k^{hj}ew]	'mountain'
kîž	[k^{hj}iʒ]	'girl'
gîrfân	[g^{j}irfan]	'pocket'

c.

kêš	[tɕeʃ]	'weight'
hargîz	[harɖʑiz]	'never'
gîrôda	[dʑirodæ]	'infatuated'

Palatalization is one of the most common types of phonological processes that is widely attested across languages, hence various typological surveys have been conducted which compare data from a large number of languages and make generalisations regarding targets, triggers and outputs of the process (Chen 1973; Bhat 1978; Guion 1996; Hall 2000; Bateman 2007; Kochetov 2011; Krämer and Urek 2016). In the rest of this section, I give a brief overview of common typological patterns of palatalization.

To start with, there is a tendency for primary palatalization to target dorsal and coronal consonants more than labials. In fact, primary palatalization of labials is very rare as it arguably occurs only in 2/58 of Bateman's (2007)[66] and 2/64 of Kochetov's (2011) surveyed languages, which are Moldova Romanian and Southern Bantu. It has, nonetheless, been debated that the labial palatalization in these languages may not be examples of true primary palatalization. Ohala (1978), who examines labial palatalization in Southern Bantu, describes it as a misperception of secondary palatalization on the part of the listener which results mostly from the similarities between the F2 transitions of secondary palatalized labials and dentals. Bateman (2007) does not agree with Ohala's acoustic and perceptual analysis of primary labial palatalization. She, rather, argues that palatalized labials in these languages are a result of diachronic changes rather than a one-step synchronic process. She (2007: 89) describes this change as 'hardening of a glide adjacent to a labial, followed by deletion or absorption of the labial' which have occurred

[66] Bateman (2007) studies 117 languages but only 58 of them have palatalization.

at different historical stages (e.g. *pj* → *pʃ* → *ptʃ* → *tʃ*).[67] Accordingly, Bateman and Ohala conclude that labials do not actually undergo primary palatalization and that the phenomenon is wrongly classified as 'labial palatalization' in these two languages.

According to Chen (1978: 177), primary palatalization spreads from back to front across the consonantal series, i.e. dorsals are the first class to undergo palatalization followed by coronals and then labials. Consequently, no language should palatalize labials and/or coronals without palatalising dorsals. This contrasts with the results of later studies which report that coronals are the most common targets of primary palatalization occurring in 39/58 languages in Bateman (2007), which outnumbers primary palatalization of dorsals which occurrs only in 21 languages. A similar result is also achieved by Kochetov (2007) who asserts that the most common type of primary palatalization is the change of alveolar to palatoalveolar which occurs in 9/17 family languages in his language survey. Both studies show that dorsal palatalization and coronal palatalization occur together and independently from each other in languages.[68]

Among the coronals, dentals and alveolars, and among the dorsals, velars are the most common targets of primary palatalization (Bateman: 2011: 591). Regarding the manner of articulation of palatalization targets, Bateman (2007: 56) observes that obstruents are the most likely to be palatalized followed by nasals and laterals while rhotics very rarely undergo primary palatalization.[69] The outputs are more likely to be posterior coronals and/or sibilants, according to Kochetov (2011: 1670).

Secondary palatalization, on the other hand, targets consonants at all places of articulation (Bhat 1978; Bateman 2007; Kochetov 2011). However, labials undergo secondary palatalization only when either coronals or dorsals or both are secondarily palatalized, whereas coronals and dorsals undergo secondary palatalization together or independently from each other (Bateman: 2007: 51).

The most common triggers of palatalization are the high front vowels [i], [e] and the palatal glide [j] (Chen 1973; Bhat 1978; Bateman 2007; Kochetov 2011) and among these, the front vowel [i] is the most common trigger which occurs in all but six of the 58 languages that have palatalization in Bateman's (2007) survey and 24/25 of Kochetov's

[67] Also see Bateman (2011).

[68] Chen's analysis was based on a very small number of languages, including Chinese, French, Italian and Spanish, while Bateman (2007) and Kochetov (2011) compare data from a larger number of languages. This is, perhaps, why the results differ substantially.

[69] See Hall (2000) for a detailed account of palatalization of rhotics.

(2001) genera. High back vowels trigger palatalization, which occurs very rarely, only if high front vowels trigger it too and if low front vowels trigger palatalization, so should do high front vowels.[70]

Another distinction can be made between phonemic and phonetic palatalization. In Slavic languages, the contrast between non-palatalized consonants and their palatalized versions is phonemic (Kochetov: 2001; Rubach: 2011). That is, palatalization has become independent from the triggers and the palatalized sounds have become lexical segments in the language. For example, [s] and [sʲ] are different phonemes in Russian.[71] Some languages, such as Polish, have both phonemic and allophonic palatalization. SK, on the other hand, has only allophonic palatalization where [k] and [kʲ] do not contrast phonemically. In languages with a plain-palatalized contrast, consonants of almost any place or manner of articulation can be palatalized with the exception of retroflex and uvular consonants (Kochetov: 2001: 14 based on Maddison 1984).

3.2.1 Palatalization in Sorani Kurdish

Research on palatalization in Sorani Kurdish has been restricted to a few brief descriptions of the process which are no more than discussions of a few examples. Most importantly, they do not point out any differences between the sub-dialects (McCarus, 1958; Mackenzie, 1961b; Mahwi, 2008b). Similarly, to the best of my knowledge, palatalization in Kurmanji Kurdish has not attracted the attention of linguists and no studies have been conducted on this process in Kurmanji either.

In SK, the velar stops *k* and *g* are palatalized before front vocoids and the output is either a secondarily palatalized velar stop (in Slemani) or an alveopalatal[72] affricate (in Hawler). Velar palatalization has been attested in many of the languages of the area. In this concern, Windfuhr (1997: 681) observes that 'fronting is part of a major cross-linguistic isogloss that begins in central Iran and stretches across Azerbaijan and the Caucasus.' For example in Persian, velar stops are secondarily palatalized before front vowels, as shown in (6).[73]

(6) *kʲar* 'deaf'

[70] For more details on palatalization triggers, see Bateman (2011).

[71] These have probably started as allophones of the same phoneme and then later subsequent phonemic splits created the separate phonemes. See Guion (1996).

[72] As discussed in §2.1.1.3, the affricates *č* and *ǰ* are realised as alveopalatal rather than post alveolar in Hawler.

[73] Data from Windfuhr (1997: 681).

gʲiǰ ‘dizzy’

In Turkish, *k* is palatalized to [c] and *g* is palatalized to [ɟ] before front vowels as shown in the examples below.[74]

(7) *kel* ‘bald’
göl ‘lake’

In Persian velar palatalization is allophonic and does not result in change in the meaning of the words, while it is phonemic in Turkish.

Similarly, the Neo-Aramaic dialects across the Iraq-Turkey border employ velar palatalization before non-rounded vowels. In the Neo-Aramaic dialects of Barwar and Amedia (Northern Iraq) *k* and *g* are pronounced with a palatalized offset which sometimes results in [c] and [ɟ] and sometimes it is fronted further to the region of [tʃ] and [dʒ] respectively (Khan: 2008), such as in:[75]

(8) *kʲasa* ‘stomach’
gʲana ‘soul’

According to Khan (1997: 31) for some speakers the palatalized velar is sometimes phonemic and it distinguishes between such words as *kʲasa* ‘stomach’ and *kasa* ‘chalice’. In Baghdadi Arabic, the voiceless velar stop was historically primarily palatalized before high front vowels that resulted in a palatoalveolar affricate which is now a distinct phoneme that contrasts with *k* in many words in Baghdadi Arabic such as *furač* ‘brushes’ *furak* ‘he rubbed’ (Bellem 2007; Youssef 2013). These were a few examples to show that velar palatalization occurs in most of the languages of the area.

In the following sections, I discuss palatalization in Slemani and Hawler varieties and demonstrate that the process has two different outputs in the two dialects. §3.2.2 is about palatalization in Slemani dialect. In §3.2.3 I demonstrate that velar stops in Hawler dialect undergo primary palatalization and that the result is an alveopalatal affricate rather than a palatal affricate. Finally, §3.2.4 is about the analysis of palatalization within ET.

[74] Data from Yavuz and Balci (2011: 24).
[75] Data from Khan (1997: 15).

3.2.2 Palatalization in the Slemani Variety

In Slemani, velar stops *k* and *g* are palatalized when followed by a front vowel or the empty vowel when followed by the palatal glide as shown in (9a). The output is a secondary palatalization.

(9)	a.	*kê*	[k^{hj}e]	‘who?’
		bâwk-î	[bawk^{hj}i]	‘his father’
		kêw	[k^{hj}ew]	‘mountain’
		kîžôła	[k^{hj}iʒołæ]	‘young girl’
		ǰâr-êkiyân	[dʒaɾek^{hj}ɨjan]	‘once’
		gêž	[g^{j}eʒ]	‘dizzy’
		gîrfân	[g^{j}iɾfan]	‘pocket’
		hargîz	[hæɾg^{j}i:z]	‘never’
		giyâ	[g^{j}ɨja]	‘grass’
	b.	*kânî*	[k^{h}ani]	‘spring’
		kôtir	[k^{h}ot^{h}ɨɾ]	‘dove’
		kâr	[k^{h}aɾ]	‘work’
		gird	[gɨɾd]	‘hill’
		gôř	[gor]	‘grave’
		garmâ	[gæɾma]	‘heat’

The difference between [k^{hj}] [g^{j}] in (9a) and [k^{h}] [g] in (9b) is the presence of a secondary palatal articulation. The primary place of articulation of [k] and [g] is velar; nonetheless, when they are followed by front vowels and the palatal glide (which are articulated in the hard palate area) an additional palatal articulation is superimposed on the consonant. Thus, the outcome is a velar consonant that has some palatal features spread from the adjacent vocoid. In the following section I discuss the phonetic correlates of secondary palatalization.

McCarus (1958: 17) maintains that in Slemani in addition to the velar stops, the labial stop [p] and the labiodental fricative [f] are also pronounced with a palatal off-glide before [e] such as in the words *pênǰ* [p^{hj}endʒ] ‘five’ and *fênik* [f^{j}enɨk] ‘cool’.[76] I, however, do not agree with McCarus in this regard because firstly, the data I have collected from Slemani speakers does not show any case of labial palatalization; i.e. labials do not affect formant

[76] Kahn (1976) reports that non-pharyngealized bilabials are slightly palatalized before front vowels in KK.

transitions before a front vocoid in the way velars do, as clarified in the following section. Secondly, according to Bateman (2007) and Kochetov (2001), the vowel [i] is the most common trigger of palatalization cross-linguistically. So, it is unlikely for [e] to trigger palatalization in labials in Slemani when [i] does not. Finally, labials are not palatalized in Hawler. Accordingly, I argue that only velars are palatalized in Slemani.

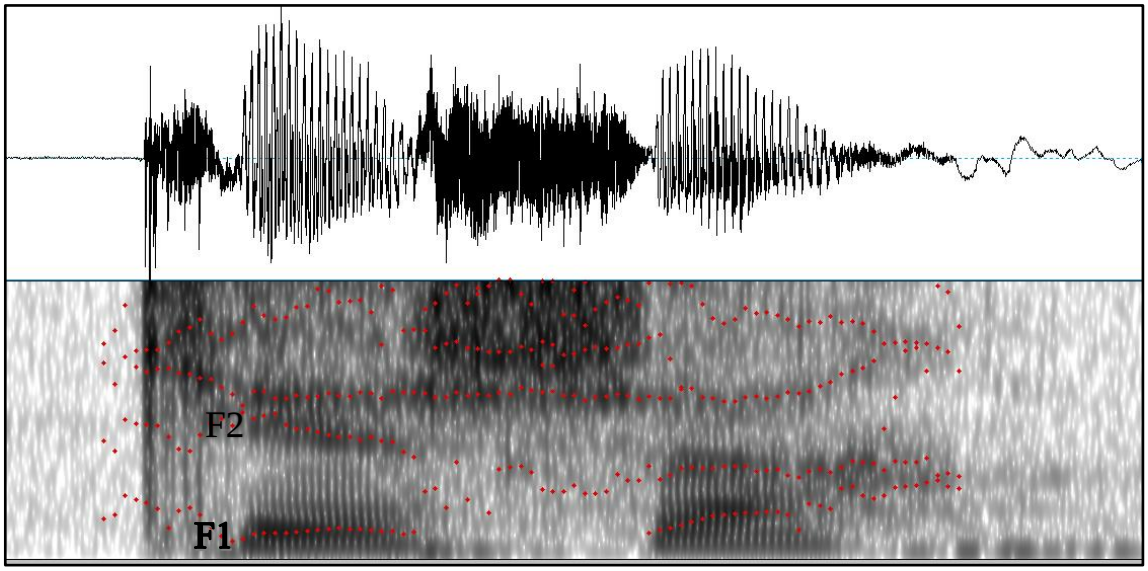
3.2.3 Phonetic Correlates of Secondary Palatalization

Secondary palatalization, according to Ladefoged and Johnson (2011: 234), is 'the addition of a high front tongue gesture, like that in [i], to another gesture.' Since velars are made with the dorsum of the tongue, moving the body of the tongue towards the position of the front vowels may result in a slight modification in the primary articulation of the consonants. Keating (1993: 16) states that in the pronunciation of a palatalized velar consonant, the whole tongue moves forward along the roof of the mouth and the primary constriction moves from the soft to the hard palate. Jones (1940: 30) notes that a *k* followed by a front vowel makes an imprint on a palatogram while it does not leave any traces in other contexts. Similarly, Jahani and Paul (2008) conduct a palatographic analysis of the voiceless velar stop *k* in Persian and conclude that *k* before front vowels is visibly fronted as compared to *k* before back vowels. Keating and Lahiri (1993) compare articulatory and acoustic features of velars before front vowels in a number of languages and they conclude that the degree of frontness in the velars is determined by the frontness of the vowel. That is, 'the more front the vowel, the more front the velar' (Lahiri and Keating: 1993: 89). Moreover, palatalization is usually more apparent at the release than during the primary constriction of the consonant (Keating: 1993: 17; Ladefoged & Maddieson 1996:363). Palatalized consonants should not be confused with palatal consonants which have the primary place of articulation in the hard palate area.

Acoustically, palatalization is usually characterized by a high second formant (F2) (Ladefoged and Maddieson: 1996: 364). Bhat (1978: 50) states that tongue fronting usually represents a rise in the frequency of the second formant which increases the gap between the first and the second formants. Consider Figures 3.1 and 3.2 which show spectrograms and waveforms of Slemani palatalized and non-palatalized velar stops.

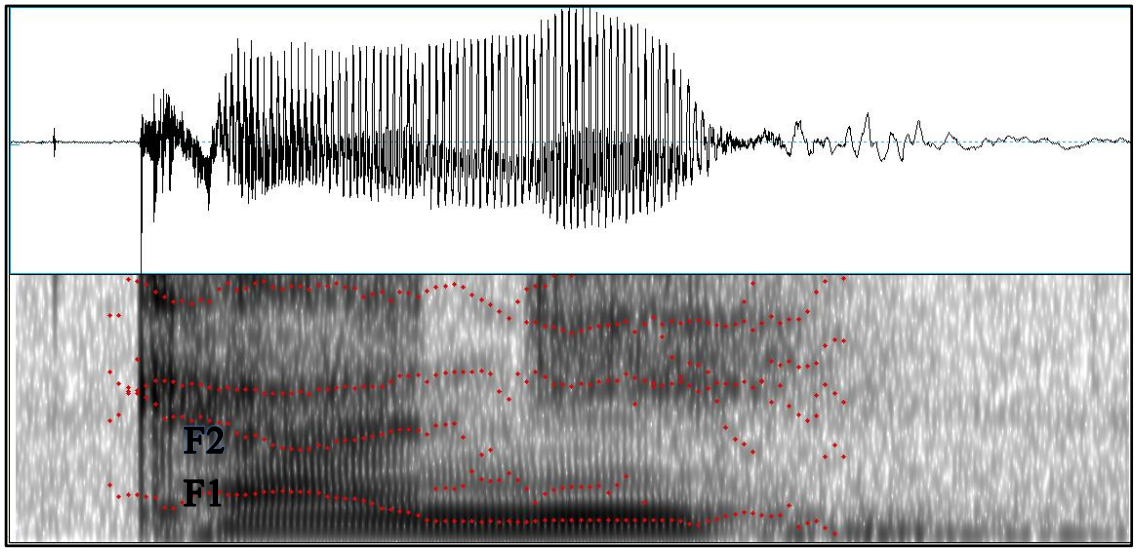
Figure 3.1 Spectrograms (and waveforms) of words showing the contrast between [k^{hj}] and [k^{h}] in SK word-initially, spoken by an adult female from Slemani

a. *kêša* [k^{hj}eʃæ]‘problem’



	k^{hj}	e	ʃ	æ	

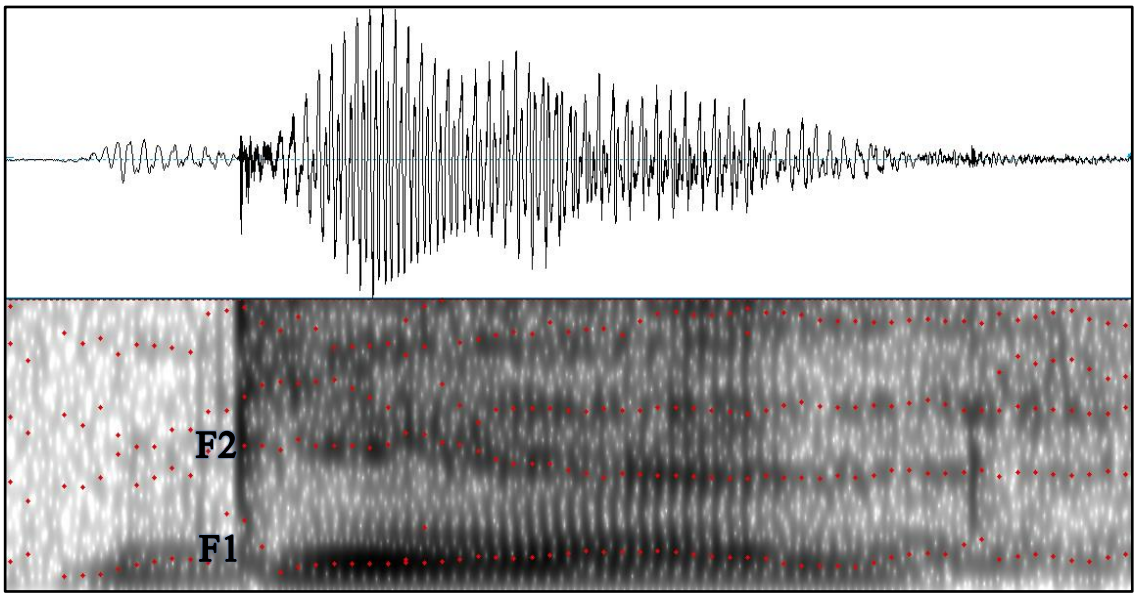
b. *kânî* [k^{h}ani] ‘spring’



	k^{h}	a	n	i	

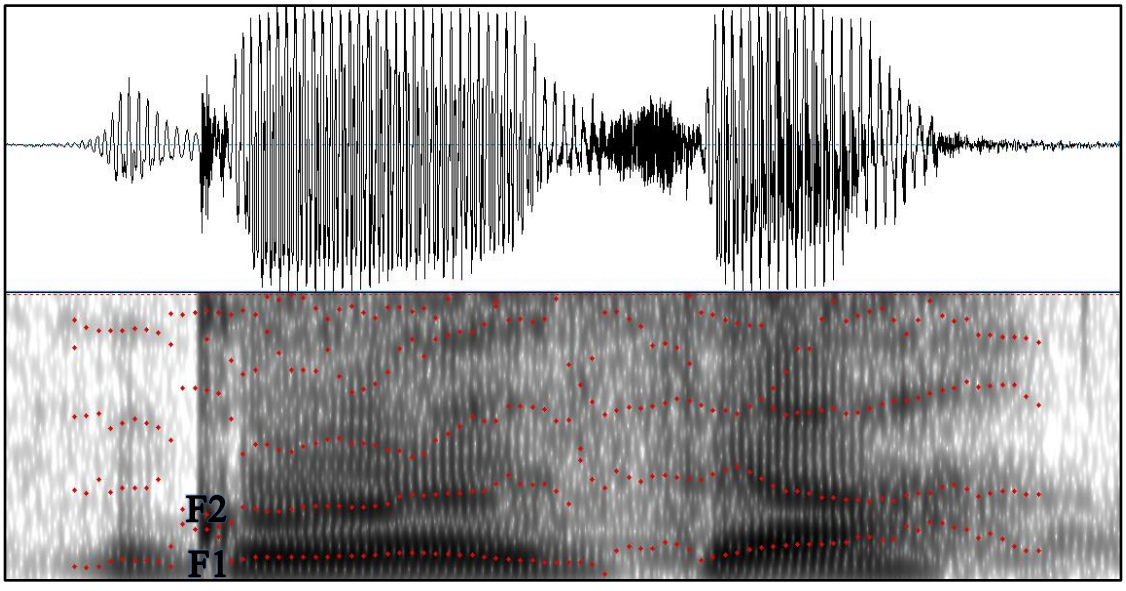
Figure 3.2 Spectrograms (and waveforms) of words showing the contrast between [gʲ] and [g] in SK word-initially, spoken by an adult male from Slemani

a. *gêl* [gʲel] 'foolish'



	gʲ	e	l	

b. *gôza* [gozæ] 'pot'



	g	o	z	æ	

The spectrograms show the increased gap between F1 and F2 transitions in the vowels following the palatalized velar stops in Figures 3.1 (a) and 3.2 (a), while the gap between F1 and F2 transitions is noticeably smaller in the vowels following the non-palatalized velar stops in Figures 3.1 (b) and 3.2 (b). The formant transitions of these segments are given in Table 3.1.

Table 3.1 Formant values (Hz) of vowel transitions following plain and palatalized velar stops in the words shown in Figures 3.1 and 3.2

Word	F1	F2	F2-F1
k^{h}ânî	802	1924	1122
k^{hj}êša	478	2273	1795
gôza	369	1106	737
g^{j}êl	383	1835	1452

The low F1 and the high F2 are the most important cues of secondary palatalization. However, Haeri (1997: 48), who studies palatalization of apical stops in Cairene Arabic, makes a comparison between strongly palatalized and weakly palatalized stops and she notes that the duration of the release burst and aspiration is longer for strongly palatalized consonants, and the release of palatalized consonants is often more gradual than the non-palatalized ones. The VOT was measured for the above four tokens, and that of [k^{hj}] was longer at 61 ms than [k^{h}] at 47 ms. This shows that both the palatalized and the non-palatalized realisations are aspirated; nonetheless, similar to Haeri's results, the aspiration is stronger in the palatalized segment. Similarly, VOT of the palatalized [g^{j}] is longer (-75 ms) than its non-palatalized realisation [g] (-58 ms).

3.2.4 Targets and Triggers of Secondary Palatalization

Secondary velar palatalization in Slemani dialect is an example of regressive palatalization since it is triggered by a following high or central front vowel or the empty vowel+palatal glide; it never occurs word-finally, before consonants, before back vowels or before a low front vowel. Furthermore, the empty vowel followed by any consonants other than the glide *y* does not trigger secondary palatalization in Slemani. For example, the initial velar stops in the initial velars in (10) are not palatalized.

(10) *gird* [gɨrd] ‘hill’
kič [kɨtʃ] ‘girl’

According to Mackenzie (1961b), secondary palatalization in Slemani has another trigger which is the vowel *ø* [œɛ]. As discussed in §2.1.2.2, this vowel has caused some disagreement among Kurdish scholars. For example, McCarus (1958: 17) does not consider it to be a vowel but rather a sequence of *w+ê* and he argues that in such words as *kwê* ‘where?’ and *gwêz* ‘walnut’, palatalization is caused by the vowel which spreads through the labial glide. I do not consider *ø* to be a vowel in Slemani and hence adopt McCarus’s analysis for the secondary palatalization in *kwê* and *gwêz*,

The targets of secondary palatalization in Slemani are the velar stops *k* and *g* and the output is a velar stop consonant pronounced with a palatal off-glide. Although McCarus (1958: 17) and Mackenzie (1961b: 6) state that the output of velar palatalization is usually a palatal affricate, none of my Slemani informants produced a palatal affricate as a result of velar palatalization, unlike Hawler (See §3.2.5). Mackenzie (1961b: 6) adds the velar nasal *ŋ* to the targets of secondary palatalization in words like *řaŋê* [raŋʲe]. Again, I did not observe any instances of palatalized *ŋ* produced by my Slemani informants, so I argue *řaŋê* is pronounced as [ræŋe].

Secondary palatalization occurs at the onset of a syllable word-initially and word-medially within the phonological word. It can also occur within and across the morpheme boundary, as shown in (9a); nevertheless, in my data only a few cases of secondary palatalization across the phonological word were observed, such as:

(11) *yak yak* [jækʰʲ jækʰ] ‘one by one’
wak yak [wækʰʲ jækʰ] ‘alike’

To sum up, secondary palatalization targets the velar stops in Slemani when they are followed by a high or central front vowel and the palatal glide which results in a palatal glide added to the consonants while their primary articulation does not change.

3.2.5 Palatalization in Hawler Variety

Based on the contemporary data I have collected, the output of velar palatalization in Hawler is different from Slemani. Both McCarus (1958) and Mackenzie (1961b) remark that the palatalization of *k* and *g* in SK can result in palatal affricate *c* and *ɟ* respectively. They, however, do not identify any differences between the dialects. Since this process

changes the primary place of articulation of the velar stops, it should be considered primary palatalization which as I mentioned earlier does not occur in Slemani in my data. Moreover, my Hawler informants produced what can be described as alveopalatal affricates *tɕ* and *dʑ* rather than palatal affricates. It is important to note that my Dukan (see Figure 1.5) informants have used primary palatalization as well. Dukan, I argue is the contact area that shares features from both Slemani and Hawler.

In this section I discuss examples of primary palatalization of velars. This process is often referred to as 'velar softening' or 'coronalisation' which involves alternations between velar stops and coronal fricatives and/or affricates (Halle: 2005). Similar to secondary palatalization in Slemani dialect, primary palatalization of velars is triggered by front vocoids in Hawler dialect. See the examples in (12a).

(12)	a.	*kêndar*	[tɕendæɾ]	'where?'
		dâk-î	[datɕi]	'his mother'
		gêlâs	[dʑelas]	'cherry'
		kangê	[kʰændʑe]	'when?'
		giyân	[dʑɨjan]	'soul'
		mâng-î	[mandʑi]	'the month of'
	b.	*dâk-im*	[dakʰim]	'my mother
		kât	[kʰat]	'time'
		gička	[gɨtɕkʰæ]	'little'
		gôt-im	[gotim]	'I said'

3.2.6 Phonetic Correlates of Primary Palatalization

Consider Figure 3.3 which shows a spectrogram and wave form of a token of the word *kêłâ*[77] 'ploughed' which is pronounced by an adult female from Hawler. As the figure shows, the first consonant is an affricate. It starts with a stop closure followed by a burst noise. Then it has an extended duration of frication with the frequency energy between 2.4 KHz - 4.5 KHz. Compare the same word pronounced by an adult female from Slemani which starts with a palatalized [kʰʲ] in Figure 3.4.

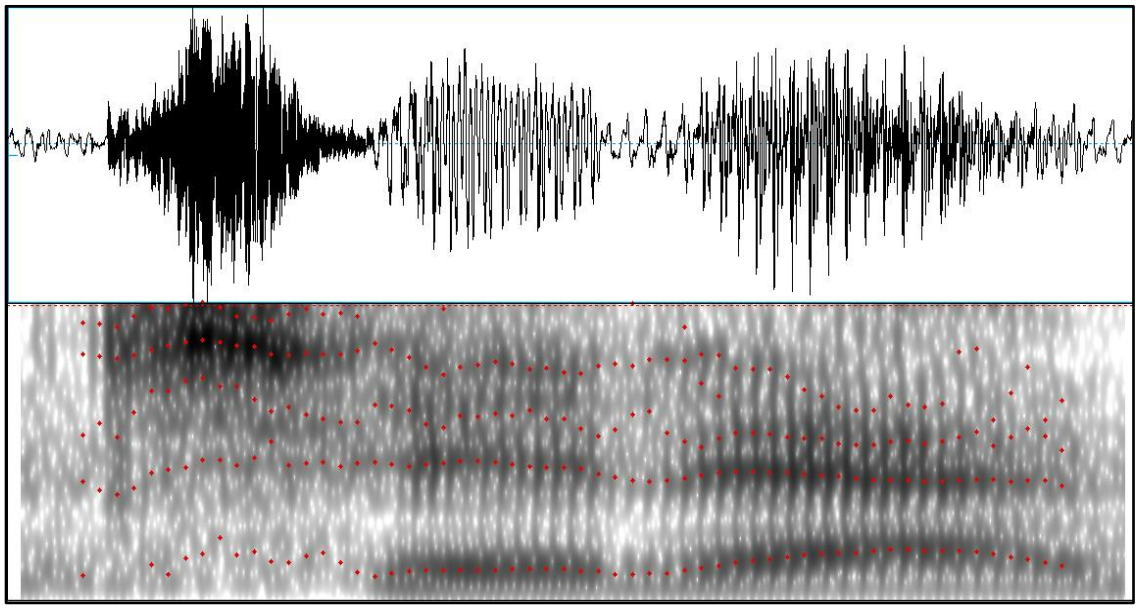
Several researchers have discussed the acoustic similarities between velar stops before front vowels, and palatoalveolar affricates (Ohala 1992; Guion 1996, 1998). As Guion

[77] Recall that in Hawler dialect *r* alternates with *ł,* this word is pronounced as *kêłâ* in Slemani and *kerâ* in Hawler. See (2.1.1)

(1998: 20) notes, a voiceless velar before a high front vowel and a palatoalveolar fricative/affricate are similar in terms of peak spectral frequency, and duration of aperiodic noise. The burst of a velar stop before front vowels and the palatoalveolar fricative [tʃ] both have a major spectral peak between 2 and 4 kHz.

Figure 3.3 Spectrogram (and waveform) of the word kêrâ spoken by an adult female from Hawler

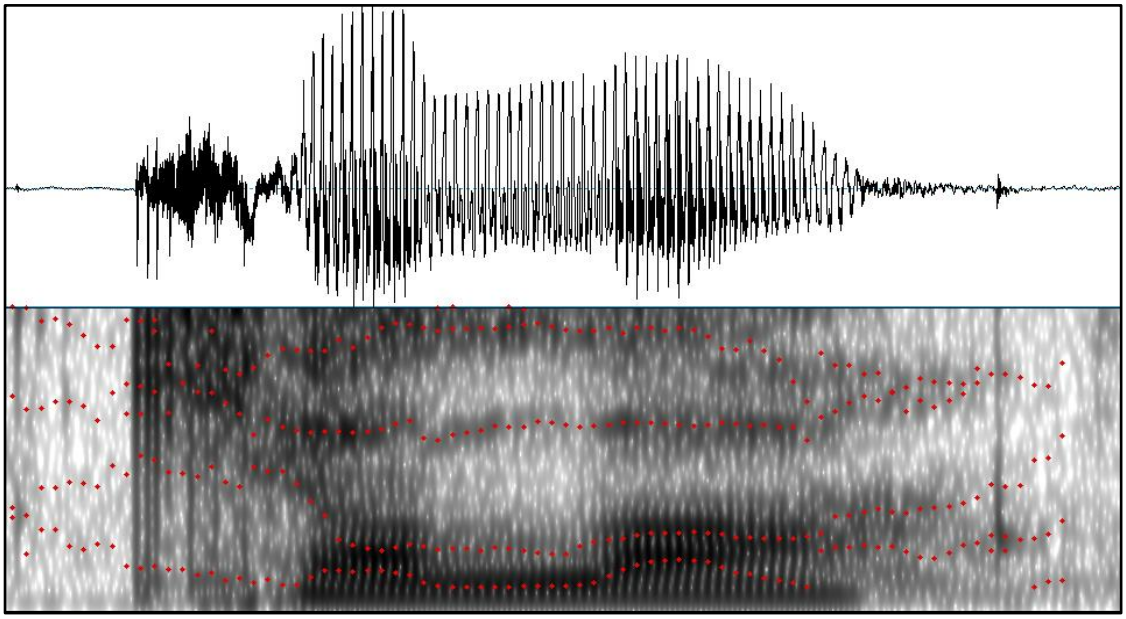
kêrâ [tɛeɾa] 'ploughed'



	tɛ	e	ɾ	a	

Figure 3.4 Spectrogram (and waveform) of the word kêłâ spoken by an adult female from Slemani

kêłâ [k^{hj}eła] ‘ploughed’



	k^{hj}	e	ł	a	

3.2.7 Targets and Triggers of Primary Palatalization

Similar to Slemani, velar palatalization in Hawler is triggered by a following high or central front vowel *î ê* or palatal glide *j*. It is never triggered by a back or a front low vowel. I have also not noticed any palatalization of velars in adjacency of the empty vowel *ɨ* in my data from Hawler speakers.

The targets of primary palatalization in Hawler dialect are the velar stops *k* and *g* which result in *tɕ* and *dʑ* respectively. Some Hawler speakers pronounced the velar stops with a palatal off-glide as in Slemani instead of the primary palatalization in a few examples. This, nonetheless, occurs relatively rarely as I have noticed this phenomenon with a very few number of my Hawler informants. It would be reasonable to assume that this occurs due to the influence of Slemani on the speakers of Hawler. Interestingly, some of my Hawler informants who had lived for a long time in Slemani only had primary palatalization of velars and no instances of secondary palatalization was recorded with these speakers. So, I argue that this phenomenon is not very common and it occurs with certain speakers only who apply it to a very few number of words in their speech.

Again, velar palatalization in Hawler occurs in the onset of the syllable within the phonological word. It can also occur within and across the morpheme boundary, as shown in (12a).

In conclusion, since palatalization is an understudied process in Sorani Kurdish phonology, most of the discussions about Slemani and Hawler are based on the data I have collected from speakers of both dialects which have revealed some differences regarding the outputs of the process in spite of having the same targets and triggers. Both dialects palatalize velar stops only and no instances of labial or coronal palatalization were observed. The triggers are the same in both dialects, i.e. front vocoids *î ê j*.

In some languages, a trigger, mostly [i], is preferred over the others, i.e. [i] is the most common trigger of palatalization that occurs in a large number of words (Kochetov: 2011). This was not noticed in Slemani and Hawler dialects as both the front vowels *î ê* and the palatal glide *j* triggered palatalization equally. Typologically, voiceless velars are more likely to palatalize than voiced velars (Bhat 1978; Guion 1998), however, in Slemani and Hawler both [k] and [g] undergo palatalization equally.

Regarding the output of the process, Slemani has secondarily palatalized velar stops while Hawler has primary palatalization which results in alveopalatal affricates. Mackenzie (1961b: 6) states that in Slemani velar palatalization 'leads, but very rarely, to a 'vulgar pronunciation of *k(y), g(y)* as affricates approaching [tʃ, dʒ].'

McCarus (1958: 17), similarly, states that the output of palatalization of velar stops is usually a palatal affricate rather than a palatalized stop. McCarus's informants were mainly educated adult males from the city of Slemani and he had also collected some data in the city of Rawandiz which belongs to the dialect group of Hawler. He (1958: 2), nevertheless, clarifies that focus of his study is the dialect of Slemani. This denotes that McCarus describes the palatalization in the dialect of Slemani as primary.

Nonetheless, none of my Slemani informants produced [tʃ] and [dʒ] as a result of velar palatalization. Similarly, my Hawler informants, including those who have lived in Slemani and have been in contact with Slemani speakers, did not produce secondary palatalization on the velar stops. Moreover, the speakers' education background, social status or gender does not have any influence on velar palatalization. My male and female informants from both dialects showed great similarity in applying the process. Since all

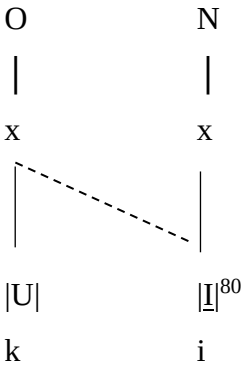
my informants were adults between 35 and 70 years old, I cannot comment on age differences regarding palatalization.

3.2.8 Velar Palatalization in Element Theory

It has been well documented that palatalization is triggered by front vowels *î ê* and the palatal glide *y*. In the model of Element Theory adopted in this thesis, it is assumed that palatals contain a headed |I| due to their interaction with front vowels which also contain a headed |I| (Harris 1994; Harris and Lindsey 1995; Backley 2011).[78] Palatalization is, thus, represented by spreading the |I| element from the front vocoids to the representation of the target consonant (Harris: 1994: 126).

The target consonants of palatalization in SK are the velar stops *k* and *g*. The place of articulation of velars is represented by the resonance element |U|.[79] Accordingly, the process of secondary palatalization can be represented as in (13) in which the element |I| in the vowel spreads to the preceding velar.

(13)



Regarding the primary palatalization of velars where the output is an alveopalatal affricate, the same process of spreading of a headed |I| is applied but the place element of the velar |U| is deleted as shown in (14). This results in a palatal consonant with a headed |I|.

[78] See §2.3.2.1.
[79] See §2.3.2.3.
[80] Only the resonance elements are shown here.

(14)

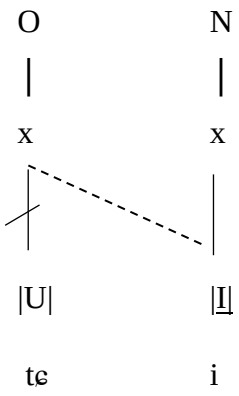
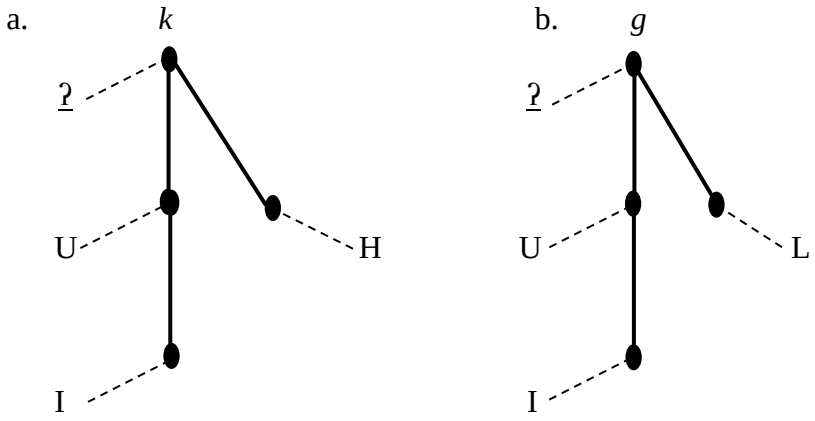


Figure 3.5 shows the representation of palatalized velars in SK.

Figure 3.5 The representation of palatalized velars in SK.



In summary, in this section I presented data to show that the output of palatalization differs between Slemani which has a secondary palatalization that results in the addition of a palatal quality to the velar stops represented by the |I| element in ET and Hawler which employs a primary process of palatalization that results in a shift in the place of articulation of velar stops to produce palatal affricates.[81]

3.3 Emphasis Spread

This section provides an account of another place assimilation process in SK which is emphasis spread. Emphasis spread is a secondary articulation which is said to cause a constriction in the pharynx while the primary constriction of the consonant occurs

[81] As discussed in chapter 2, the affricates *č ǰ* are palatals phonologically regardless of their articulatory properties.

elsewhere in the vocal tract. It is usually associated with a class of consonants[82] traditionally referred to as 'emphatics' commonly found in the sound system of Semitic languages, including Arabic, Neo-Aramaic and Hebrew. This secondary articulation is said to spread to neighbouring vowels and consonants.

Research into Arabic emphatics has a long history, dating back to Sibawayh's *Kitâb* in the eighth century. Therefore, there is a large volume of published studies describing emphatics in different dialects of Arabic using different linguistic approaches from both phonetic and phonological perspectives.[83] A few studies have been conducted on emphatics in Hebrew[84] and different dialects of Neo-Aramaic as well.[85] In Kurdish (especially SK), which is not a Semitic language so it does not share a common ancestor with the Semitic languages mentioned above, on the other hand, emphatics have not drawn much attention and the study of this group of sounds is limited to a few sources which only provide some brief descriptions and examples, although they occur in a considerable number of high-frequency Kurdish words. The only study that thoroughly treats emphatics in Kurdish is Kahn's (1976) work on the Urmi/Rezaiye variety of Kurmanji.

I will discuss the realisation of Kurdish emphatic consonants shortly but let us first examine the articulatory correlates of these sounds as there has been considerable debate among linguists regarding the exact articulatory characteristics of the secondary constriction involved in the production of emphatic consonants. This is mainly because emphasis spread is a complex process that cannot be summarised in a single feature. 3.3.1 presents an account of the articulatory correlates of emphasis spread. I discuss the acoustic correlates of emphasis spread in 3.3.2. Finally, 3.3.3 is about emphatics in SK.

3.3.1 Articulatory Correlates of Emphasis Spread

To begin with, Sibawayh (1982) refers to emphasis as *iṭbâq* which means 'covering with a lid'.[86] According to Sibawayh (1982: 436), Arabic has four emphatic consonants, or as he names them *al-ḥuruf al-muṭbaqa* 'lidded sounds', which contrast with the rest of the Arabic sounds which are all *munfatiḥa* 'open'. The *muṭbaqa* sounds are characterised by

[82] See Ladefoged and Maddieson (1996: 306-310) for pharyngealized vowels.
[83] Lehn (1963), Laradi (1983), Herzallah (1990), Watson (2002), Bellem (2007) and Youssef (2011) among others.
[84] See Laufer and Baer (1988).
[85] Garbell (1964, 1965), Hoberman (1985, 1988) and Khan (2008, 2016).
[86] Herzallah (1990: 46) and Bellem (2007: 44).

having two places (of articulation) on the tongue. Besides the primary coronal articulation, the consonants have a secondary constriction which is created by raising the dorsum of the tongue towards *al- ḥanak al-aʕlâ* 'the upper palate', i.e. the velum. Hence the back of the tongue is covered with the palate and the air is trapped between the primary and the secondary places of articulation which results in the emphatic nature of the sounds. Sibawayh does not use the terms 'primary' and 'secondary' places of articulation; nevertheless, it can be concluded from his description that the constriction created by *iṭbâq* is secondary. He (1982: 436) points out that if the *iṭbâq* is removed, the sound will have only one place of articulation and the result will be a *munfatiḥa* consonant except for *ḍ* which does not have a *munfatiḥa* counterpart in its place of articulation.[87]

Following Sibawayh's description, most modern Arabic scholars initially described the secondary constriction in emphatics as 'velarisation', similar to Sibawayh. It has also been described as 'uvularization', such as Dolgopolsky (1977) and McCarthy (1994). Nonetheless, later x-ray studies have shown that emphatic sounds are made in the upper pharynx area (Jakobson: 1957; Al-Ani: 1970: 44; Herzallah: 1990: 47). Hence the term 'pharyngealization' came into use. Ladefoged and Maddieson (1996: 366) state that the secondary process of pharyngealization occurs, for most Arabic speakers, 'approximately midway between the uvula and the level of the epiglottis' which is a higher location than the primary constriction of the pharyngeal consonants of Arabic.

Ali and Daniloff (1972), who study 'the physiological activities of the tongue root, the velum, the posterior pharyngeal wall, and the hyoid bone during the articulation of contrasting Arabic emphatic and non-emphatic consonants', conclude that neither the velum nor the posterior pharyngeal wall actively participate in the production of emphatics. It is, rather, the tongue dorsum which moves backwards and causes the restriction in the pharyngeal cavity. So, they determine that the related terminology, viz. velarisation and pharyngealization, is not correct to describe the production of emphatics. Similarly, Al-Nassir (1985) makes an x-ray comparison between *t* and *ṭ* and he concludes that the tongue dorsum is raised towards the velum and the tongue root is retracted towards the back wall of the upper pharynx for the emphatic consonant. To solve this problem, linguists mostly use the term pharyngealization to refer to the general role of the pharynx. As McCarthy (1989 cited in Herzallah: 1990: 49) notes, pharyngealization

[87] See Al-Nassir (1985).

refers to the ‘place of articulation’ rather than an ‘articulator’ when used in relation to the emphatic sounds.

However, all these articulatory terms have caused considerable controversy as it is not possible to restrict the articulation of emphatics to a single feature. As Lehn (1963: 30) notes, the production of emphatics in Cairene Arabic mainly requires ‘slight retraction, lateral spreading, and concavity of the tongue and raising of its back’ along with one or all of the following: ‘faucal and pharyngeal constriction’, ‘slight lip protrusion or rounding’, and ‘increased tension of the entire oral and pharyngeal musculature resulting in the emphatics being noticeably more fortis than the plain segments’. Lehn (1963: 31) clarifies that some of these features may be more enhanced than the others depending on the speakers and/or the phonetic environment. Watson (2002: 269) states that in a number of Arabic dialects pharyngeal and pharyngealized consonants are enhanced by lip-rounding or lip-protrusion. This labialization either spreads throughout the phonological word, such as in Baghdadi Arabic, or it is restricted to the emphatic sound, such as in Cairene Arabic. Thus, tongue retraction and lip protrusion are considered the most prominent features of emphatics which help enlarge the oral cavity. Another way to enlarge the oral cavity, according to Bellem (2007: 45), is lowering the jaw which causes the dorsal concavity in the production of emphatics. This increase in the volume of the oral cavity gives the ‘dark’ quality to emphatics. These enhancing features differ from dialect to dialect and they do not necessarily occur in all dialects and languages.

As noted earlier, there are no detailed studies of emphatic consonants in SK and all the available sources use such terms as ‘emphatic’, ‘pharyngealized’ or ‘velarised’ to refer to these sounds in Kurdish without discussing their articulatory features. Kurdish scholars, including McCarus (1958), Mackenzie (1961) and Kahn (1976), seem to have borrowed these terms from Arabic phonology considering that emphatics were originally borrowed from Arabic into Kurdish. I do not subscribe to this assumption because a) Arabic is not the only language that has this feature; Aramaic, which is one of the ancient languages widely used in the areas where Kurdish is spoken, has emphatic consonants; b) the contact between Kurdish speakers and Aramaic speakers is much older than the contact between Kurdish and Arabic; c) furthermore, most of the Kurdish words that have emphatic consonants are everyday words, such as numbers, that are more likely to have existed in the language before the arrival of Arabic to the area. Since there are not enough sources and detailed studies about the Kurdish language history and the effect of the contact languages on its phonology, most scholars tend to adopt the Arabic approach.

Moreover, Kurdish emphatics do not show much resemblance to those of Arabic since SK does not have the enhancing features discussed above that exist in some Arabic dialects such as Baghdadi and Sanʕani. For instance, SK emphatic consonants are not accompanied by lip protrusion. In fact, I argue that in SK the lips are in a neutral position for emphatics. The lips are rounded for the palatal *š*, spread for *s* and neutral for *ṣ*. Moreover, the emphatics are produced with a backed tongue. That is, the tongue is further back for *ṭ* than for *t* and there is not much jaw lowering. In this regard, Kahn (1976: 23) states that pharyngealization in KK is not as strong as that of Arabic, especially Iraqi Arabic. These are some articulatory correlates of SK emphatics but to decide on the exact properties of these sounds and determine whether they are velarized or pharyngealized, we need x-ray analyses which is out of the scope of this study. Therefore, I will leave that for future research. I will focus on the phonological evidence here to determine the nature of these sounds. I will discuss emphatics in SK and how it differs phonologically from Arabic and KK in the following section.

Emphatics have been grouped with other classes of sounds based on their articulatory features and/or the effects they have on neighbouring sounds. Sibawayh (1982: 129), for instance, groups emphatics with the uvulars to make the *mustaʕliyah* sounds which are characterised by raising the back of the tongue towards the velum. In 1989, Hayward and Hayward proposed [guttural] as a natural class which includes the laryngeals, the pharyngeals and the uvulars which according to McCarthy (1994) are all produced in the pharynx area and hence he uses the feature [pharyngeal]. Emphatics share a secondary [pharyngeal] feature with the guttural sounds in which the feature is primary. In a few dialects of Arabic and Aramaic (Hoberman: 1985) and in KK (Kahn: 1976) pharyngeals and pharyngealized consonants result in lowering and backing in neighbouring vowels. For example, in the Syrian dialects both gutturals and emphatics prevent *imâla* in the following vowels (McCarthy: 1994). Nonetheless, this does not occur in SK, i.e. pharyngeal consonants do not cause any changes in the following vowels as the emphatic consonants do. In SK, emphatic consonants are never followed by front vowels while pharyngeals precede both front and back vowels.

Other features for emphatics have also been suggested such as Constricted Pharynx [CP] used by Hoberman (1988) and Retracted Tongue Root [RTR] used by Al-Ani and El-Dalee (1983) and Davis (1993). All the above-mentioned distinctive features are articulatory based and do not conform to the principles Element Theory adopted in this study. Two acoustically based features have been suggested, namely [flat] by Jakobson

(1957) and [+F2 Drop] by Card (1983), which indicate weakening of the high-frequency components of the sound spectrum. Then again, these are all binary features that contrast with the framework of ET in which phonological primes are privative. In the rest of this section I use the term 'velarization' based on the targets and triggers of emphasis spread in SK.

3.3.2 Emphasis Spread in Sorani Kurdish

In his classification of Arabic sounds, Sibawayh (1982) identifies only four emphatic consonants which are the coronal obstruents *ṣ ṭ ḍ ẓ*. In modern studies these are classified as the primary emphatics which are retained in most of the modern dialects of Arabic (Herzallah: 1990; Bellem: 2007).[88] They are the most common emphatics that occur in all positions and in contiguity of all vowels (Harrell: 1957: 71). Moreover, they spread the emphasis leftwards and rightwards to other segments in the phonological word which usually affects the quality of the adjacent vowels, especially the low vowels. The main characteristic of these sounds is that they contrast phonemically with their plain counterparts. That is, the emphatic coronals are lexical segments in Arabic; for instance, *ṭiːn* 'mud' vs *tiːn* 'figs' (Harrell: 1957: 71). Arabic also has a less common group of emphatics, namely the secondary emphatics, which include *ṛ ḷ ḅ ṃ*. These consonants either occur in the environment of the primary emphatics or, when they occur independently, they occur in adjacency of back vowels (Harrell: 1957: 72-74; Bellem: 2007: 131).[89]

Although SK manifests most of the abovementioned emphatic sounds, they seem to behave differently from Arabic pharyngealized consonants. First, emphasis is not lexical in SK as it is in Arabic for the primary emphatics. Secondly, the emphatic sounds in SK have a very limited distribution; that is, they occur in adjacency of a subset of vowels only. Finally, and most importantly, I argue that emphatics in SK are velarized rather than pharyngealized as I will discuss shortly.

To date, very little attention has been paid to the study of emphatics in Kurdish, especially in SK. Most of the studies on Sorani phonology provide brief discussions of two emphatic coronals only: *ṣ* and *ṭ*. Nevertheless, other emphatic consonants, namely the coronals *ḍ ẕ*

[88] At least three of them have survived in the modern Arabic dialects as *ḍ* and *ḏ* are merged in most of the dialects to *ḍ* or *ẕ* (Bellem: 2007: 43).

[89] Harrell (1957) discusses another group of emphatics, namely 'marginal emphatics', which include *g f ʃ x ɣ h n w y ʔ*. They only occur in close proximity of other secondary emphatics.

and the labials *p̣ ḅ* and *m̥*,[90] occur in a substantial number of words as I illustrate later in this section. These consonants, to the best of my knowledge, are not discussed in any sources on SK except for a brief reference to some examples of *z̦* and *d̦* in Hamid (2016). These consonants, along with č̣, also occur in Kurmanji (Kahn: 1976) and the Neo-Aramaic dialect of Amedia (Hoberman: 1985) and the Neo-Aramaic dialect of Barwar (Khan: 2008) in northern Iraq.

To begin with, McCarus (1958) considers *ṣ* to be a lexical segment of extremely limited distribution in SK. According to McCarus (1958: 22; 1997: 694), this consonant occurs only in two words: *ṣad* 'one hundred' and *šaṣt* 'sixty'. Mackenzie (1961: 4), on the other hand, adds another word to this very short list, *ṣag* 'dog', and considers the emphatic consonant as a phonetic variant of the plain coronal *s*. Although *ṣ* occurs in many other high-frequency words, it is not accurate to consider it a lexical segment as it cannot form minimal pairs with its plain counterpart. That is, such words as *ṣag ~ sag* do not make minimal pairs. This is why most studies on Kurdish phonology consider it an allophone of *s*, for example Wais (1984), Amin (2004), Mahwi (2008) and Fatah (2010).

Similarly, *ṭ* substitutes the plain obstruent *t* in a number of words in SK and since it does not make any difference in meaning, it is considered an allophone of *t*. Some studies, for example Mackenzie (1961), McCarus (1958, 1997) and Amin (2004), do not, surprisingly, mention this velarized allophone of *t*, whereas Wais (1984) and Fatah (2010) briefly discuss this sound.

While there is, somehow, general consensus among linguists that *ṣ* and *ṭ* are allophones of *s* and *t* respectively,[91] the distribution of these allophones remains a controversial topic. Fatah (2010: 44) states that the use of *ṣ* might be determined by the morphology of these words as the sound occurs in a limited number of words in SK. Fatah does not give any explanation of any morpho-phonological rules to justify the use of this sound. He (2010: 44) simply remarks that linguists have so far failed to identify the source of emphasis in

[90] Bellem (2007) argues that in Arabic, labials, along with velars, do not become emphatics. They are perceived as 'being in 'front' or 'non-front' domains'.

[91] In earlier studies of SK, the Arabic letters ص and ط were included in the alphabet of SK, which uses the Perso-Arabic script, to represent the emphatic sounds especially in words borrowed from Arabic (for instance Fossum: 1919). It is worth mentioning that in the earlier studies of Kurdish, 'letters' are sometimes used to represent 'sounds'. This is why the use of these letters are sometimes misleading. Fatah (2010), however, argues that since the consonants are not part of the phonemic inventory of the language, there should not be any letters to represent them.

these words. Regarding *ṭ*, Wais (1984: 61) and Fatah (2010: 44) point out that it is usually replaced by *ṭ* when preceded or followed (though not adjacent to) by *ɬ*.

In the following sections I discuss the targets and triggers of emphasis spread in Slemani and Hawler and argue that the process is velarization and not pharyngealization.

3.3.2.1 Targets and Triggers of Emphasis Spread in Slemani Variety

In Slemani, three consonants *ɬ ř ŋ* spread emphasis leftwards to a preceding consonant in the vicinity of a low back and/or central vowel. Consider the following examples.

(15)	a.	*ḅâɬ*	[bˠɑɬ]	‘wing’
		ḅôɬa ḅôɬ	[bˠɒɬa bˠɒɬ]	‘rumbling’
		ḍâɬ	[dˠɑɬ]	‘eagle’
		ḍiɬ	[dˠiɬ]	‘heart’
		ḍôɬ	[dˠɒɬ]	‘valley’
		ṃâɬ	[mˠɑɬ]	‘home’
		ṃôɬat	[mˠɒɬat]	‘permission’
		ṗaɬa	[pˠʌɬæ]	‘stain’
		ṗiɬing	[pˠiɬiŋ]	‘tiger’
		ṗôɬâ	[pˠɒɬa]	‘steel’
		ṣâɬ	[sˠɑɬ]	‘year’
		ṣiɬâw	[sˠiɬaw]	‘greetings’
		baṭâɬ	[bætˠɑɬ]	‘empty’
		ṭâɬ	[tˠɑɬ]	‘bitter’
		ṭaɬa	[tˠʌɬæ]	‘trap’
		ẓâɬ	[zˠɑɬ]	‘dominant’
		ẓôɬ	[zˠɒɬ]	‘devious’
	b.	*ḅâŋ*	[bˠɑŋ]	‘call’
		ḍaŋ	[dˠʌŋ]	‘voice’
		ẓaŋ	[zˠʌŋ]	‘bell’
		ẓôŋ	[zˠɒŋ]	‘stagnant water’
	c.	*ḅařa*	[bˠʌræ]	‘rug’
		lâṗařa	[lapˠʌræ]	‘page’
		ṃôřa	[mˠɒræ]	‘frowning’
		ṗař	[pˠʌr]	‘feather’

	ṭař	[tᵛʌr]	‘wet’
	ṭôř	[tᵛɒr]	‘net’
d..	*bâš*	[baʃ]	‘good’
	bîr	[biɾ]	‘well’
	âmâda	[amadæ]	‘ready’
	mêš	[meʃ]	‘fly’
	pûlaka	[pʰulækʰæ]	‘sequin’
	sirka	[siɾkʰæ]	‘viniger’
	âzâ	[aza]	‘brave’

The empty vowel *ɨ* cooccurs with emphasis spread in a few words as in:

(16)	*dił*	[dᵛɨɬ]	‘heart’
	siŋ	[sᵛɨŋ]	‘chest’
	siř	[sᵛɨr]	‘numb’

Front vowels *î ê* and high back vowels *u û* block emphasis spread.

(17)	*pêłâw*	[pʰeɬaw]	‘shoes’
	tûřa	[tʰuræ]	‘angry’

Further, as the examples in (15d) show, the low back and/or central vowels do not spread emphasis when followed by other consonants than *ł ř ŋ*. The targets of emphasis spread in Slemani are the labials *p b m*, the dentals *t d* and the alveolars *s z*. According to Kahn (1976), Kurmanji has a pharyngealized affricate *ċ̌* [tʃᵛ] that occurs in such words as *ċ̌ang* ‘claw’ and *ċ̌am* ‘river’. This sound is not emphatic in SK, and neither my Slemani nor Hawler informants produced a voiceless emphatic affricate.

(18)	Slemani	Hawler	
čâł	[tʃaɬ]	[ʨaɬ]	‘hole’
čiř	[tʃɨr]	[ʨɨr]	‘dense’

Moreover, Kahn (1976) considers the uvular stop *q* to be a pharyngealized counterpart of *k* in KK on the basis of its phonological behaviour. I do not agree with Kahn in this regard for SK. See §2.3.2.5.

3.3.2.2 Targets and Triggers of Emphasis Spread in Hawler Variety

As noted in chapter two, Hawler dialect substitutes the velarised *ɬ* with *r* which blocks the emphasis spread. Similarly, the velar nasal *ŋ* does not occur in Hawler. Some examples are shown in (18).

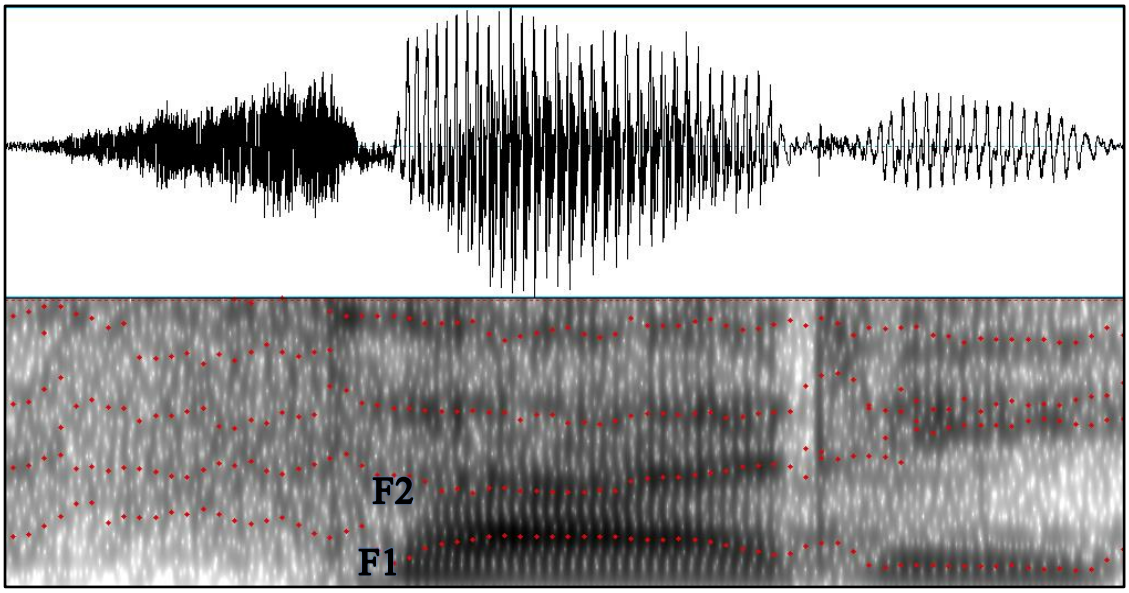
(18)

	Slemani	Hawler	
ṣâɬ	[sˠɑɬ]	[saɾ]	'year'
ṃâɬ	[mˠɑɬ]	[maɾ]	'home'
ḍiɬ	[dˠɨɬ]	[diɾ]	'heart'
ẓaŋ	[zˠʌŋ]	[zæng]	'bell'
ẓôŋ	[zˠɒŋ]	[zong]	'stagnant water'

See the difference between the two spectrograms in Figure 3.6 which show the emphatic and the plain allophones of *s* in the word *sâɬ-î* 'the year of' pronounced in Hawler and Slemani dialects respectively. In Slemani, the emphasis spreads to the *s* and there is a clear approximation between F1 and F2 of the following vowel, while in Hawler the flap *r* does not trigger emphasis spread to the *s*. It is important to note that some of my Hawler informants, those who have been in contact with Slemani speakers, sometimes produced the emphatic forms.

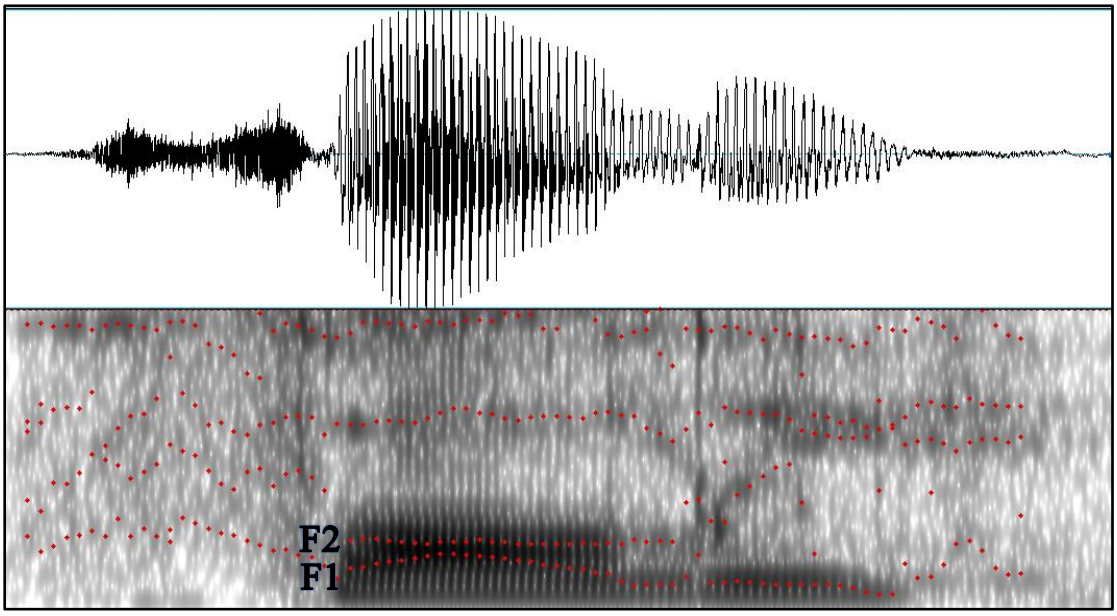
Figure 3.6 Spectrograms (and waveforms) of the word sâł-i 'the year of' in Slemani dialect vs Hawler dialect spoken by two adult males from (a) koya and (b) Slemani

a. [saɾi]



s	a	ɾ	i

a. [sˠɑɬi]



	sˠ	ɑ	ɬ	i	

In Hawler, the targets of emphasis spread are the same as Slemani, *p b m t d s z*. The trigger, however, is only the trill *ř* when preceded by a low back/central vowel.

(19)	*daṣiř*	[dæsˠɨr]	‘tissue’
	ṃař	[mˠʌr]	‘sheep’
	pâpộř	[papˠor]	‘ship’
	ṭařa piyâz	[tˠʌræ pjaz]	‘green onion’

The emphasis in some other words might be a result of a historical borrowing rather than a phonological process. Some examples are given in (20), however it is not easy to know the origins of Kurdish words as no comprehensive studies have been conducted on the etymology of words in Kurdish[92]. The words *toz* and *sâʁ* are borrowed from Turkish via Iraqi Arabic, *tox* is borrowed from Persian via Iraqi Arabic, *top* is borrowed from Persian and Turkish via Iraqi Arabic[93]. The initial consonants in these words are pharyngealized in Iraqi Arabic, while they are plain in the source languages. *supâs* and *sawiz* are borrowed from Persian; though, *supâs* is not used anymore in Persian (Hasanpoor: 1999: 139).[94]

(20)	*ṭôz*	[tˠɒz]	‘dust’
	ṣâʁ	[sˠɑʁ]	‘healthy/complete’
	ṭôx	[tˠɒx]	‘dark color’
	suṗâs	[sʊpˠɑs]	‘thank’
	ṭôp	[tˠɒp]	‘ball’
	ṣawiz	[sˠʌwɨz]	‘green’

Other words are borrowed directly from Arabic, such as:

(21)	*qaṣâb*	[qæsˠɑb]	‘butcher’
	faṣił	[fæsˠɨɬ]	‘season’
	ṣâbûn	[sˠɑbun]	‘soap’
	ṭałâq	[tˠʌɬaq]	‘devorce’
	ṭabaqa	[tˠʌbˠʌqæ]	‘layer’

[92] A few studies have been conducted on borrowing and loanwords in Kurdish which might be of some help to identify the origins of a small number of words. For example Abdulla (1980) and Hasanpoor (1999).
[93] See Has (2013) for the etymology of the Iraqi words.
[94] It is important to note that the pronunciation of loanwords may vary from speaker to speaker. So a few of my informants produced plain consonants.

Some loanwords are depharyngealized, such as:

(22)	*ṣabir*	→	*sabir*	'patience'
	ṭayyâra	→	*tayâra*	'aeroplane'
	qâḍî	→	*qâzî*	'judge'

As the examples in this and the previous section show, SK emphatics occur only when followed by low back/central vowel + *ɬ, ř, ŋ*. In ET terminology, the targets of emphasis spread, as discussed in chapter 2, all have a |U| element which spreads to the previous sounds. This asserts that regardless of their articulatory properties, emphatics are velarized phonologically in SK. One should keep in mind that the classification of sounds in phonology might be different from the phonetic classifications. That is, sounds are grouped into classes based on the phonological processes they participate in. This is why I I argue that, based on their phonological behaviour, the emphatics of SK are velarized.

3.3.3 Acoustic Correlates of Emphasis Spread

Acoustic correlates of emphasis spread in SK has not been investigated to date. This is why I briefly discuss the acoustic correlates of emphasis in other languages and compare them with SK in an attempt to identify the nature of empahtics in SK.

Arabic emphatics are pharyngealized. Ladefoged and Johnson (2011: 235) point out that 'since the cardinal vowel (5)—[ɑ]—has been defined as the lowest, most back vowel possible without producing pharyngeal friction, pharyngealization may be considered as the superimposition of this vowel quality'. The cardinal vowel [ɑ] is characterised by a low F2 and a high F1.[95]

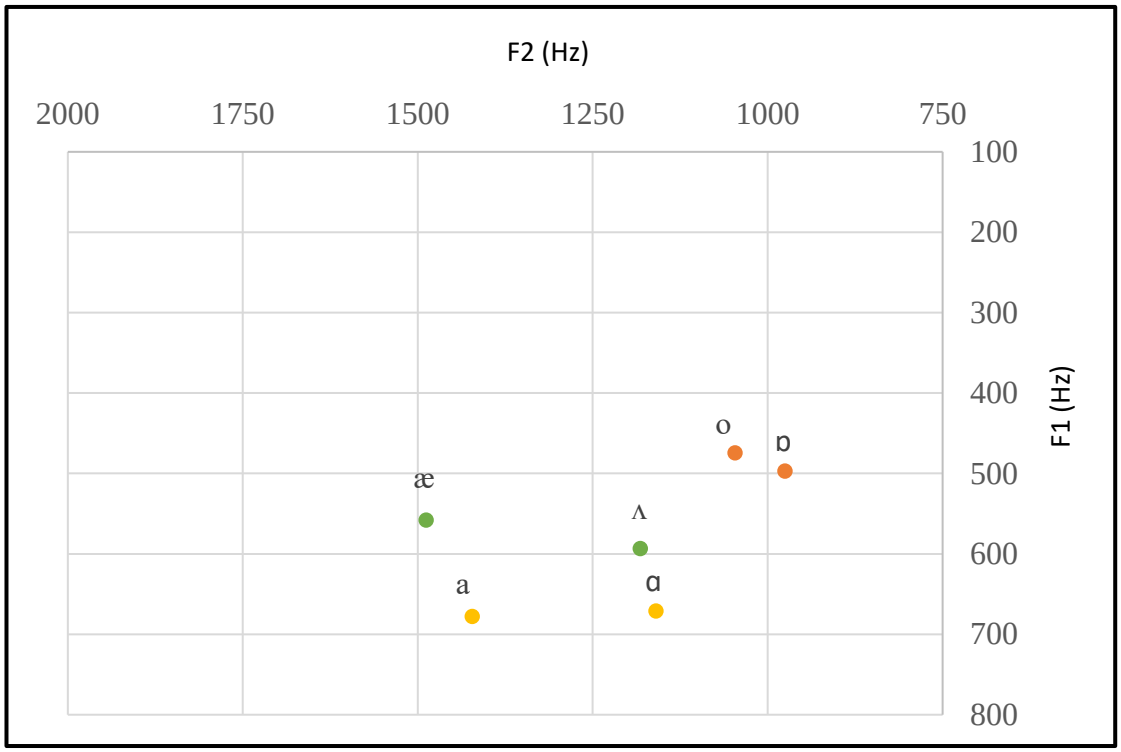
Pharyngealization spreads to neighbouring sounds and it causes lowering and backing in the adjacent vowels. Acoustic studies on pharyngealization agree that its main acoustic feature is reducing the gap between the first formant and the second formant. This mostly happens by lowering the second formant, which is a result of the enlarged oral cavity (Al-Ani 1970; Herzallah 1990; Watson 2002; Bellem 2007). There has been debate on whether pharyngealization causes F1 to rise or not. Some studies, among others Ghazeli (1977) and Shahin (1996, 1997), report a slightly higher F1 in context of pharyngealization, while others, e.g. Obrecht (1968) argues that the only acoustic cue of pharyngealization is a lowered F2.

[95] See Bellem (2007: 48).

In order to examine the influence of emphasis spread in SK, 50 tokens for each vowel in the context of emphasis spread, produced by 5 native speakers from Slemani (no Hawler speakers were includes since the examples included words having *ɬ* and *ŋ* which are not used by Hawler speakers), was acoustically analysed and F1 and F2 were measured.[96] Figure 3.7 shows that the vowels [æ] [a] [o] are backed (drop in F2) and [æ] [o] also show a visible rise in F1 while F1 was not changed for [a].

As the figure shows, [æ] is backed and lowered to [ʌ], [a] is backed to [ɑ] while [o] is backed and lowered to [ɒ]. However, the empty vowel [ɨ] does not change in the context of emphasis spread. Figures 3.8 and 3.9 show spectrograms and waveforms of the plain and emphatic voiceless coronal stops *t* and *ṭ* and voiced coronal stops *d* and *ḍ* respectively.

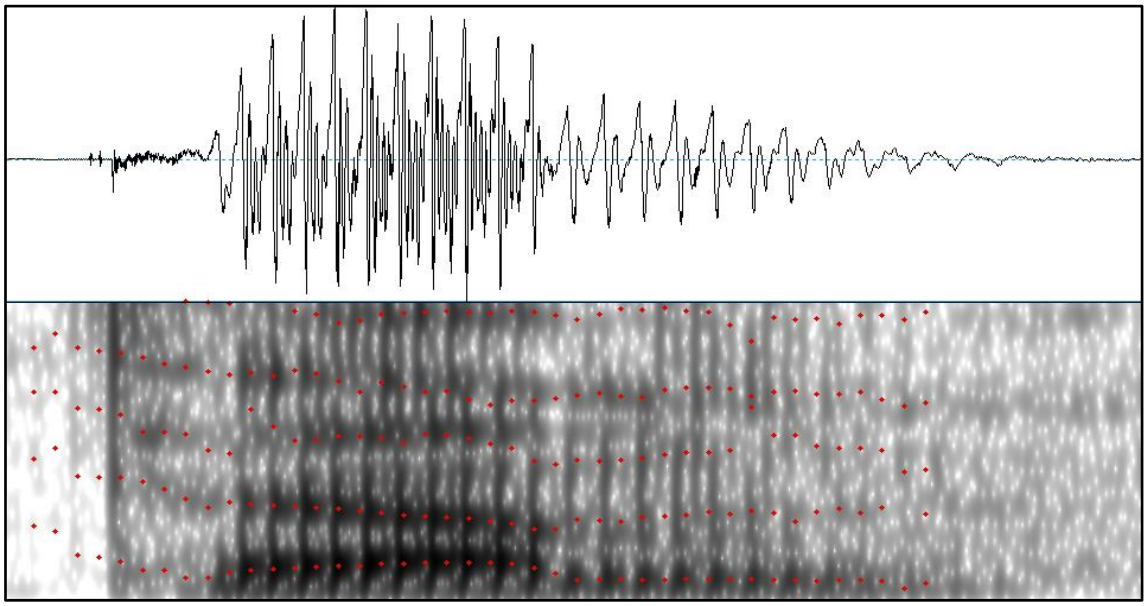
Figure 3.7 plain vs emphatic vowels



[96] See Appendix C.

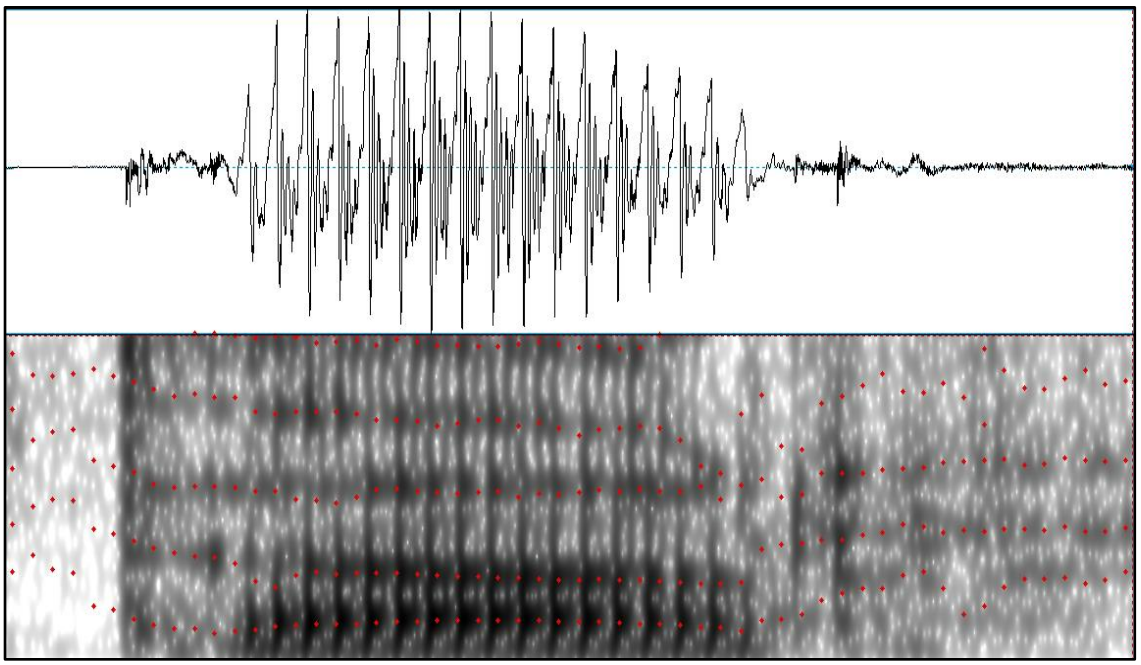
Figure 3.8 Spectrograms (and waveforms) of the words tam and ṭař spoken by an adult male from Hawler

a. tam [tʰæm] ‘fog’



	tʰ	æ	m	

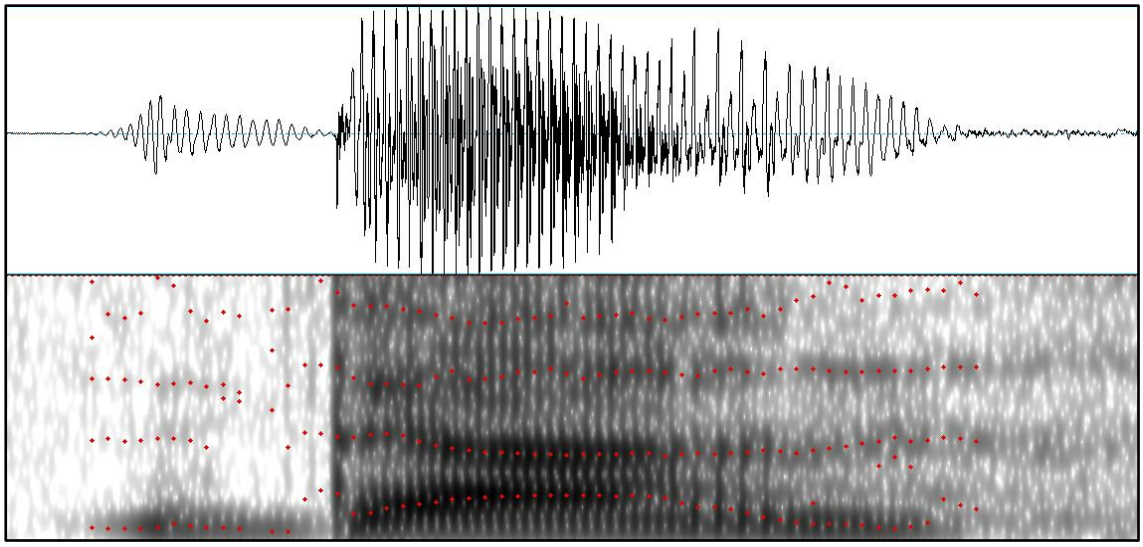
b. ṭař [tʸʌr] ‘wet’



	tʸ	ʌ	r	

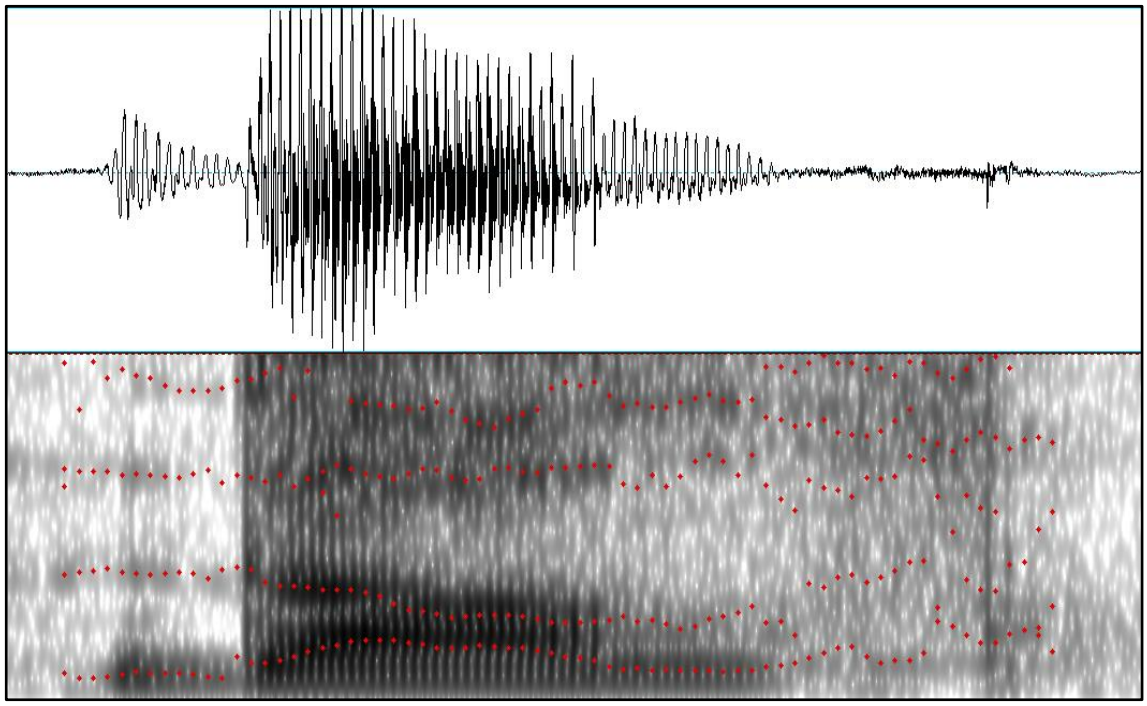
Figure 3.9 Spectrograms (and waveforms) of the words dân and ḍâł spoken by an adult female from Slemani

a) [dan]



	d	a	n	

b. [ḍɑł]



	dˠ	ɑ	ɬ	

As the spectrograms show, the gap between the first and second formants of the vowels following the emphatic *ṭ* and *ḍ* is noticeably decreased as compared to the vowels following the plain *t* and *d* as shown in table 3.2 below. VOT of *d* is (-85) and the VOT of *ḍ* is (-63).

Table 3.2 Midpoint frequencies (Hz) of the vowels shown in Figures 3.7 and 3.8.

Word	F1	F2	F2-F1
tam	515	1415	900
ṭař	617	1313	696
dân	794	1737	943
ḍâł	798	1338	540

Hoberman (1985) states that in the Neo-Aramaic dialects of Iran, the domain of pharyngealization is the whole word, i.e. the whole word is either plain or pharyngealized. Similarly, in Cairene and SanʕaniArabic dialects of Arabic (Watson 2002; Bellem 2007) pharyngealization may spread to the entire word. In SK, on the other hand, the domain of velarization is the syllable. Velarization spreads leftwards (regressive) only to the adjacent vowel, i.e. it does not extend to distant vowels in the word. That is if a word has more than one syllable, only the vowel preceding ł *ŋ ř* is velarized. As the following examples show, the vowel and the consonant following *ł* are not velarized.

(23) *ṃôłat* [mʸɒłat] ‘permission’
ṭała [tʸʌłæ] ‘trap’
ḅařû [bʸʌru] ‘oak’

3.3.4 Velarization in Element Theory

Velarization is spreading a velar quality to a preceding consonant. As discussed in chapter 2, velars in SK have a non-headed |U| in their representation. Consequently, the process of velarization involves spreading a |U| element from the trigger to the target segment. The triggers of velarization in SK, *ł ř ŋ*, have a non-headed |U| that spreads to the preceding consonant. The process is represented as follows.

(24)

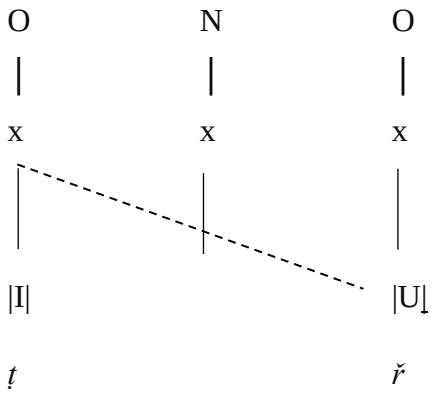
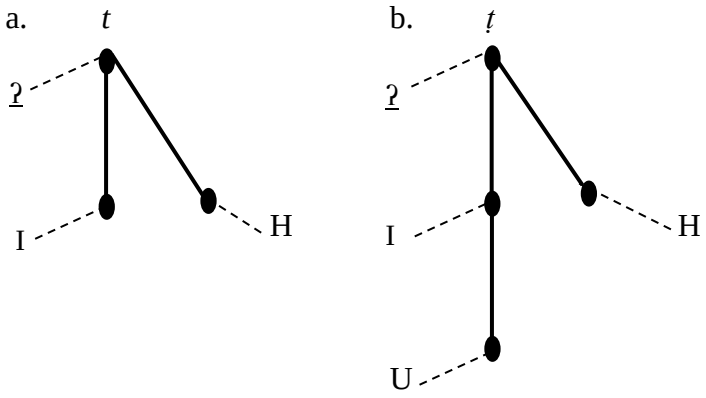


Figure 3.10 the representation of plain and velarized ṭ



To sum up, the process of emphasis spread is triggered by *ɬ ř ɬ* and it targets the labials *p b m* the coronals *t d s z*. It results from spreading a |U| element so I described as velarization rather than pharyngealization, as described in Semitic languages.

3.4 Nasal Place Assimilation

Nasal assimilation is one of the most common phonological processes in which a nasal assimilates in place of articulation to a following consonant. This process occurs in many languages such as English (Kang: 1996), Arabic (Elramli: 2012), German (Hall: 2010) and Italian (Celeta et al.: 2013).

3.4.1 Nasal Place Assimilation in SK

SK has two underlying nasal consonants, namely *n* and *m*. In addition to these two, the Slemani variety has another nasal segment *ŋ*.[97] The coronal nasal assimilates to the place of the following consonant while the labial nasal does not assimilate. According to

[97] See chapter 2 for details on nasal consonants in SK.

Padgett (1995), nasal place assimilation is triggered by stops and fricatives; however, typologically, nasals assimilate before stops more than fricatives.

3.4.1.1 The Assimilation of *n*

The place of articulation of *n* is coronal and it assimilates to:

(25) labial before the labial stops *p b*

farmânbar	*farmâmbar*	'employee'
barânbar	*barâmbar*	'opposite'
bôynbâx	*bôymbâx*	'necktie'
nân biřîn	*nâm biřîn*	'dismiss'
ǰiwân pôš	*ǰiwâm pôš*	'classy'
zimân pîs	*zimâm pîs*	'foul-mouthed'
hanbâna	*hambâna*	'sack'

(26) labio-dental before the labio-dental *f*

ǰiwên fîrôš	*ǰiwêɱ fîrôš*	'foul-mouthed'
gyân fîdâ	*gyâɱ fîdâ*	'fighter'

In the above examples, the assimilation is partial as the nasals have similar resonance elements but have different manner and/or laryngeal elements. If the trigger of the process is *m*, the assimilation is complete, as in (27).

(27)

binmîč	*bimmîč*	'ceiling'
xiwên miž	*xiwêm miž*	'tyrant'

Slemani also has a process in which the coronal *n* assimilates to the velar *ŋ* such as in:

(28)

Hawler	Slemani	
hang	*haŋ*	'bee'
mâng	*mâŋ*	'moon'

However, this is a slightly different process that also involves deletion and I will discuss it in chapter 5.

The labial nasal *m* does not undergo place assimilation except for one loanword from Arabic as shown in (29) and this happens for some speakers only. (30) shows *m* in adjacency of dental consonants.

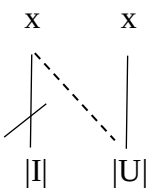
(29) *îmtîḥân* *întîḥân* ‘exam’

(30) *kam tarxam* ‘defective’
am dîw ‘this side’
hamdîs ‘again’

3.4.1.2 Nasal Place Assimilation in Element Theory

In ET terminology, the process of nasal place assimilation occurs when the resonance element of one nasal spreads to the preceding nasals. The resonance element of the trigger is delinked as shown below.

(31)



To sum up, SK has a regressive process of nasal place assimilation in which the coronal nasal assimilates to the following labial sounds. The labial nasal *m* does not undergo nasal place assimilation.

3.5 Summary

In this chapter, I discussed three types of place assimilation in SK: palatalization, emphasis spread and nasal place assimilation. Neither palatalization nor emphasis spread, to the best of my knowledge, have been discussed in detail in SK. So, I discussed the targets and the triggers of palatalization and presented data to show that the output of palatalization differs between Hawler and Slemani. I also discuss emphasis spread in SK and concluded that it differs from emphasis spread in other languages as it actually is velarization rather than pharyngealization based on the phonological evidence. The chapter ends with a section that briefly discusses nasal place assimilation in SK.

Chapter Four

Laryngeal Processes in Sorani Kurdish

In chapter three, I discussed three phonological processes that involve place assimilation: palatalization, emphasis spread and nasal place assimilation. In this chapter, I focus on phonological processes that trigger laryngeal properties of obstruent consonants. The chapter studies voicing properties of obstruent consonants in SK. There is a large body of literature analysing laryngeal specifications of obstruents which either provide a cross-linguistic account, such as Lisker and Abramson (1964), Cho and Ladefoged (1999) and Petrova et al. (2006), or study specific languages such as Kallestinova (2004) in Turkish, Bijankhan and Nourbakhsh (2009) in Persian, Ringen and Suomi (2010) in Fenno-Swedish, Vanlocke (2011) in Dutch, Jessen (1998) and Jessen and Ringen (2002) in German, Ringen and Kulikov (2012) in Russian, Hunnicut and Morris (2016) in Southern American English and Kahn (1976) in Kurmanji Kurdish.

Laryngeal contrasts in SK have not been investigated. There are a few sources which briefly mention the laryngeal specifications of stops, but they are based on impressionistic judgements and they are not backed up by acoustic measurements.

This chapter provides the first detailed account of VOT as the main acoustic cue of laryngeal contrasts in SK obstruents in word-initial position. 4.1 is a background to laryngeal contrasts. 4.2 discusses VOT as a cue of voice and aspiration. 4.3 is about word-initial laryngeal contrasts in SK. Then, in the rest of the chapter, I discuss two main phonological processes that involve laryngeal specifications of obstruent consonants which are final laryngeal neutralization in 4.4 and voice assimilation in 4.5.

4.1 Background

Collins and Mees (2013) divide languages into two groups: a) those that have aspiration such as English, standard German, Danish, Swedish and Welsh, b) those that do not have aspiration such as Dutch, Spanish, French, Russian and Polish. Non-aspirating languages, known as true voice languages, have a two-way laryngeal contrast between voiced stops and voiceless unaspirated stops word-initially; the voiced stops in these languages are pre-voiced, i.e. the vibration of the vocal folds starts before the stop closure.[98] For

[98] van Alphen and Smits (2004) argue that utterance-initial pre-voicing in Dutch, which is a non-aspirating language, is not consistent for all speakers and 25% of all the tokens produced by their subjects did not have pre-voicing. Also see Ringen and Suomi (2010) for similar results in Fenno-Swedish.

example Russian has a contrast between voiceless unaspirated *p t k* and voiced *b d g* (Kulikov: 2012). Aspirating languages, on the other hand, have a two-way word-initial laryngeal contrast between plain voiceless and voiceless aspirated stops. English, for example, has a contrast between plain voiceless *b d g* and voiceless aspirated p^h t^h k^h.[99]

This shows that the SPE-feature terminology 'voiced' vs 'voiceless'[100] does not accurately describe laryngeal contrasts in all languages. This terminology may be accurate for such languages as Russian and French where the lenis stops *b d g* are fully voiced and contrast with the voiceless *p t k*, while lenis stops in English and German are actually voiceless word-initially. Harris (1994: 134) notes that the so-called voiced stops *b d g* in English are not phonetically voiced word-initially and that they are actually identical to the plain *p t k* in French. Keating (1984) argues that the phonetic realization of the lenis voiceless stops in English is [b̥ d̥ g̥] instead of [b d g]. Further, not all fortis stops are plain voiceless as in aspirating languages the fortis stops are articulatorily aspirated. Hence, the feature [voice] can describe laryngeal contrasts in true voice languages but it does not represent laryngeal contrasts in the aspirating languages.

Some linguists, among others Kim (1970), Iverson and Salmons (1995), Jessen and Ringen (2002) and Petrova et al. (2006), argue that in aspirating languages, laryngeal contrasts in stops are represented by glottal aperture; that is, the feature [spread glottis]. This feature was first proposed by Kim (1970) and was developed in Halle and Stevens (1971). In this regard, Kim states:

> …it seems to be safe to assume that aspiration is nothing but a function of the glottal opening at the time of release. This is to say that if a stop is *n* degree aspirated, it must have an *n* degree glottal opening at the time of release of the oral closure. (1970: 111)

Accordingly, aspirated stops are produced with a widely open glottis while voiced stops are characterized by a constricted glottis.

After the release of the stop, the vocal folds start to come together to produce the vibration for the following vowel and, according to Kim (1970: 109), the length of aspiration is equal to the time it takes for the open glottis to close for vibration of the following vowel.

[99] Lombardi (1991) proposes a system of laryngeal specifications in languages with three or four series with obstruents that include six laryngeal groups which are voiced glottalized, voiced, voiceless, voiced aspirated, voiceless aspirated and voiceless glottalized.

[100] Other terminology has also been used to show this distinction. For example, 'tense' or 'fortis' which involve strong muscular effort and movement vs 'lax' or 'lenis' which are produced with less muscular effort and movement. Harris (1994: 134), following Halle and Stevens (1971), uses 'stiff' vs 'slack' which represent tension of vocal folds and correspond to the presence of the H element and L element respectively.

In aspirated stops, the vocal folds take a longer time to get together and start vibrating. That is, the glottis is still open after the release of the closure. In voiced stops, on the other and, the glottis is already narrow at the time of release; therefore, vibration for the following vowel does not take long.[101]

Kim's (1970) proposal was developed later to what is now known as Laryngeal Realism (Honeybone: 2005) which argues that in aspirating languages the feature [spread glottis] is active while in true voice languages the feature [voice] is active, and these both contrast with a plain category that lacks these features, as shown in the table below.[102] As discussed in the following sections, the data used in this study suggest that SK uses both [voice] and [spread glottis] to show laryngeal contrasts.[103]

Table 4.1 Laryngeal specifications in languages with two-way laryngeal contrasts

Aspirating languages	*p^h t^h k^h*	[spread glottis]
	b d g	[Ø]
True Voice Languages	*p t k*	[Ø]
	b d g	[voice]

Lisker and Abramson (1964) propose that laryngeal contrasts can be represented by means of variations in voice onset time (hereafter VOT). In the following section, I discuss VOT as a cue for laryngeal contrasts across languages.

4.2 Voice Onset Time

Voice onset time refers to the point in time at which the vocal folds start vibrating in relation to the release of a closure. Lisker and Abramson (1964) study VOT of word-initial stops in eleven languages and they identify three types of languages: a) languages with two-way laryngeal contrasts such as Dutch and English, b) languages with three-

[101] Kim (1971: 110) studies Korean which has a three-way contrast between a heavily aspirated series characterized by a spread glottis (10 mm), a slightly aspirated series with a narrower glottis (3mm) and a plain series with a closed glottis (1 mm).

[102] See Honeybone (2005) for diachronic evidence of [spread glottis] in aspirating languages.

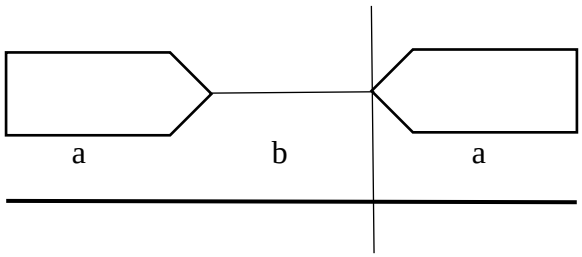
[103] See Vaux and Samuels (2005) for a detailed discussion of laryngeal markedness in which they argue that the generalizations that the aspirated series is more marked than the plain and voiced series are incorrect.

way laryngeal contrasts such as Thai and c) languages with four-way laryngeal distinctions such as Hindi.

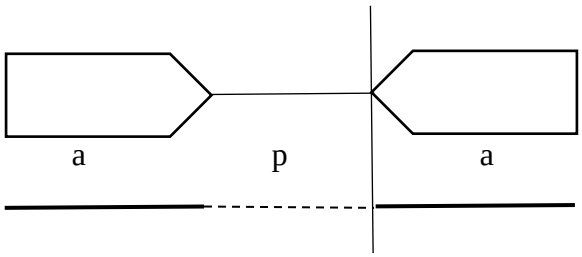
Lisker and Abramson (1964) identify three types of VOT in word-initial position: a) negative VOT where voicing starts before and continues during the release of the stop closure, b) zero VOT where the voicing for the following vowel starts very shortly after the release of the closure, and c) positive VOT in which vibration of the vocal folds starts after the release of the closure. Figure 4.1 shows the VOT of a) fully voiced *b*, b) voiceless unaspirated *p* and c) voiceless aspirated p^h as illustrated by Davenport and Hannahs (2005).

Figure 4.1 VOT of b, p and p^h (from Davenport and Hannahs 2005: 70)

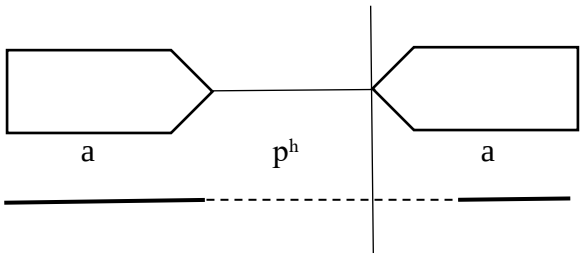
a. *b*



b. *p*



c. p^h



For the fully voiced *b*, voicing (indicated by a black thick line) starts before the closure and continues after the release of the closure into the following vowel. In the voiceless unaspirated *p*, there is a period of lack of voicing (indicated by a broken line) during the closure of the stop and voicing starts after the release of the closure. Sometimes voicing does not start immediately after the release, and the stop has a short-lag VOT. In the aspirated p^h, there is a substantial delay between the release of the stop and onset of voicing for the following vowel. Hence, the stop is aspirated.

In Lisker and Abramson's (1964) study, four languages, namely Dutch, Spanish, Hungarian and Tamil, have a set of negative VOT values (voiced) contrasting with a set of small positive VOT values (plain voiceless), see Table 4.2. Cantonese and English have a set of small positive values (plain voiceless) that contrast with a set with higher positive value, see Table 4.3.

Table 4.2 Mean VOT (in ms) values of stops in Dutch, Hungarian, Puerto Rican Spanish and as reported by Lisker and Abramson (1964)

	Dutch	Hungarian	Puerto Rican Spanish	Tamil
p	10	2	4	12
t	15	16	9	8
k	25	29	29	24
b	-85	-90	-138	-74
d	-80	-87	-110	-78
g		-58	-108	-62

Table 4.3 Mean VOT (in ms) values of stops in Cantonese and English as reported by Lisker and Abramson (1964)

	Cantonese		English
p	9	*b*	1
t	14	*d*	5
k	34	*g*	21
p^h	77	p^h	58
t^h	75	t^h	70
k^h	87	k^h	80

As the data in Tables 4.2 and 4.3 show, the languages with a two-way laryngeal contrast have a plain category that contrasts with a voiced category in true voice languages and contrasts with an aspirated category in the aspirating languages. None of these languages has a distinction between a fully voiced and a voiceless aspirated set of stops. Eastern Armenian has a three-way contrast between voiced, voiceless glottalized unaspirated and voiceless aspirated while Hindi has an additional category which is voiced aspirated (Lisker and Abramson: 1964: 397).

Lisker and Abramson (1964: 403) conclude that the VOT values in the eleven languages they study can be classified into three categories. The first category ranges from -125 to -75, the second category ranges from 0 to +25 and the third category ranges from +60 to +100. However, Cho and Ladefoged (1999: 223), who study VOT in 18 languages, state that VOT values of stops vary from language to language and the distinction between aspirated and unaspirated stops is not as straightforward as it seems to be. Therefore, they argue that only two phonetic categories are not enough to distinguish between aspirated and unaspirated stops in all languages. They identify four phonetic categories for velar stops: unaspirated (30ms), slightly aspirated (50ms), aspirated (90ms) and highly aspirated stops.

The duration of VOT depends on the place of articulation of the stop; that is, the further back, the longer the VOT (Maddieson: 1999). In Lisker and Abramson's (1964) study, velar stops tend to have the longest VOT. Similarly, Cho and Ladefoged (1999) conclude that velar stops have higher VOT values than labial and coronal stops and in the languages that have a contrast between velar and uvular stops, either velar or uvular stops have the longest VOT. Similar results have been reported in other studies such as Byrd (1993) and Nearey and Rochet (1994).[104] Maddieson (1999) and Cho and Ladefoged (1999) argue that this variation is caused by the size of the supraglottal cavity behind the point of constriction. For velars, the cavity behind the constriction is smaller and the cavity in front of the constriction is larger compared to labials and coronals. Consequently, the air pressure behind the velar constriction is high enough to not let any airflow from the lungs flow through the vocal folds and cause vibration. Similarly, the large volume of air in front of the velar constriction takes a longer time to be moved in order to make room for

[104] See Dorechy (1992) for more details on studies that show variation in VOT across the places of articulation.

the air behind the constriction to be released. This is why velar stops tend to have a longer VOT than labial and coronal stops.

Furthermore, Hardcastle (1973 in Cho and Ladefoged: 1999) argues that VOT variation can also be caused by the movement of the articulators, i.e. the articulators for labial and coronal stops (the lips and the tip of the tongue) move faster than the articulator for velars (the back of the tongue). Additionally, Maddieson (1997) states that the movement of the lips is accelerated by 'the effect of jaw opening' while the articulators for velars take a longer time to separate and are not affected by the jaw opening.[105]

However, as Maddieson (1997) and Cho and Ladefoged (1999) argue, the abovementioned causes of VOT variation hold for unaspirated or slightly aspirated stops while the longer VOT in velars might be because 'the glottal opening area after the release will decrease less rapidly for the velar than for the alveolar or labial because the intraoral pressure drops more slowly for the velar' Cho and Ladefoged (1999: 213).

Another factor that has been reported to cause VOT variation is the phonemic environment. In Klatt (1975), VOT was longer before sonorant consonants than before vowels. While Lisker and Abramson (1964) report that vowel quality does not affect VOT, other studies such as Klatt (1975) and Rochet and Fei (1991) argue that the VOT of stops also varies according to the quality of the following vowel. Klatt (1975: 691) reports that the VOT of stops is longer before high vowels than low vowels. That is, VOT is generally longer if the following segment has a low F1. Similar findings are presented in Ohala (1981), Rochet and Fei (1991) and Morris et al. (2008).

VOT is said to vary according to other factors such as speech rate (Miller et al. 1986; Baum and Ryan 1993; Kulikov 2012), age of the speaker (Bóna: 2014), sex of the speaker (Swartz 1992; Whiteside and Irving 1997; van Alphen 2004) and fundamental frequency (McCrea and Morris: 2005).

In the following section, I discuss laryngeal contrasts in SK. I discuss voice and aspiration of stops and affricates in word-initial position and also study VOT in the velarized counterparts of the stops.

[105] See Cho and Ladefoged (1999: 210).

4.3 Laryngeal Contrasts in Sorani Kurdish: Word-initial Position

There is general consensus in the literature on Sorani phonology that the voiceless stops *p t k* are aspirated and contrast with a set of voiced stops *b d g*. McCarus (1958: 17) argues that 'voiceless stops (except uvular and glottal) are slightly aspirated in word-initial position, and may or may not be aspirated in word-final position.' Mackenzie (1961b) maintains that *p t k* are aspirated in all positions and *q* is aspirated only before *u*. The affricates *č ǰ*, which I argue behave like the stops in SK, have not been discussed with regard to laryngeal specifications. Moreover, to the best of my knowledge, no studies provide acoustic measurements of stop consonants to show laryngeal contrasts in SK.

The only study that gives a detailed account of laryngeal contrasts in Kurmanji Kurdish, is Kahn (1976), which presents VOT values of stops and affricates in KK. Kahn concludes that KK has three voicing categories: voiced, voiceless unaspirated, voiceless aspirated in addition to a pharyngealized category which has a similar VOT to the voiceless unaspirated series. See the examples in Table 4.4, below.

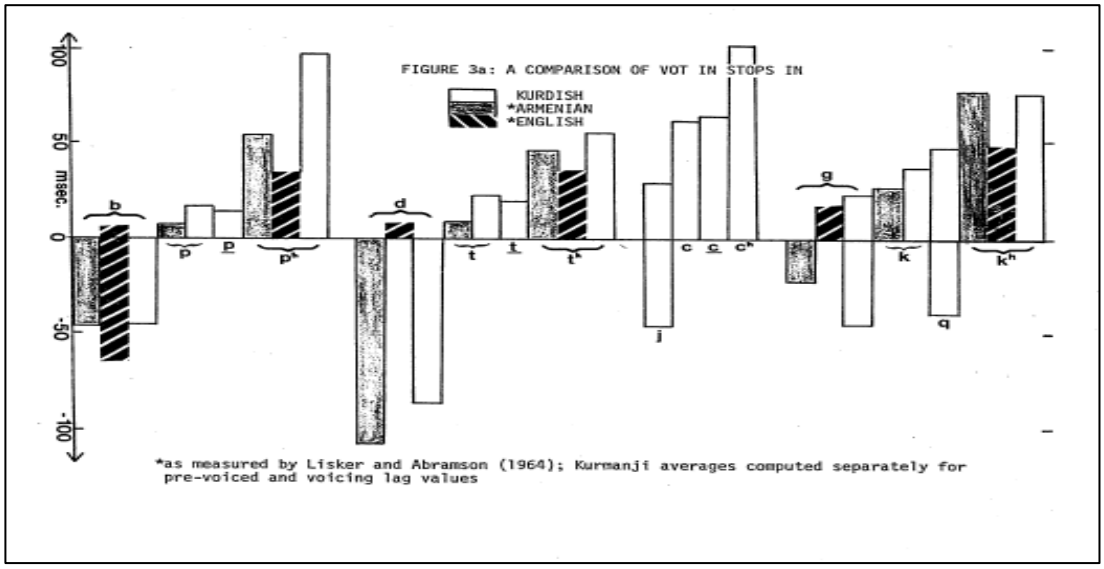
Table 4.4 Laryngeal categories in Kurmanji Kurdish as reported by Kahn (1976)

Voiced	*bâr* 'load'	*dil* 'heart'	*gal* 'with'	*ǰînâr* 'neighbour'
Voiceless unaspirated	*pâr* 'last year'	*tirî* 'grapes'	*kitkit* 'little by little'	*čap* 'left'
Voiceless aspirated	*pʰâra* 'money'	*tʰuk* 'hair'	*kʰitʰêb* 'book'	*čʰîn* 'China'
Pharyngealized	*ṗân* 'wide'	*ṭoti* 'parrot'	*qalam* 'pen'	*ʠang* 'fistful'

Kahn (1976) considers the voiceless uvular stop *q* as a pharyngealized counterpart of the velar stop *k* and this is why she includes it in the laryngeal categories presented in the table above. Although I argue that *q* behaves like a back consonant and has an |A| element in its representation, I do not consider it as a pharyngealized counterpart of *k* in SK.[106] Figure 4.2 shows Kahn's (1976) mean VOT values of stops and affricates in KK compared to English and Armenian.

[106] See §2.1.1.1 and §2.4.2.6 for details about *q* in SK.

Figure 4.2 Mean VOT of stops and affricates in Kurmanji Kurdish compared to English and Armenian by Kahn (1976)



Kahn (1976: 22) argues that Kurmanji might have borrowed the voiceless unaspirated series from Armenian, which is a neighbouring Indo-European language, and has a three-way laryngeal contrast between voiced, voiceless unaspirated and voiceless aspirated (see Cho et al. 2019) and so she compares her results for KK with Lisker and Abramson's (1964) results for Armenian. Figure 4.2 also includes laryngeal contrasts in English (see Table 4.3) which is used as an alternative to Persian as, Kahn (1976: 22) argues, English and Persian have similar laryngeal distinction systems and she could not obtain data from Persian. Kallestinova (2004) studies VOT of stops in Standard Contemporary Persian and concludes that the language has a two-way laryngeal contrast between a voiceless aspirated series which has a long lag VOT and a voiced series which in the majority of the voiced tokens has a short lag VOT. This supports Kahn's view that English and Persian have similar laryngeal contrasts.

In the rest of this section, I investigate laryngeal contrasts in word-initial position in SK and discuss the data I have collected from my Slemani and Hawler informants, and I argue that unlike KK, SK has a two-way laryngeal contrast between a fully voiced group and a voiceless aspirated group.

4.3.1 The Data

Five Sorani speakers, two from Hawler and three from Slemani, were recorded. Four of the participants were monolingual[107] and the other one spoke Arabic and English as well. They were all educated, and their ages ranged from 30-43. The participants were recorded in a quiet room reading a list of words with word-initial stops and affricates in front of a microphone which was placed approximately 20 cm from their mouth. They were instructed to read the words one by one leaving a pause between the words at a normal tempo as naturally as they could. To achieve this, they were asked to read the list twice and only the second recordings were included in the study as they sounded more natural and the participants felt more comfortable with the recording environment. Moreover, the exact purpose of the recordings was not explained for the participants in order to avoid overexaggerating in pronouncing the words.

The data include voiced and voiceless stops with three different places of articulation: bilabial, dental and velar and voiced and voiceless affricates followed by both high and low vowels. The data also include a set of voiced and voiceless velarized stops with labial and dental place of articulation followed by back vowels.[108] As discussed in chapter two, Kurdish does not allow word-initial consonant clusters; this is why the list does not include any word-initial stop/affricate+C clusters. The VOT of 55 tokens for each of the plain obstruents (385 in total) and 25 (100 in total) tokens for each of the velarized obstruents was manually measured using Praat (Boersma and Weenink: 2018). A detailed list of the data is given in Appendix C.

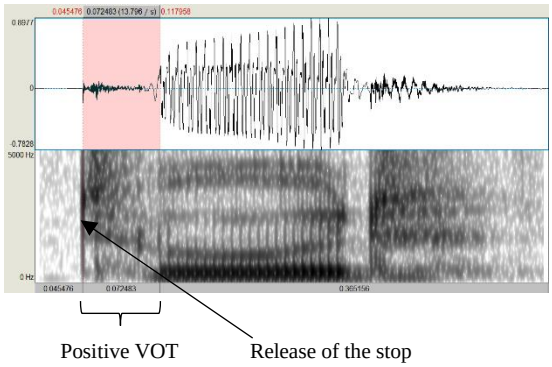
For the voiceless stops *p ṗ t ṭ k q* the beginning point was defined as the point in time in which the stop closure was released and the end point was the point in time when the vocal folds started vibration, as shown in Figure 4.3a. For the voiced stops *b ḅ d ḍ g*, the beginning point was defined as the point in time in which the vocal folds started to vibrate and the end point was the burst of the stop, as shown in Figure 4.3 b. A similar procedure was followed for the affricate and velarized consonants.

[107] Due to the strong language contact discussed in chapter one, most educated speakers of Sorani in Iraq speak or at least understand another language, mainly Arabic. This, however, does not seem to have affected their production of laryngeal contrasts as they have spent the majority of their life in a community that predominantly speaks Kurdish.

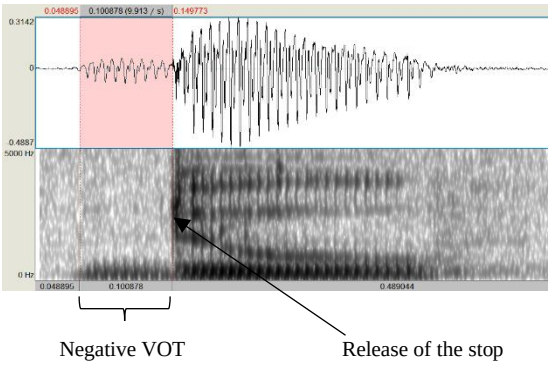
[108] Velarized consonants in SK are always followed by back vowels. See Chapter 3.

Figure 4.3 VOT measurement of a) voiceless and b) voiced stops

a) voiceless word-initial *t*



b) voiced word-initial *d*



The results of these analyses are summarized in table 4.5 and 4.6 and figure 4.4 below.

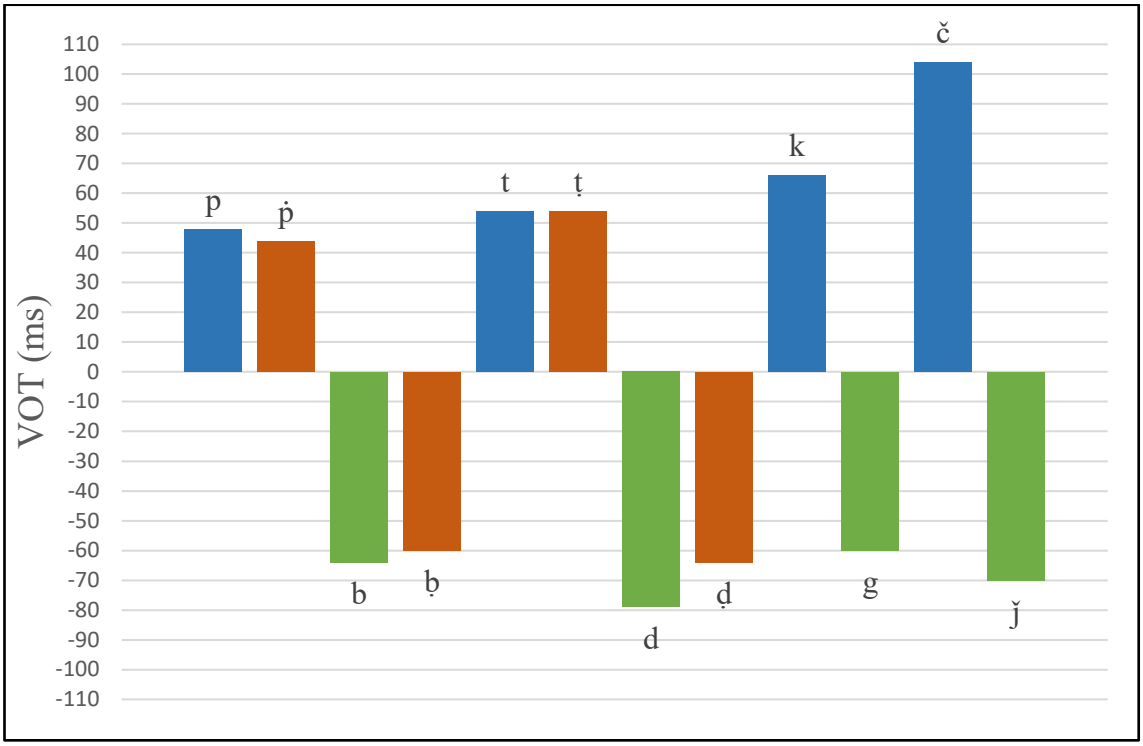
Table 4.5 Mean VOT values of word-initial stops in SK in (ms), (n=55)

	Labial *p b*	Coronal *t d*	Palatal *č ǰ*	Velar *k g*	Uvular *q*
Voiceless	48	54	104	66	56
Voiced	-64	-79	70	-60	

Table 4.6 Mean VOT values for word-initial velarized stops in (ms), (n=20)

	Labial *ṗ ḅ*	Coronal *ṭ ḍ*
Voiceless	44	46
Voiced	-60	-64

Figure 4.4 Chart of mean VOT values of word-initial plain stops, velarized stops and affricates in SK

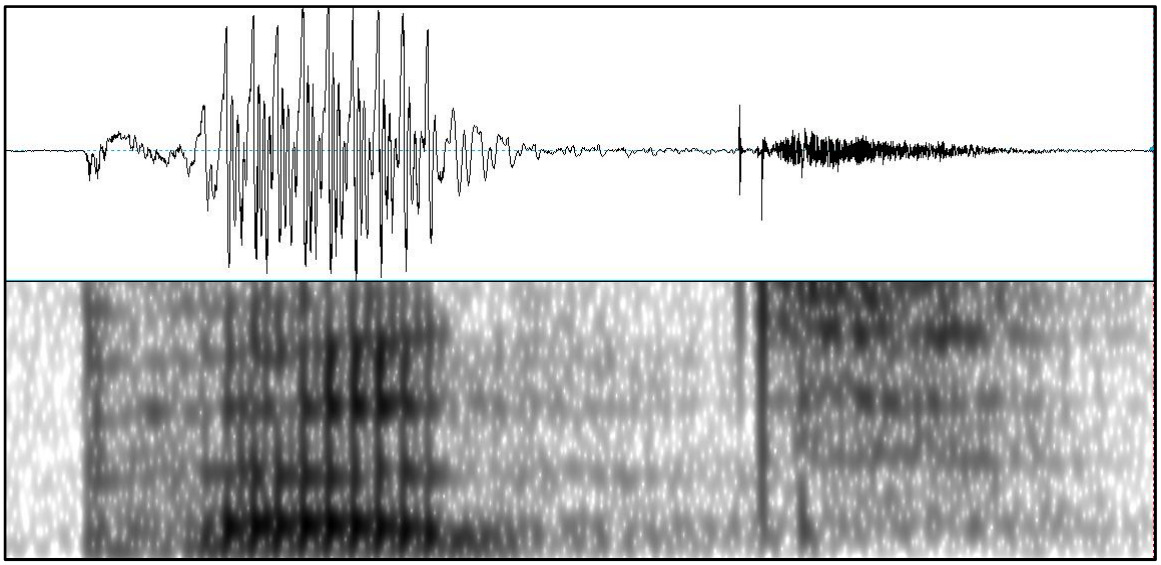


4.3.2 Voiceless Stops

The voiceless stops *p t k q* and the affricate *č* are aspirated in word-initial position with positive VOT values, as shown in table 4.5. Figures 4.5 and 4.6 show spectrograms and waveforms of word-initial aspirated stops in SK.

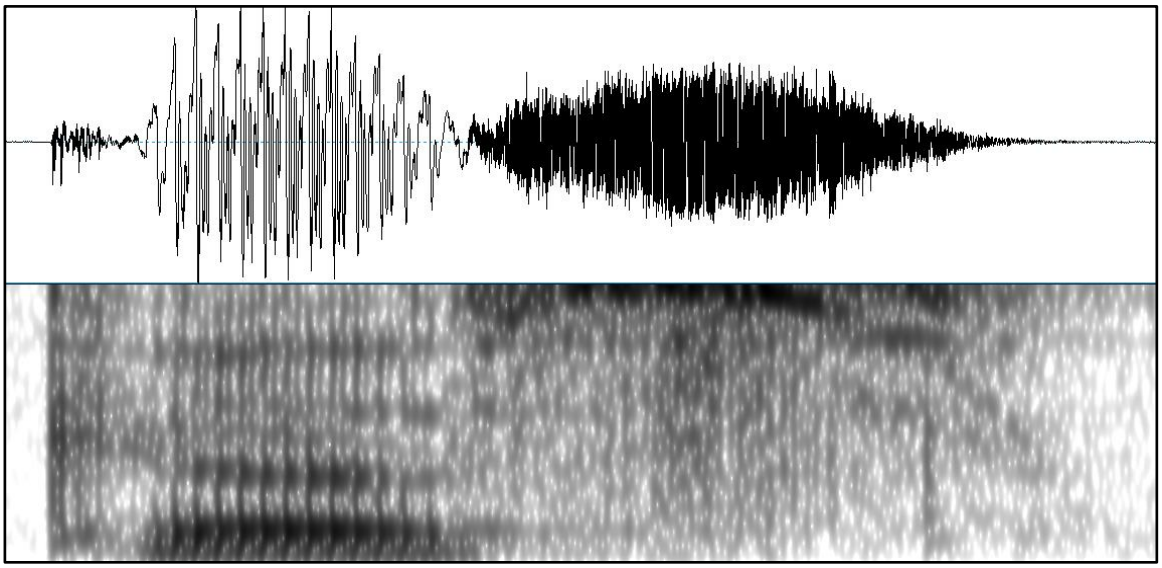
Similar to the results found by Lisker and Abramson (1964) and Cho and Ladefoged (1999), the velar *k* has the longest positive mean VOT (66 ms), followed by the uvular *q* (56 ms) and then the coronal *t* (54), while the labial *p* has the shortest positive mean VOT (48). All voiceless stops are aspirated before all the lexical vowels as well as the empty vowel. In contrast to Mackenzie's (1961b) argument, in my data, as shown in appendix C, the voiceless uvular stop *q* is aspirated before all vowels, not only *u*. Positive VOT is, however, higher before high vowels than before low vowels, as shown in Table 4.7, below.

Figure 4.5 Spectrogram and waveform of word-initial p in the word pat [pʰætʰ] 'rope' spoken by a male speaker from Slemani



	p^h	æ	t^h	

Figure 4.6 Spectrogram and waveform of word-initial k in the word kas [kʰæs] 'no one' spoken by a male speaker from Slemani



	k^h	æ	s	

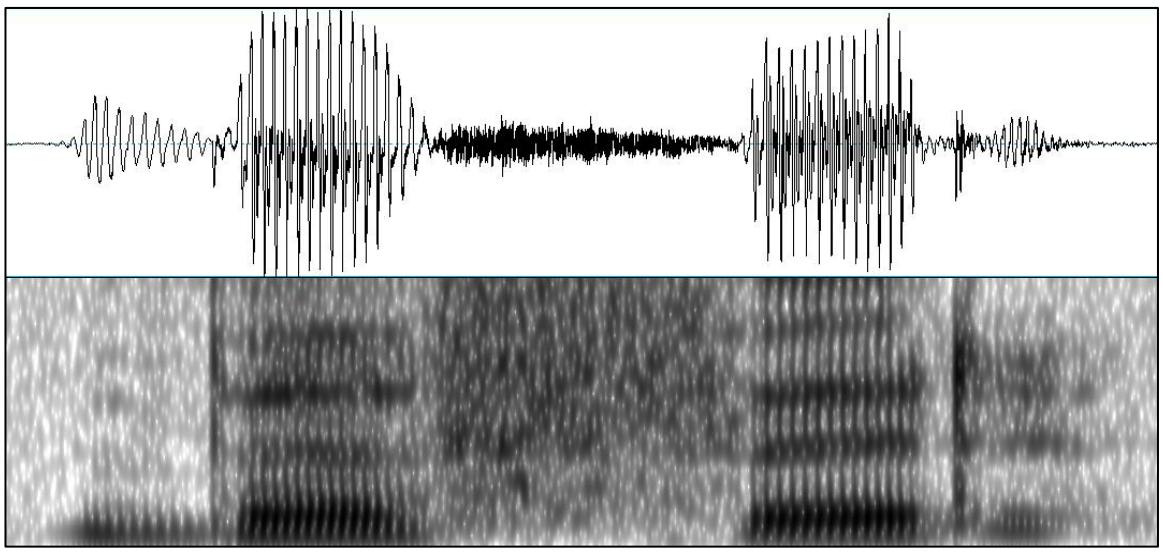
Table 4.7 VOT values for stops before high and low vowels in (ms) spoken by a female from Slemani

token	VOT	token	VOT
pat	39	*pîr*	49
tam	48	*tîr*	67
kam	58	*kîž*	81
qal	50	*qîn*	59

4.3.3 Voiced Stops

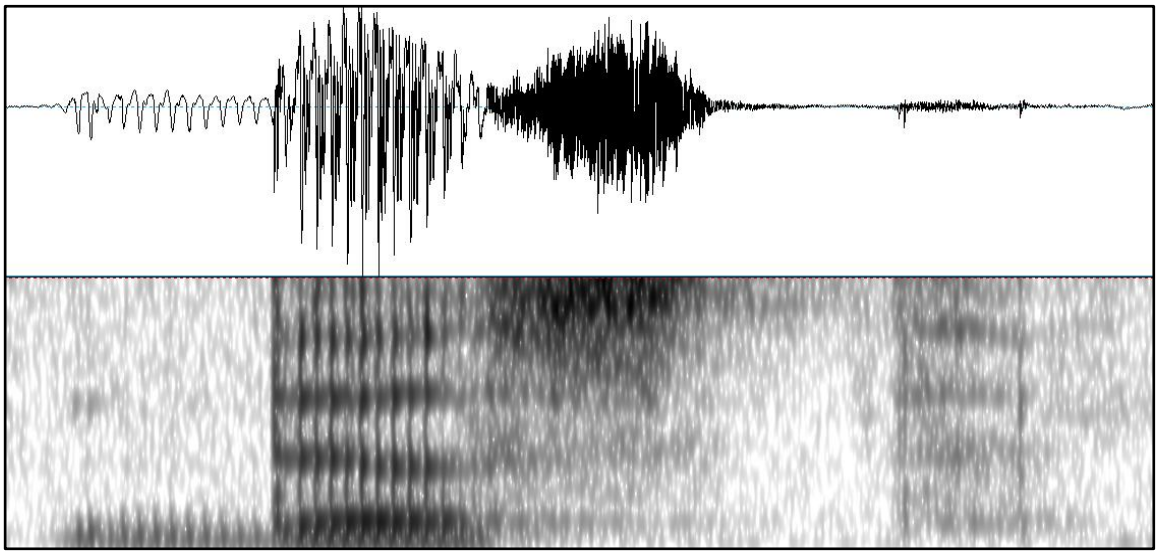
The voiced stops *b d g* and the affricate *ǰ* are prevoiced with negative VOT values. Figures 4.7 and 4.8 show spectrograms and waveforms of word-initial voiced stops in SK.

Figure 4.7 Spectrogram and waveform of word-initial b in the word bafir [bæfɨr] 'snow' spoken by a male speaker from Slemani



	b	æ	f	ɨ	ɾ

Figure 4.8 Spectrogram and waveform of word-initial d in the word dast [dæst^{h}] 'hand' spoken by a male speaker from Slemani



	d	æ	s	t^{h}

Similar to the duration of aspiration in the fortis stops, place of articulation is said to influence the duration of prevoicing in lenis consonants (Lisker and Abramson: 1964). The results[109] support the cross-linguistic generalizations[110] which confirm that prevoicing in bilabial and dental stops is longer than in velar stops. In SK the dental *d* has the longest voicing lead followed by the bilabial *b* and the velar *g* has the shortest voicing lead. This result differs from results for Dutch and Hungarian and Puerto Rican Spanish, displayed in Table 4.2 above, where the bilabial stop has the longest voicing lead followed by the dental then the velar stop. However, consider Tamil, Table 4.2, which has a similar pattern of voicing lead to SK in relation to the place of articulation.

4.3.4 Discussion

It has been established in previous studies (Lisker and Abramson 1964; Iverson and Salmons 1995; Honeybone 2005) that there are three classes of sounds across the VOT continuum which are negative VOT, short lag VOT and positive VOT and that languages with two-way laryngeal contrasts utilize only one part of this continuum. That is to say,

[109] See Table 4.5.
[110] Lisker and Amberson (1964), van Alphen (2004), Kulikov (2012).

a language has a contrast either between a negative VOT and a short lag VOT or between a short lag VOT and a positive VOT. In this regard, Lisker and Abramson state:

> …not a single one of the two-category languages locates its categories where we might expect to find them, that is, at opposite ends of the continuum of voice onset time. This fact, if it is a reflection of the situation in languages generally, is evidence for the view that in the phonetic "realization" of phonemic contrasts human beings fall considerably short of utilizing all the phonetic space available to them. (1964: 403-407).

The data presented in this study do not conform to this generalization. As the voiceless series *p t k q* are aspirated, it was expected for the voiced series to have a short lag VOT in order to fit into the generalizations made in the literature on laryngeal specifications. The results, nevertheless, show that the voiced group are actually prevoiced with negative VOT. This means that SK utilizes the extreme points in the VOT continuum.

Another group of sounds investigated in this study is the velarized set that appears to have short lag VOT in other languages. For example, in KK, as discussed by Kahn (1976), the velarized series resembles the voiceless unaspirated series and has short lag VOT. A similar result is achieved by Jesry (1996 in Bellem: 2007) in Syrian Arabic where the emphatic and the plain voiceless obstruents are unaspirated and contrast with a series of voiced obstruents. Baghdadi Arabic, on the other hand, has a voiced series, a voiceless aspirated series and an emphatic series which is voiceless unaspirated (Heselwood 1996 in Bellem: 2007; Bellem 2007).

So, I compared the VOT of plain and velarized obstruents in order to determine whether they represent the voiceless unaspirated set in SK (see Table 4.6 and Figure 4.4). It is important to take into consideration that velarized consonants have limited distribution in SK since they occur only with low back vowels[111] and the velar stops *k g* and the affricates *č ǰ* do not have velarized counterparts. The data show that the difference between the mean VOT of the plain voiceless stops *p t* and their velarized counterparts *ṗ ṭ* is not substantial and the two groups are aspirated, while the voiced velarized stops *ḅ ḍ* are fully voiced.

Thus, I argue that SK has a two-way laryngeal contrast between fully voiced and aspirated obstruent consonants in word-initial position. The word-initial two-way contrast between prevoiced and aspirated stops has been reported to occur in other languages such as Hebrew (Raphael et al.: 1995), Western dialects of Armenian (Vaux: 1998), Tigrinya,

[111] See chapter 3.

which is a Semitic language, (Bellem: 2007),[112] Turkish (Kallestinova: 2004) and Central Standard Swedish (Petrova et al. 2006; Helgason and Ringen 2008). This does not concur with the generalizations discussed earlier in the chapter, which predict that all languages have a 'plain' series (Lisker and Abramson 1964; Cho and Ladefoged 1999; Harris 1994).

4.4 Final Laryngeal Neutralization

In this section, I discuss the phonological process of laryngeal neutralization in word-final position that occurs in many languages such as German, Dutch, Russian, Turkish and Sorani Kurdish. As noted earlier, many languages have a distinction between voiced and voiceless obstruent consonants in word-initial position. This distinction is, however, neutralized in word-final position in a way that only the voiceless set is allowed. This process is generally referred to as 'final obstruent devoicing' (henceforth FOD). See the following examples of FOD in Dutch and German:[113]

(1) a. Dutch

bed	[bɛt]	'bed'	*bedden*	[bɛdən]	'beds'

b. German

blind	[blint]	'blind (Pred.)'	*blinde*	[blində]	'blind (Att.)'

In the above examples, in both Dutch and German, the voiced *d* is neutralized with its voiceless counterpart *t* in word-final position. At first glance, the two processes seem to be similar; though, they differ fundamentally as the two languages have different laryngeal distinction systems. In Dutch, which is a true voice language, the fully voiced set of obstruents loses the [voice] and becomes voiceless and hence the process can be called final devoicing, whereas in German, which is an aspirating language, the process is the addition of [spread glottis] to a set of plain unaspirated obstruents. That is to say, 'final devoicing' occurs only in true voice languages in which the voiced obstruents are actually voiced and lose their [voice] in the word-final position. This is the view presented by Iverson and Salmons (2007) who argue that, based on the premises of Laryngeal Realism, final obstruent neutralization in German is final fortition. Iverson and Salmons (2007) argue that German is a typical example of the languages that employ full neutralization in word-final position in a way that the process results in homophonous

[112] It is important to note that Tigrinya (and other Ethio-Semitic language) has a three-way contrast between a fully voiced, a voiceless aspirated and a voiceless ejective series, and Bellem argues that this is akin to maximal dispersion in the perceptual space.

[113] Data from van Oostendorp (2008).

segments (also see Fourakis and Iverson: 1984). Accordingly, they describe all final voiceless obstruents as aspirated in German. For example, the German noun *Bund* 'league' and the adjective *bunt* 'colourful' have no phonological contrast and are both perceived as [bunt] by native speakers (Brockhaus: 1995: 3).

A large body of literature has investigated final devoicing (e.g. Ernestus and Baayen 2006 in Dutch; O'Dell and Port 1983; Piroth and Janker 2004; Kleber et al. 2010 in German; Kharlamov 2014 in Russian; Tofigh and Abolhasanizadeh 2015 in Persian) and propose that the process of FOD does not result in full neutralization and that the output of the process does preserve some acoustic cues from the voiced obstruent that enables the listeners to distinguish between the underlying voiceless series and the devoiced series. This is why, Harris (2009) argues that the process of final devoicing is lenition or weakening not only in true voice languages but also in aspirating languages. That is, the process of final devoicing in both true voice languages and aspirating languages results in a set of plain voiceless obstruents that lack laryngeal specifications.

The main cues of incomplete neutralization include the duration of the preceding vowel which is said to be longer before the devoiced series than before the underlying voiceless series, release burst and aspiration duration and voicing into the consonant closure. It is worth noting that most of the studies which argue for incomplete neutralization in different languages have been criticized of not being accurate as the methodology they used affected the production of the devoiced vs voiceless obstruents. For example, the devoiced/voiceless distinction is mirrored in the orthographical system of German and most of the studies involved participants reading word lists in laboratories, so the orthographical forms might have affected the readers to produce the sounds in a different way from their normal day to day speech (see Fourakis and Iverson 1984; Röttger et al. 2014 for discussion).

In the following section, I discuss the process of final devoicing in SK and analyse data in order to determine whether SK employs incomplete final neutralization.

4.4.1 Final Devoicing in Sorani Kurdish

In §4.3, I concluded that Sorani Kurdish is both a true voice language and an aspirating language. The voiced obstruents *b d g ǰ v z ž ʁ*[114] are fully voiced word-initially but they

[114] *ʕ* does not undergo final devoicing.

are neutralized in word-final position with their voiceless counterparts. Consider the following examples:

(2)	*bâš*	[baʃ]	'good'	*qaṣâb*	[qʰæṣap]	'butcher'
	dargâ	[dærga]	'door'	*sârd*	[sart]	'cold'
	garim	[gærɨm]	'hot'	*ṣag*	[ʂɑk]	'dog'
	ǰôr	[dʒor]	'type'	*biriŋǰ*	[bɨrɨntʃ]	'rice'
	avɨn	[ævin]	'love'	*mirôv*	[mɨrof]	'human'
	zû	[zu]	'early'	*âwâz*	[awas]	'melody'
	žin	[ʒɨn]	'woman'	*dirêž*	[dɨreʃ]	'long'
	ʁarîb	[ʁærɨp]	'stranger'	*qônâʁ*	[qʰonax]	'stage'[115]

To the best of my knowledge, the only study that investigates the process of final devoicing in SK is by Hamid (2014, 2015) who presents a description of the process based on the perception of 10 native speakers who described the voiced obstruents as devoiced word-finally. However, no instrumental analysis has been conducted to examine the acoustic correlates of this process in SK and determine whether Kurdish employs full or incomplete neutralization. This is why in the rest of this section I discuss data from Hawler and Slemani dialects to accurately describe the nature of final devoicing in SK.

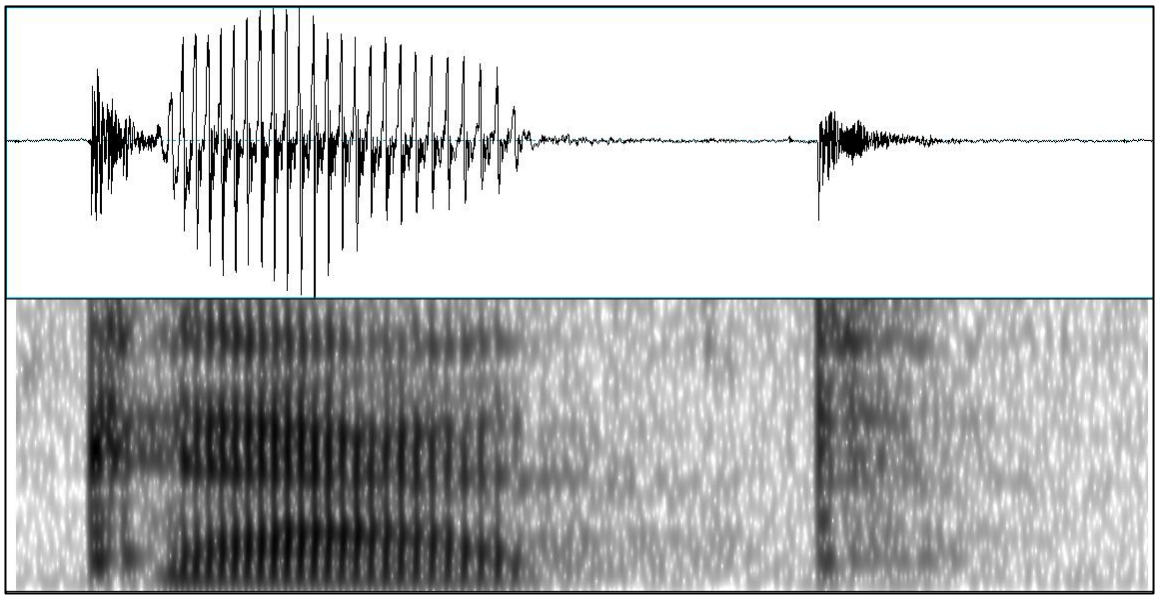
As the examples in (2) show, in utterance-final position, the voiced obstruents are realized as voiceless but they recover their underlying voicing specification when a suffix starting with a vowel is added to the word, as shown in (3a). (3b) shows underlying voiceless stops in intervocalic position.

(3)	a.	*dôłâb*	[dołap]	'cupboard'	*dôłâb-aka*	[dołabækʰæ]	'the cupboard'
		âzâd	[azat]	'free'	*âzâd-î*	[azadi]	'freedom'
		quřig	[qʊrɨk]	'throat'	*quřg-im*	[qʊrgɨm]	'my throat'
	b.	*pat*	[pætʰ]	'rope'	*pata-kân*	[pætʰækan]	'the ropes'
		dɨłôp	[dɨłopʰ]	'drop'	*dɨłôp-êk*	[dɨłopekʰ]	'a drop'
		yak	[jækʰ]	'one'	*yak-am*	[jækʰæm]	'the first'

Figures 4.9 and 4.10 show waveforms and spectrograms of underlying voiceless and underlying voiced stops in word-final position.

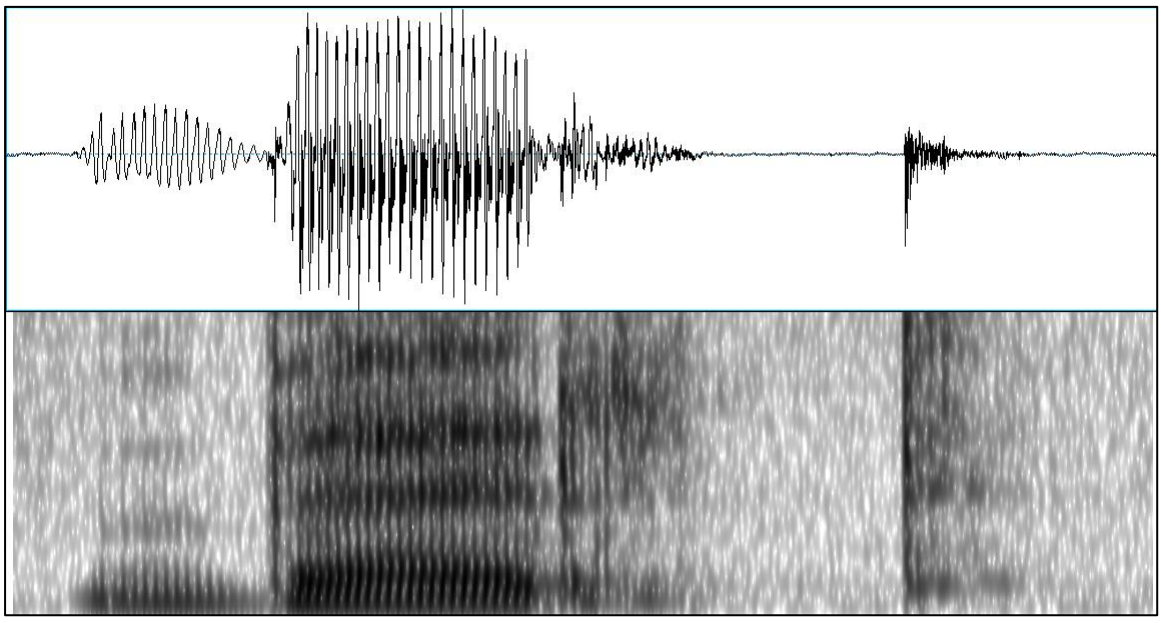
[115] *ʁ* behaves differently from the other obstruents in that can also be neutralized with *x* in word-initial and medial positions in native Kurdish words, while it is not neutralized word-initially and word-medially in loanwords such as *ʁarîb* 'stranger' and *mašʁûł* 'busy' which are borrowed from Arabic. See §2.1.1.3 for details on *ʁ*.

Figure 4.9 Spectrogram and waveform of word-final t in the word kât [kʰatʰ] 'time' spoken by a female speaker from Slemani



	k^h	a	t^h	

Figure 4.10 Spectrogram and waveform of word-final d in the word bard [bært] 'stone' spoken by a female speaker from Slemani



	b	æ	ɾ	t	

I argue, based on the data I have collected from Hawler and Slemani speakers, that SK has incomplete neutralization in utterance-final position. A list of monosyllabic and disyllabic words ending in voiceless obstruent consonants *p t k č s š ʁ*[116] and voiced obstruent consonants *b d g ǰ z ž x* was read by three female speakers (two from Slemani and one from Hawler) who were aged between 35-45. I should point out that, like German, the voiced/voiceless distinction is reflected in Kurdish orthography as Kurdish has different letters for the underlying voiceless and devoiced obstruents which might influence the way the informants read the words. To minimize this influence, the informants were not told about the exact purpose of the recordings and they were asked to read the list twice and only the second recordings were used as the participants got used to the recording environment and read the words more naturally. The recordings were then analysed using PRAAT (Boersma and Weenink: 2018).

The acoustic analysis of this data focused on two major cues of incomplete FOD, which are the duration of aspiration and the duration of the preceding vowel. First, the VOT of the voiceless and voiced stops were measured and the results are shown in the table below.

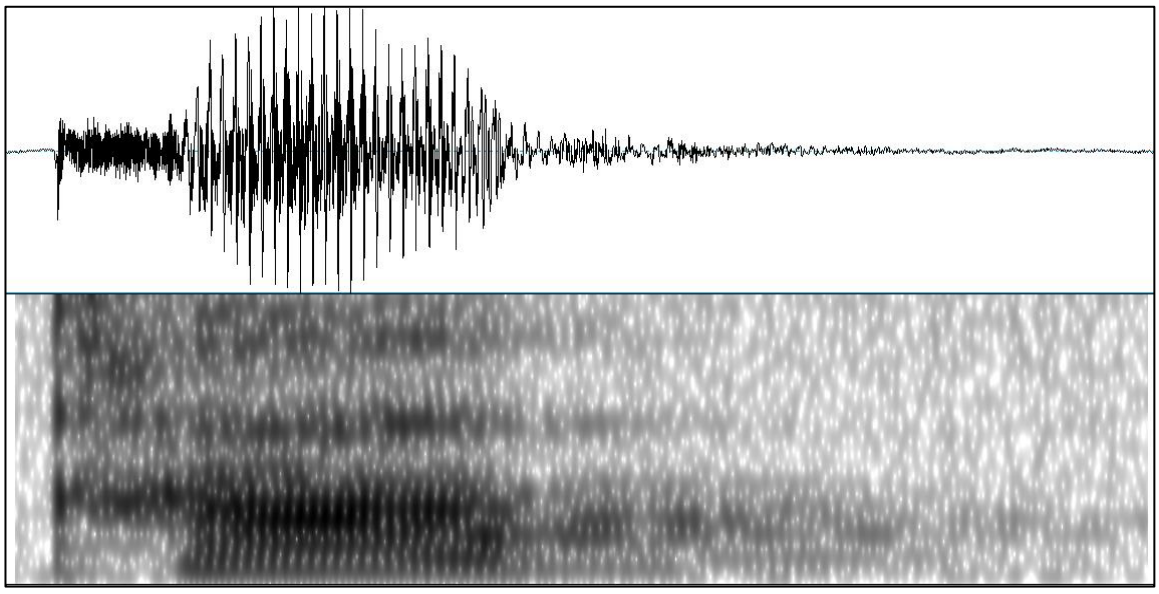
Table 4.8 VOT values for voiceless and voiced in (ms) spoken by a female from Slemani

Voiceless	VOT	Voiced	VOT
sarqâp	42	*dôłâb*	22
qat	49	*qad*	18
yak	63	*řag*	17

As the data show, the voiceless stops are aspirated while the devoiced stops have a short lag VOT. McCarus (1958) argues that all stops are fully released in all positions and the voiceless stops (except uvular and glottal) may or may not be aspirated word-finally. However, my data showed that both voiceless and voiced stops could be unreleased word-finally, as shown in Figures 4.11 and 4.12, where the stops do not have an audible release of closure. See the examples in (4).

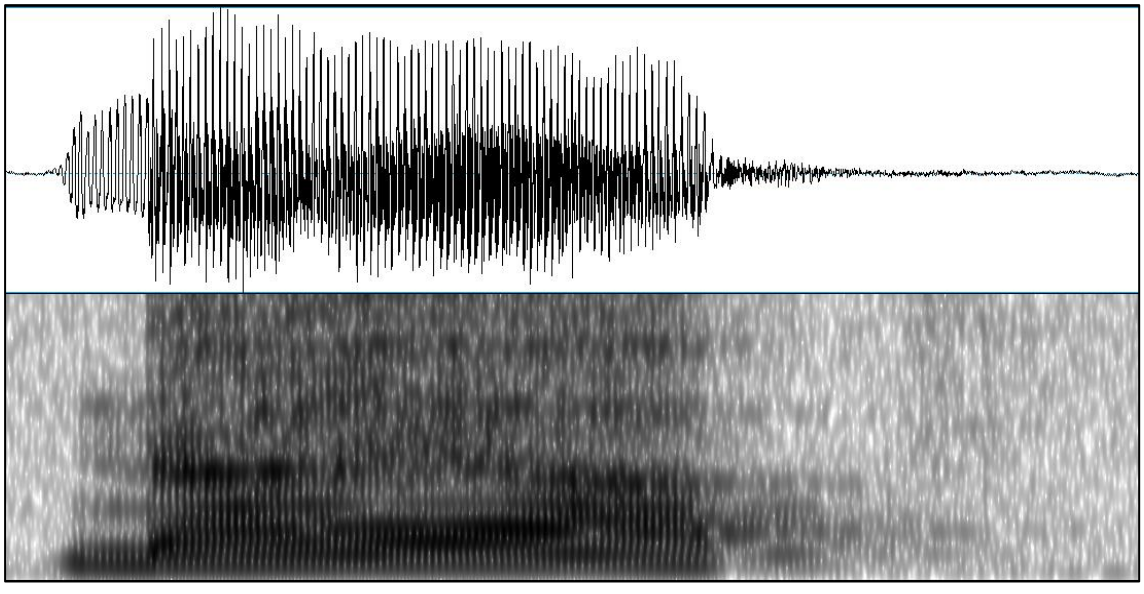
[116] The voiceless stop *q* was not included because it does not have a voiced counterpart in Kurdish.

Figure 4.11 Spectrogram and waveform of word-final unreleased p in the word qâp [qʰapˉ] 'plate' spoken by a female speaker from Slemani



	q^h	a	$\bar{p}$	

Figure 4.12 Spectrogram and waveform of word-final unreleased b in the word nâyâb [nayabˉ] 'excellent' spoken by a female speaker from Hawler



	n	a	j	a	$\bar{b}$

(4)	*ṭôp*	[ṭʰopʰ]	~	[ṭʰop̄]	‘ball’
	ḥab	[ḥæp]	~	[ḥæb̄]	‘pill’
	lat	[lætʰ]	~	[lat̄]	‘piece’
	zard	[zært]	~	[zærd̄]	‘yellow’
	wak	[wækʰ]	~	[wæk̄]	‘like’
	řag	[ræk]	~	[ræḡ]	‘root’

The main cue of incomplete FOD is said to be the duration of the preceding vowel. So, I measured the duration of vowels in a list of words which were followed by voiceless and devoiced stops. The words in each pair had similar durations. The beginning of the vowel was marked as the start of vibration and the end of the vowel was marked as the end of vibration on the waveform. Table 4.9 shows the difference in vowel duration before voiceless and devoiced stops.

Table 4.9 Duration of vowels preceding voiceless and devoiced stops in (ms) by a female from Slemani and a male speaker from Hawler

voiceless stop	female	male	devoiced stop	female	male
qulâp	98	107	*dôłâb*	126	117
čap	63	71	ḥab	72	84
ṭôp	107	108	řôb	138	129
lat	81	79	qad	96	86
lût	108	115	sirûd	155	142
nak	83	75	bag	98	96

The results show that the duration of vowels before voiceless stops is shorter than before devoiced stops; the mean difference between them is 20.33 ms. This is similar to the results found in other languages, such as Persian (Tofigh and Abolhasanizadeh: 2015) and Dutch (Ernestus and Baayen: 2006).

4.4.2 Final Devoicing in Element Theory

Element theory employs two elements |L| and |H| to represent laryngeal contrasts. True voice languages have an unmarked series that contrasts with a fully voiced series that has |L|, and aspirating languages have an unmarked series that contrasts with an aspirating series that has |H|. In other words, languages can be described as being an |L| system or an |H| system in regard to their laryngeal specifications. Hence, French and Dutch are |L|

languages while English and German are |H| languages. These laryngeal elements are equivalents of the [voice] and [spread glottis] discussed earlier in this chapter. What makes a language an L language is the fact that the L element is active in phonological processes, such as voicing assimilation, in that language. The same is true for H languages. The neutral series does not usually participate in phonological processes since it does not have any elements to be delinked or spread.

The process of FOD in L languages involves suppressing the salient laryngeal property which voicing in L languages. In H languages, the process is represented differently. Consider the following examples from Russian and German.[117]

(4) a. Russian

gro[b]*u*	|U L H ʔ|[118]	'coffin (dative)'
gro[p]	|U H ʔ|	'coffin (nominative)'
b. German		
gel[b]*e*	|U ʔ|	'yellow (attributive)'
gel[p]	|U ʔ|	'yellow (predicate)'

In the Russian examples, the voiced obstruent is fully voiced, and the voicing is represented by |L|, therefore FOD includes deleting the L element from the expression. In German, however, the voiced obstruent is not marked for laryngeal properties and therefore it has no laryngeal element to be deleted. Backley (2011: 193) argues that in German, the neutral series *b d g* has passive voicing which lost in word-final position. So *b* is phonologically neutral and phonetically voiceless.

Backley's account of laryngeal representations does not include such languages as Swedish and SK that have both |L| and |H| as they oppose a fully voiced series with an aspirating series of obstruents. Cyran (2017) describes these languages as having 'over-specification' as they exploit a maximal dispersion along the VOT continuum. SK fulfils two of Cyran's (2017) criteria for L system which are:

1. It exhibits Final Obstruent Devoicing
2. It exhibits Regressive Voice Assimilation

[117] Data from Backley (2011: 193).

[118] This is Backley's (2011) representation of the voiced stop in Russian. I present a different representation of the voiced stop in SK which has an unheaded |L| (see Chapter 2). Moreover, Backley (2011, 2017) argues that an expression can be double-headed. I, however, do not adopt his view and hence I argue that SK allows an expression to have one head only (see §1.2.4).

However, it differs from the other L languages that it contrasts voiced obstruents with voiceless aspirated obstruents.

The process of final devoicing is represented as follows in ET.

(5)

b	→	*p*	vs	p^h
U ʔ L		U ʔ		U ʔ H
d	→	*t*	vs	t^h
I ʔ L		I ʔ		I ʔ H

I, therefore, argue that SK employs incomplete FOD since the output of the process is not identical to the voiceless aspirated series. Hence, SK has a contrast between a fully voiced and voiceless aspirated series in word-initial position while it has a contrast between a neutral devoiced and voiceless aspirated series in word-final position. Moreover, the data supports Harris' (2009) argument that FOD is actually a case of lenition which results from delinking an L element from the representation of an underlying voiced obstruent. As the output is neutral and not specified for laryngeal property, there is no element spread to its representation.

4.4 Voicing Assimilation

Voicing assimilation is another common phonological process that involves agreement in voicing between two adjacent consonants with different voicing specifications. This process has been attested and studied in a large number of languages such as English (Kim: 2004), Catalan (Torres: 2001), Swedish (Ringen and Helgason: 2004), Russian (Samokhina: 2010), Hebrew (Samokhina: 2004) and Dutch (Grijzenhout and Krämer: 2000).

When obstruent consonants become adjacent in a cluster, they often agree in voice with the rightmost obstruent. Consider the following examples.

(6) a. English

five	*fifth*
describe	*description*

b. Russian

lodka	lo[tk]a	'boat'	*lodok*	lo[d]ok	'boats'

prosjba pro[zjb]a ‘request’ *prositj* pro[s]itj ‘to ask’[119]

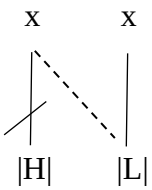
SK also employs voicing assimilation in obstruent clusters as shown in the examples below.

(7) a.	*hašt*	‘eight’	*haž-da*	‘eighteen’
	dast	‘hand’	*daz-bajǐê*	‘immediately’[120]
	baš	‘section’	*baž-dâr*	‘participant’
	tômat	‘accusation’	*tômad-bâr*	‘accused’
	pêš	‘before’	*pêž-marga*	‘Kurdish fighters’
	yak	‘one’	*yagǰâr*	‘altogether’
b.	*ǰanâb*	‘excellency’	*ǰanâp-tân*	‘your excellency’
	ṣag	‘dog’	*ṣak-sâr*	‘ugly’
	bad	‘bad’	*bat-xû*	‘rude’

The above examples show regressive voicing assimilation, since the trigger of the process follows the target. In (7a), the first obstruent in the cluster which is voiceless assimilates to the voicing specification of the target obstruent which is voiced; while in (7b) the voiced target becomes voiceless. Figure 4.13 shows a regressive assimilation of *k* which becomes *g* when followed by the voiced *b*. Figure 4.14 shows *k* which remains voiceless when followed by the voiceless *t*. *g* has a very short lag before *d* in Figure 4.13, while both *k* and *t* are slightly aspirated in Figure 4.14. The data I have collected did not show any substantial differences between Hawler and Slemani.

In ET terminology, voicing assimilation occurs when the laryngeal element of a consonant spreads to a preceding consonant with an opposite laryngeal specification.

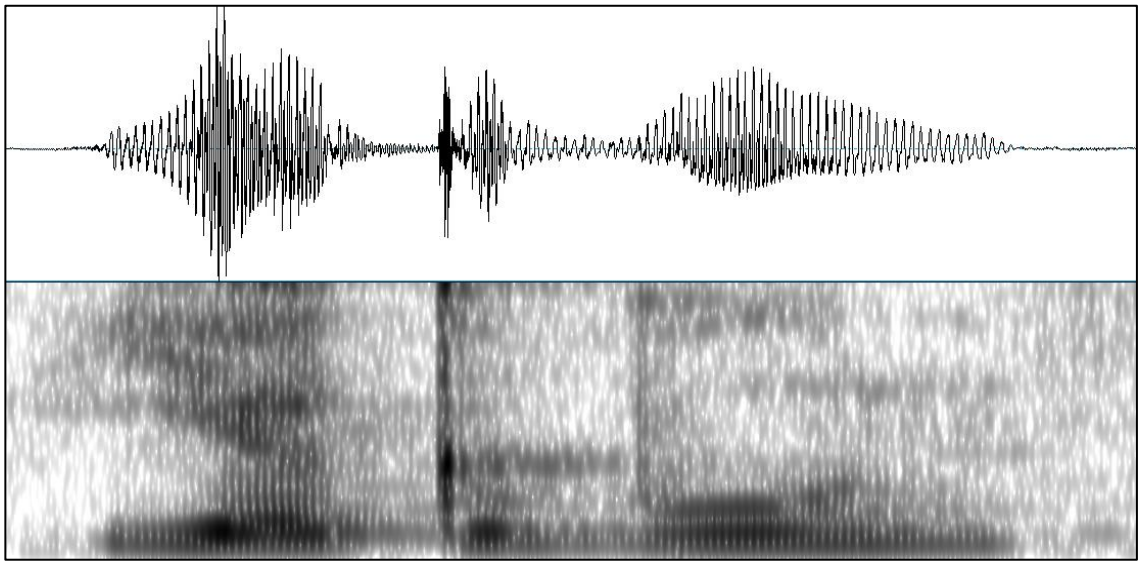
(8)



[119] Data from Samokhina (2010).

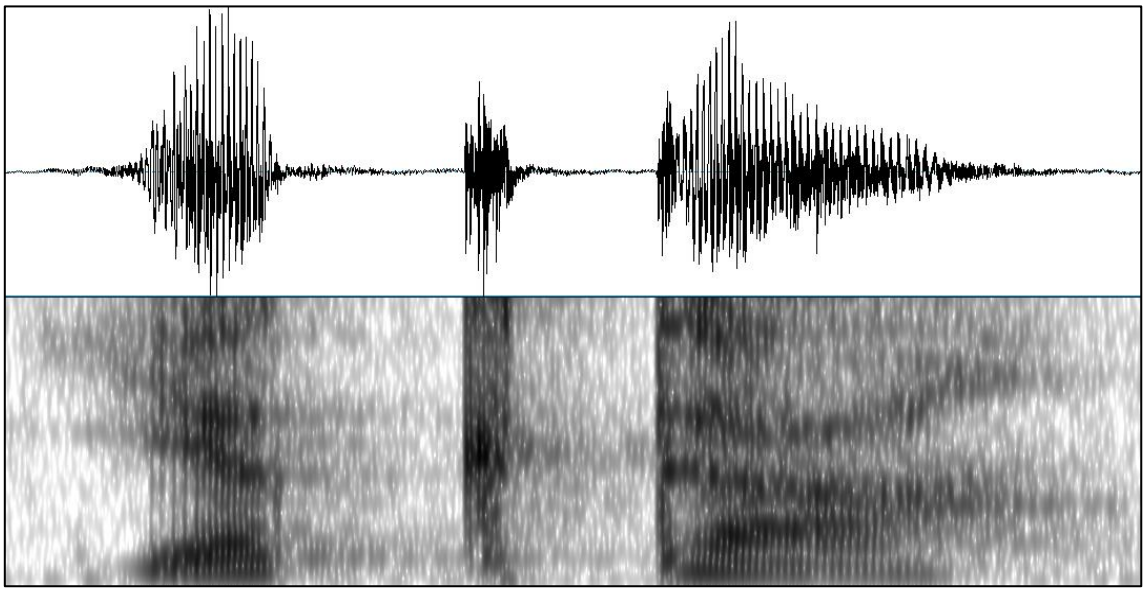
[120] In *hašt and dast*, the final *t* deletes and then the voicing assimilation is applied to the preceding obstruent. See chapter 5.

Table 4.13 Waveform and Spectrogram of word yak-bûn [jægbun] 'unity' by a female speaker from Hawler



	j	æ	g	b	u	n	

Table 4.14 Waveform and Spectrogram of word yak-tâ [jæk^{h}t^{h}â] 'all' by a female speaker from Hawler



	j	æ	k^{h}	t^{h}	â	

4.5 Summary

In this chapter I discussed the laryngeal specifications of SK. Since no previous studies have been conducted on laryngeal distinctions in SK. I presented VOT measurements of data collected from Hawler and Slemani in order to identify the laryngeal categories of SK. The data revealed a typologically uncommon pattern of laryngeal specification that does not conform to the generalizations made in the literature that state all languages should have a neutral series. SK employs a fully voiced series of obstruents that contrast with an aspirated series.

I also discussed how the fully voiced series that have a voicing lead are devoiced in utterance-final position, but this does not result in final obstruent neutralization. So, following Harris (2009), argue that final devoicing in SK is a lenition process. I finally discussed the process of voicing assimilation.

Chapter Five

Syllable Structure Processes

In the previous chapter, I discussed the laryngeal specification of obstruents in SK and presented data on two phonological processes that involve laryngeal properties of obstruents: final devoicing and voicing assimilation.

In this chapter, I discuss two other processes that are considered to be syllable structure processes as they change entire segments or syllables: metathesis and deletion. The phonological processes discussed in the previous chapters target specific properties, or in ET terms they add or remove certain elements in the representation of a single segment. For example, the assimilation process of palatalization adds an |I| element to the structure of a velar stop *k g* which is spread from a following front vocoid *y î ê*. Syllable structure processes, on the other hand, target the segment as a whole. For example, in the process of deletion an entire segment, that usually has more than one element in its representation, is deleted such as the deletion of *t* in such words as *čônît?* → *čônî?* 'how are you' in SK.

5.1 Metathesis

Metathesis is a phonological process which involves reordering of segments (Buckley: 2011). Hume (2001: 1) defines metathesis as 'the process whereby in certain languages, under certain conditions, sounds appear to switch positions with one another. Thus, in a string of sounds where we would expect the linear ordering of two sounds to be ...*xy*..., we find instead...*yx*....' Metathesis is often used to refer to historical sound changes, as shown in the following examples from Old English which are metathesized in Modern English (1a)[121] and Pahlavi which are metathesized in Persian (1b)[122].

(1) a.	Old English	Modern English	
	brid	*bird*	
	cræt	*cart*	
b.	Pahlavi	Persian	
	wafra	*barf*	'snow'
	hagriz	*hargez*	'never'

[121] Data from Wójcik (2012).
[122] Data from Ahmadkhani (2010).

Metathesis has been also attested in a large number of languages as a synchronic phonological process that changes the linear ordering of segments. However, Hume (2001) argues that metathesis is a poorly understood process because, compared to other phonological processes such as assimilation, it has been considered as a marginal process and hence little attention has been given to the analysis of this process in the phonological literature. Due to its sporadic nature, metathesis has been described as being restricted to performance errors (Crystal: 2008) and child language (Hume: 2001). Moreover, as Hume (2001) denotes, unlike the majority of the phonological processes which can be defined in terms of a single target that is triggered by a certain context, metathesis has a distinct nature in the sense that it involves two segments that undergo the process together. That is, in the process of nasal place assimilation, *n* assimilates to *m* in the context of a labial consonant. In metathesis, on the other hand, when the cluster *sk* is metathesized to *ks*, it is not easy to identify the target and the trigger in the process. Consequently, analysing metathesis 'has required extensions of otherwise highly restrictive phonological formalisms' (Blevins Garrett: 2004: 117).

For these reasons, metathesis has posed a problem for linguistic theories and was considered to be phonologically motivated as it is phonetically less natural than the other phonological processes. Blevins and Garrett (2004), however, argue that metathesis 'can be explained in a phonetically natural way based on precisely the same assumptions required to understand other phonological phenomena' (see Blevins and Garrett (1998, 2004) for discussion).

The most common type of metathesis involves switching adjacent segments which is referred to as local metathesis; these segments are either two consonants (CC), two vowels (VV) or a consonant or a vowel (CV). The words in (1b) are examples of local metathesis. Long-distance (also non-local) metathesis, on the other hand, refers to the process by which two non-adjacent segments are switched (Buckley: 2011). The words in (1a) are examples of long-distance metathesis. In the rest of this section, I present a discussion of synchronically active metathesis in SK.

5.1.1 CC Metathesis

CC metathesis involves the reordering of two consonants. The group of liquids, which includes the laterals *l ɫ* and the rhotics *r ř*, is one of the common consonants that undergo the process of metathesis with other consonants. Ultan (1978: 375) states that 'the disproportionately high (and widespread) frequency of occurrence of liquids in metathesis

is proverbial' and he gives a list of languages that employ liquid metathesis. Blevins and Garrett (2004) argue that certain segment types including liquids and pharyngeals have elongated phonetic cues that are realized over long durations and their phonetic correlates extend across the entire CV or VC string which makes it difficult for the listener to localize the origin of the phonetic cue. This results in perceptual metathesis which involves shifting the position of the segment with the elongated phonetic cue.

Liquids occur in diachronic metathesis, such as the historical liquid metathesis in Slavic languages (see Cyran: 2010). See the examples below.[123]

(2)	Proto- Slavic	Bulgarian	Polish	
	**orbota*	*rábota*	*robota*	'work'
	**melko*	*mléko*	*mleko*	'milk'

Liquids also participate in synchronically active metathesis processes. In SK, the rhotics *r ř* switch their position with sibilant consonants, for examples:

(3)	*fiřîn*	~	*řifîn*	'to fly'
	fiřândin	~	*fiřândin*	'to kidnap'
	barif	~	*bafir*	'snow'
	tarza	~	*tazra*	'hail'

Liquids can also swap with the nasal *n*, as in:

(4)	*čawanar*	~	*čanawar*	'beetroot'
	sarîn	~	*sanîr*	'pillow'
	řiwânîn	~	*nwâřîn*	'to look'
	fânîla	~	*fâlîna*	'vest'

Another type of metathesis in SK is when two liquids swap, such as in:

(5)	*mêrûla*	~	*mêlûra*	'ant'
	qarabâɬiʁ	~	*qaɬabâriʁ*	'crowded'

A few other examples of CC metathesis which involve consonants other than liquids can be found in SK, such as:

[123] Data from Backley (2011: 167)

(6) *ǰiwên* ~ *ǰinêw* ‘swear’

qâzânǰ ~ *qânǰâz* ‘profit’ (in this word the fricative *z* is swapped with the cluster *nǰ*)

5.1.2 CV metathesis

Another type of metathesis involves the swap of a consonant and a vowel. In the Slemani variety, the sequence *w*+ê is metathesized to *y+ô*, as shown below.

(7) *kiwê* ~ *kiyô* ‘where’

giwê ~ *giyô* ‘ear’

giwêz ~ *giyôz* ‘walnut’

This process applies only when the preceding consonant is a velar and words such as *diwênê* ‘yesterday’ and *šiwên* ‘place’ do not undergo metathesis. Moreover, this process does not occur in the Hawler variety since the sequence *w+ê* in these words is replaced by different vowels in Hawler (see §2.1.2.2).

In some loanwords, the sequence *y+ô* is metathesized to w+ê, such as:

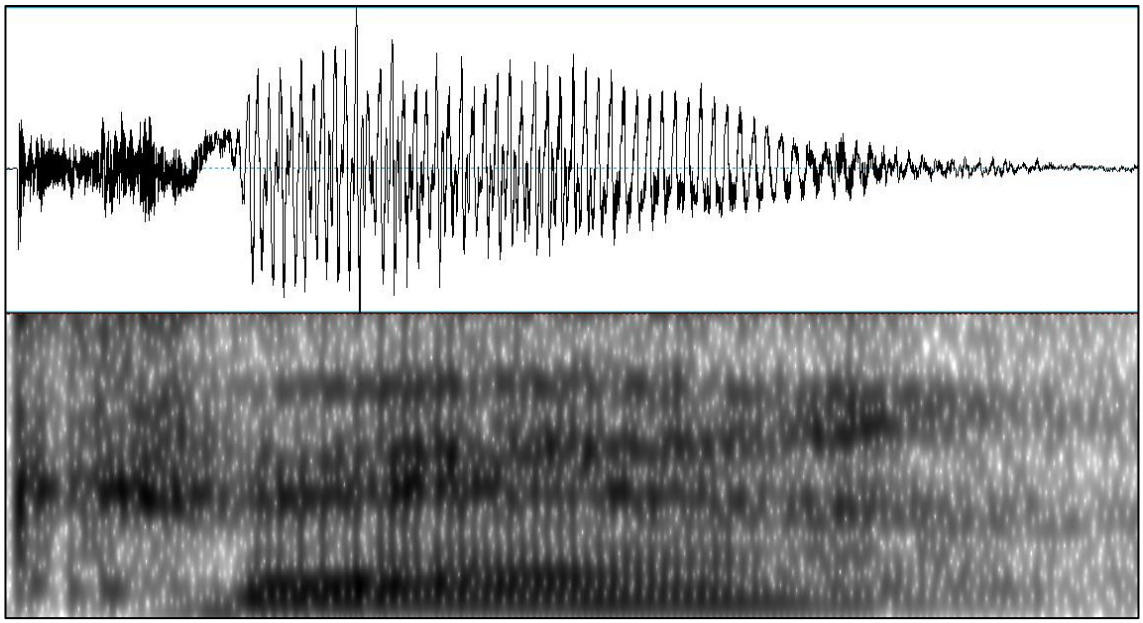
(8) *yônân* ~ *wênân* ‘Greece’

řâdyô ~ *řâdwê* ‘radio’

milyôn ~ *milwên* ‘million’

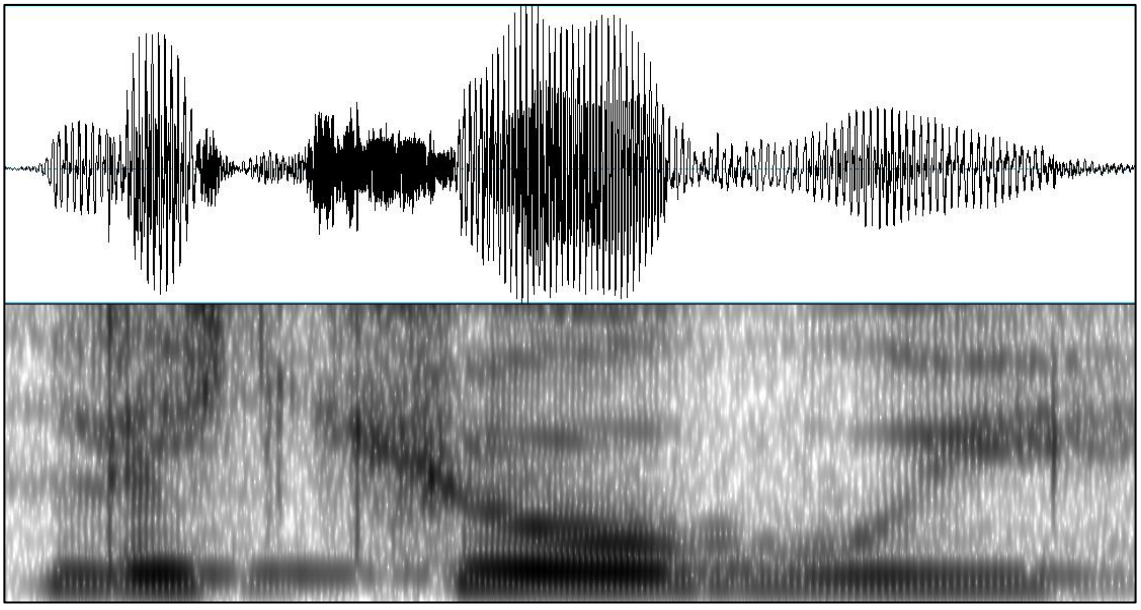
Figure 5.1 shows the waveform and spectrogram of the word *kiwê* by a female speaker from Slemani and Figure 5.2 shows the waveform and spectrogram of the metathesized form of *kiwê*: *kiyô* by another female speaker from Slemani.

Figure 5.1 The waveform and spectrogram of the word kiwê 'where?' by a female speaker of Slemani



	k^h	i̵	w	ê	

Figure 5.2 The waveform and spectrogram of the sentence la kyô buy 'where were you?' by a female speaker of Slemani



læ	k^h	i̵	j	o	buj

In some of the examples given above, both forms of the words occur in the same dialect. For examples, one of my Slemani informants, a female aged 41, pronounced *čawanar* as *čanawar* 'beetroot' and another speaker pronounced *kiwê* and *giwê* as *kiyô* and *giyô*, while all the other informants used the unmetathesized form. According to Fattah (2011), some of the metathesized forms are used in certain varieties only. For example, *tarza* 'hail' is used in Slemani while *tazra* is used in Hawler. Also, *bafir* 'snow' is used in Sorani while *barif* is used in Kurmanji varieties. Matras (2017) provides a map which shows the distribution of the metathesis in *bafir* which supports Fattah's argument.

Studying the process of metathesis across the different varieties of Kurdish requires data collection from a large number of speakers of each dialect. As metathesis is sometimes a feature in the speech of a certain speaker that does not necessarily represent the entire dialect.Moreover, as Fattah (2011) argues, the use of some of the metathesized forms shows the social status of the speaker. These are usually loanwords that involve pharyngeal and laterals consonants and they are used by illiterate speakers. Such as:

(9)	*ǰumʕa*	~	*ǰuʕma*	'Friday'
	řubiʕ	~	*řuʕib*	'quarter'
	laʕnat	~	*naʕlat*	'curse'
	suʕbat	~	*subʕat*	'joking'
	daʕwat	~	*dawʕat*	'invitation'
	taslîm	~	*tasmîl*	'hand in'

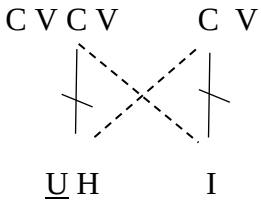
It is important to not here that only two of my informants, one female from Dukan who was 50 years old and a female from Koya who was 71 years old and could read and write, pronounced the metathesized forms of the abovementioned words.

5.1.3 Metathesis in Element Theory

The processes discussed in the previous chapters target one element in the representation of a segment. That is to say, they either involve adding a single element to the representation of the target segment, such as palatalization which adds an |I| element to the preceding velar consonants, or they involve deleting an element in the representation of the target segment, such as final devoicing which involves deletion the |L| element in the voiced segment. There are also processes which target more than one element in the melodic expression which results in either supressing or spreading entire segments and according to Harris (1994), processes of metathesis fall into this category.

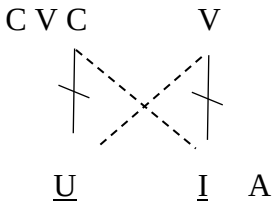
Hume (1992) argues that the process of metathesis involves more than one operation that occur separately. Others, including van der Hulst and van Engelenhoven (1995), describe metathesis as a process of delinking and spreading, and this is the view that I adopt in this study. Consider the following example.

(10) *bafir* ~ *barif*



(10) is an example of long-distance CC metathesis in which both elements |U H| delink from *f* and then spread to *r*, and the element |I| delinks from the *r* and spreads to the position of *f*. Consequently, the two consonants exchange positions. (11) represents a slightly different process which also results in the metathesis of two segments: the CV metathesis in the word *kiwê* 'where?'.

(11) *kiwê* ~ *kiyô*



In this process, the |U| element delinks from the glide and then spreads to the position of the vowel while the |I| delinks from the vowel and spreads to the consonant position. The |A| does not delink or spread in this process. The output is a glide with a headed |I| and a vowel with a headed |U| and a non-headed |A|: *y*.

To sum up, metathesis is a phonological process that involves reordering the segments in a string which targets all the elements, and in a few cases one element, in the melodic expression. This can occur between adjacent and non-adjacent sounds. SK employs both types of metathesis in native Kurdish words as well as loanwords. The study of metathesis in SK requires a large database that includes data from numerous speakers of all the varieties in order to identify the distribution of the metathesized forms in these varieties. This is out of the scope of this study, so I will leave that for future research.

5.2 Deletion

A common process in languages of the world is deletion whereby a segment is deleted. Harris (2011) argues that in a language, a morpheme can have two alternants in one of which a segment might be missing. This is the result of the process of deletion which was used to refer to historical changes but is now growing to cover synchronic segment deletion as well.

SK employs the deletion of consonants in word-final and in some cases word-medial positions. It also has a very common deletion of *d* in word-medial position. In this section, I discuss the process of consonant deletion in SK. §5.2.1 is about word-final deletion and §5.2.2 is about word-initial position.

5.2.1 Final Consonant Deletion

In word-final position, the coronals *t d* and the velar *k* are deleted as shown below.

5.2.1.1 The deletion of *t*

(12) in the pronominal clitics *-ît* (2nd person singular)

čôn-ît?	~	*čôn-î?*	‘how are you?’
tô dařô-yt	~	*tô dařô-y*	‘you are going’
tô hât-ît	~	*tô hât-î*	‘you came’

(13) in the pronominal clitics *–(ê)t* (3nd person singular)

aw dařwâ-t	~	*aw dařwâ*	‘he is going’
aw danw-êt	~	*aw danw-ê*	‘he sleeps’

(14) in consonant clusters when preceded by *s*

dast	~	*das*	‘hand’
pêwist	~	*pêwis*	‘necessary’
mâst	~	*mâs*	‘yogurt’
dirust	~	*dirus*	‘correct’

The coronal is deleted even when a suffix is added, such as:

(15)

das	*das-im*	‘my hand’
pêwis	*pêwis-a*	‘it is necessary’
mâst	*mâs-aka*	‘the yogurt’

In some cases, the coronal *t* is deleted morpheme-internally, such as:

(16)	*mâmôstâ/mâmôṣtâ*	~	*mâmôsâ/mâmôṣâ*	‘teacher’
	wastâ	~	*wasâ*	‘builder’

The coronal does not delete in other word-final clusters, such as:

(17)	*hašt*	‘eight’
	pišt	‘back’
	baxt	‘luck’
	part	‘scattered’

5.2.1.2 The deletion of *d*

The voiced coronal *d* is also deleted in final consonant clusters following the nasal *n*, as in:

(18)	*pasand*	~	*pasan*	‘acceptable’
	dawłamand	~	*dawłaman*	‘rich’
	pičřând	~	*pičřân*	‘cut’
	čând	~	*čând*	‘planted’
	čand	~	*čand*	‘some’

d remains deleted after a suffix is added:

(19)	*čân*	*čân-im*	‘I planted it’
	pasan	*pasan-a*	‘it is acceptable’

d is not deleted after the rhotic *r*, it is only devoiced (see chapter 4):

(20)	*sârd*	‘cold’
	bard	‘stone’

Both my Hawler and Slemani informants deleted *d* in the previous examples.

In some words, *d* is deleted morpheme-internally:

(21)	*minḍâł*	~	*minâł/miŋâł*	‘child’
	andâm	~	*anâm*	‘member’

In some words, *d* id not deleted but it lenites to *y*, as in:

(22)	*âgâdâr*	~	*âgâyâr*	‘aware’

âgâdârî	~	*âgâyârî*	‘anouncement’
âwadân	~	*âwayân*	‘flourishing’

Slemani has a velar nasal *ŋ* which is a result of a phonological process of deletion of consonant clusters of *-ng*. For example:

(23)

Hawler	Slemani	
bâng	*ḅâŋ*	‘call’
hang	*haŋ*	‘bee’
mang	*ṃaŋ*	‘still’

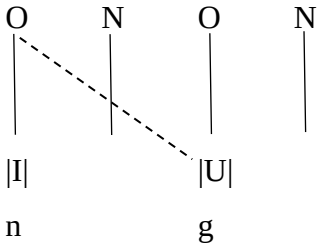
For some speakers, *ŋ* also occurs as a result of *-nd* deletion. For example:

(24)

Hawler	Slemani	
sand	*ṣan/ṣaŋ*	‘took’
marband	*ṃałban/ṃałḅaŋ*	‘centre’

The two processes should be analysed separately. The first process whereby *-ng* changes to *ŋ*. The *g* which is a velar and has a |U| element, spreads its resonance element to the preceding coronal and then it is deleted. This process is nasal assimilation which results in the velar nasal and then the velarization spreads to the preceding segments as discussed in chapter 3. The process is represented as in (25).

(25)



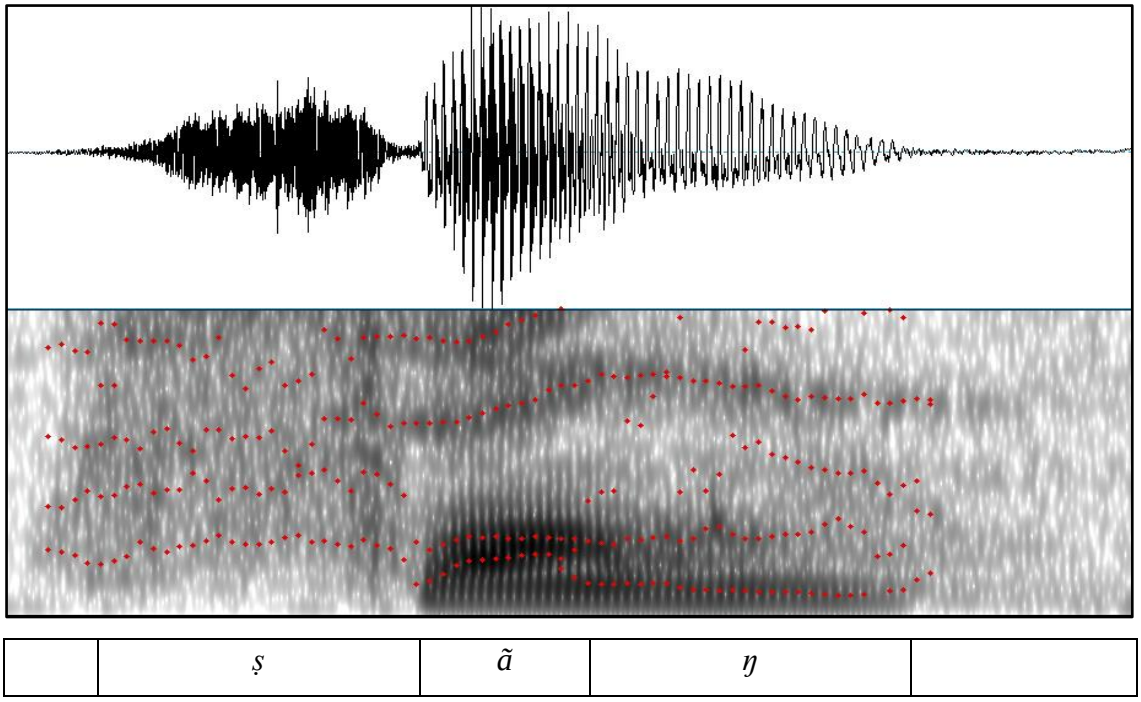
The second process involves two coronal segments that both have an |I| element, so the process does not involve spreading of a |U| element. I argue that the process occurs in a few steps, it starts with an |L| element that spreads from the nasal to a preceding vowel which results in a nasal vowel, then the nasal is deleted, then the *d* is also deleted. Finally, the nazality (|L|) spreads back from the vowel to the empty onset and the preceding coronal. Hence the difference between the words in (23) and (24) is that the first are velarized and the second are nasalized.[124] So, the words in (24) should be written as:

[124] See Ploch (1999) for a similar analysis in French.

(26) *ṣãŋ*
ṃałḅaŋ

Both processes occur in adjacency to low vowels and cause lowering of F2 and raising F1 in the preceding vowel. See Figure 5.3.

Figure 5.3 The waveform and spectrogram of the word ṣãŋ 'took' by a female speaker of Slemani



The mean F1 of the vowel *ṣãŋ* is (840) while the mwan F2 was (1192) which causes lowering and backin.

5.2.1.2 The deletion of *k*

In both hawler and Slemani, *k* is deleted in the definite article.

(27) *yakêk* ~ *yakê* 'one'
kičêk ~ *kičê* 'a girl'

It is important to note that in more formal and careful speech, both final *k* in *-êk* and final *t* in –(ê)t are pronounced.

5.2.2 Debuccalization of Word-initial *d* in Slemani Variety

One of the most common processes in Slemani is the debuccalization of the word-initial *d* in present tense indicative prefix as in:

(28)

Hawler	Slemani	
da-xôm	*a-xôm*	'I eat'
da-řôy	*a-řôy*	'you go'
da-mawê	*a-mawê*	'I want'

When a consonant-final word precedes these words, the *ʔ* is not pronounced and the final consonant of the preceding word fills the onset position in the first syllable of the verb.

(29) *nân axôm* ~ *nâ.na.xôm* 'I am eating'

bread eat I

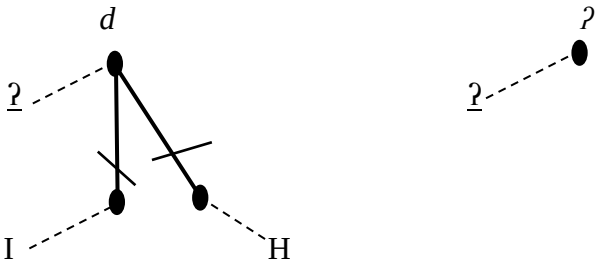
kâr aka-m ~ *kâ.ra.ka-m* 'I am working'

work do I

All my Slemani informants always debuccalized the *d* while my Hawler informants never did. Interestingly, my Dukan informants always produced the *d*. This is a feature used in the variety of Dukan which shares characteristics of both Hawler and Slemani.

Debuccalization is a lenition process in which an oral sound loses its resonance and manner element and becomes glottal, as shown below:

(30)



5. 3 Summary

In this chapter, I discussed two phonological processes that target the segment as a whole and change all its elements: metathesis and deletion. I presented data and showed examples of metathesis in SK and demonstrated that the most metathesized segments in SK are the sonorants. However, in order to present a more comprehensive account of metathesis, we need a larger scale of data and to compare metathesis in SK with the contact languages as metathesis appears to be an areal phenomenon. So, this thesis could be regarded as a basis for future studies on metathesis.

The second section of the chapter was about deletion in SK. I presented examples of final consonant deletion as well as word-initial deletion in SK.

Conclusions

This thesis has been concerned with phonological processes in Sorani Kurdish based on data collected from speakers of two main varieties of SK spoken in northern Iraq which are Hawler and Slemani.

Chapter two presented an analysis of the segmental system of SK. Since the phonology of SK is one of the least studied areas of Kurdish linguistics, it was important to establish the inventory of the lexical segments, especially because previous studies provide different and sometimes contradicting accounts of the segments in SK. Most importantly, previous works are mostly descriptive accounts of the phonology of the Slemani variety and ignore the Hawler variety which has significant contributions to make to our knowledge of the phonological system of Sorani. For this reason, I investigated the major phonological properties of these two varieties in this chapter. I concluded that SK has 29 consonants, 8 simple vowels including an empty vowel and that SK does not have diphthongs. The second part of chapter two dealt with an Element Theory analysis of the segmental system of SK in which I analyse the representation of each segment depending on their phonological behaviour. For example, I argued that the affricates *č ǰ* and the fricatives *š ž* are post-alveolar articulatorily while they pattern with the palatals phonologically and hence they have a headed |I|. Further, SK belongs to the lnaguages that represent coronality by an |I| element as opposed to the |A| element in other languages such as Munster Irish.

Chapter three dealt with place assimilation processes. This chapter presented the first detailed account of the process of palatalization and provided data to show differences and similarities between Hawler and Slemani. I concluded that although the targets and the triggers of palatalization are similar in both varieties, the output of the process is different as Slemani has secondary palatalization, while Hawler has primary palatalization. The chapter then discussed one of the most common yet understudied processes in SK, which is emphasis spread. There has been some debate in the literature on Sorani phonology regarding such emphatic sounds as *ṣ ṭ*; and some sources consider them to be lexical while others ignore them entirely. This chapter provided data for all the emphatic sounds, some of which had not been discussed earlier such as *ṗ ṃ*, and contrasted the data with emphatics in Arabic. I concluded that emphatics, based on their phonological behaviour, in SK are velarized as the process involves spreading a |U| element while emphatics in Arabic are pharyngealized and result from spreading of an |A| element. Finally, I discussed the process of nasal place assimilation and provided data to

show that in SK the coronal *n* assimilates to the resonance of the following sound while *m* does not assimilate.

Chapter four was concerned with the laryngeal system of SK. Since no previous studies have dealt with the laryngeal contrasts in word-initial position in SK, I presented instrumental measurements of VOT of word-initial position obstruents. The data showed that SK is both a true voice and an aspirating language since the voiced obstruents are pre-voiced (have a voice lead) and the voiceless obstruents are fully aspirated. This does not conform to the generalizations made in typological studies that assert that each language should have a neutral series of obstruents that contrasts with either a pre-voiced series (in true voice languages) or an aspirated series (aspirating languages). So, SK has a typologically uncommon laryngeal system. The second part of the chapter was about the process of final obstruent devoicing. No previous instrumental analysis has been conducted on final devoicing in SK. So, this chapter provided the first instrumental measurement of VOT in utterance-final position in SK. The data supported Harris' (2009) argument that final devoicing is weakening as the pre-voiced series were devoiced but did not neutralize with the aspirated series. However, in contrast to Harris' (1994) argument that languages with a two-way laryngeal contrast have a neutral (i.e. laryngeally unspecified) series, I concluded that SK has a fully aspirated set and a neutral series which results from a lenition process of devoicing of lexically voiced obstruents, in utterance final position. In this chapter, I also discussed the process of voice assimilation and provided examples of regressive voice assimilation in SK.

Chapter five dealt with two other common phonological processes in SK that are described as syllable structure processes as they, unlike the previous processes which target certain elements, target segments as a whole, viz. metathesis and deletion. The study of metathesis requires data collection on a larger scale to include all varieties of SK and show the geographical distribution of the metathesized forms as some of the examples are specific to certain dialects only. So, in this chapter I provide some observational data to illustrate the common patterns of metathesis in SK and the data showed that most of the examples included the sonorants. The second part of the chapter discussed the process of deletion which is one of the most common characteristics of Slemani; it is less common in Hawler. One of the processes discussed was the nasalization that results from the deletion of *nd* in such words as *sand* which is realized as *ṣaŋ* 'took'.

The overall aim of the thesis was to provide original data to highlight the areas of differences and similarities between the varieties of Hawler and Slemani in order to

present a comprehensive critical analysis of the segmental phonology of SK. The data showed that although the two varieties have much in common as they both belong to SK and are used in adjacent areas, there are still certain interesting differences that have not been investigated thoroughly in previous studies or viewed in light of phonological typology. My data conforms to the arguments in the recent works on Kurdish dialectology that SK can be divided into Northern Sorani and Southern Sorani with Hawler and Slemani being the epicentres, respectively.

My data showed that Dukan (and Little Zab) could be considered as the area of contact between the two varieties which showed features from both Slemani and Hawler. For example, the lateral *ɬ* in Slemani is replaced by the tap *r* in Hawler. My Dukan informants produced the *ɬ* in words like *ḅâɬâ* 'height' compared to my Koya and Hawler informants who produced *bârâ*. However, they did not delete the *d* in words like *dałêm* 'I say' and *minḍâɬ* 'child' which is always deleted in Slemani, *ałêm* and *minâɬ/ miŋâɬ*. Moreover, palatalization of the velars is primary which results in an affricate, such as in *kičêkî ǰiwân* [kɨtʃetʃi dʒɨwan] 'a beautiful girl'.

This thesis provides a good basis for further research building on its findings and its methodological analysis of the segmental phonology of these two pivotal dialects of Sorani Kurdish. One area that is yet to be developed is evidenced and comprehensive critical accounts of the phonology of other related varieties of SK, especially the varieties used in Iran as they are described to have similar phonological systems as Hawler and Slemani; nalysing data from such other varieties will reveal phonological patterns the SK group of dialects and will help better understand the distribution of the Sorani varieties. Further, having a larger set of cross-linguistic data for phonological analysis might help answer, for example, the question of why Hawler replaces *ɬ* by *r* that could not be answered in this study.

Another extremely important but severely neglected area to be investigated is the relationship of Kurdish with the contact languages in the area as they are most likely to have had at least some degree of influence on its phonology. In particular, the influence of Neo-Aramaic varieties which have had direct contact with SK, but the contact effects have never been studied. In particular, it is generally assumed that many lexical and linguistic imports from or influences of non-Kurdish-Iranian languages are from Arabic, whereas they are likely to have originated from - or come via - Neo-Aramaic varieties prevalent across Kurdistan, and in the case of Hawler and Slemani, northern Iraq in particular.

Finally, more data could be collected on metathesis in order to provide a more detailed account of this process. Some metathesized forms are used in certain dialects that were out of the scope of this study and I could not collect enough data. So, this study could be regarded as a basis for future work on metathesis and the other processes as well. Metathesis is a common process in Kurdish as well as in Persian, but it is perhaps an areal phenomenon influenced by contact, since it is also well known in spoken Arabic, particularly involving. It is not clear to what extent there is related metathesis in e.g. Neo-Aramaic, Turkish and other potential contact languages.

I close by noting that the analysis of Kurdish phonology in this thesis has also contributed to theoretically-based phonological typology. For instance, I have shown how emphasis (or, more broadly, backing) behaves and patterns differently between Semitic languages like Arabic and Indo-Iranian Kurdish. This work also therefore pushes forward our knowledge on resonance typologies and their theoretical modelling. It, therefore, pushes forward the knowledge on resonance typologies and their theoretical modelling.

Appendix A: Pictures showing lip protrusion for the consonants *č ǰ š ǰ* by a speaker of Slemani

š

ž

č

ǰ

Appendix B: Formant frequencies (in Hz) for SK vowels by 5 speakers (3 male, 2 female)

1. Formant frequencies for the vowel /i/

Wôrd list		Male 1		Male 2		Male 3		Female 1		Female 2	
		F1	F2	F1	F2	F1	F2	F1	F2	F1	F2
1	dîn	312	2074	343	2008	311	2290	454	2622	440	2652
2	tîn	322	1942	313	2030	289	2700	463	2583	469	2638
3	pîr	300	2397	299	2440	302	2331	421	2667	423	2722
4	îš	304	2178	297	2327	468	2123	327	2446	321	2004
5	panîr	344	2405	348	2583	359	2305	390	1669	380	2223
6	šîr	318	2195	324	2253	396	2091	342	2246	299	2293
7	bɨrsî	303	2329	307	2356	469	2160	372	2487	383	2548
8	fîl	286	2193	320	2131	450	2059	360	2517	344	2675
9	mîwa	326	2228	337	1654	450	1891	380	2837	389	2830
10	čaqîn	357	2073	327	2071	449	1960	367	2570	347	2598
11	bîr	306	2123	308	2183	309	2212	453	2424	475	2512
12	hanǰîr	299	2069	308	2212	324	2131	443	2315	462	2468
13	bîst	301	2178	305	2118	316	2219	365	2556	391	2424
14	lîta	304	2273	335	2096	321	2074	391	2468	431	2577
15	nîwa	308	2251	309	2161	315	1920	431	2183	439	2380
16	nizîk	278	2115	315	2030	319	2273	426	2490	431	2446
17	mrîšk	308	2210	312	2183	328	2134	409	2309	343	2336
18	mâsî	378	2142	321	2118	331	2096	387	2249	380	2303
19	žîr	340	2069	306	2175	317	2185	321	2030	361	2054
20	řîš	326	1978	312	2013	321	2088	365	2368	343	2285
	Mean	316	2171.1	317.3	2157.1	357.2	2162.1	393.35	2401.8	392.55	2448.4

2. Formant frequencies (in Hz) for the vowel /e/

Wôrd list		Male 1		Male 2		Male 3		Female 1		Female 2	
		F1	F2	F1	F2	F1	F2	F1	F2	F1	F2
1	bêška	406	1900	403	1906	458	1909	584	1942	562	2052
2	êra	409	1997	415	1898	469	1863	556	1942	553	2098
3	êš	426	1880	451	1898	541	1863	650	2086	577	2025
4	êsk	421	1831	414	1882	469	1925	512	2030	508	2118
5	gêž	363	1963	358	1838	523	1869	554	2040	536	2049
6	harmê	417	1946	389	1900	501	1896	574	1942	562	2052
7	kê	431	1873	413	1898	503	1814	540	2008	518	2078
8	lâdê	379	1950	361	1981	510	1942	497	2086	540	2227
9	pê	418	1997	411	2012	505	2032	532	2086	650	2186
10	xêrâ	430	1960	425	1947	426	1878	609	1994	626	2118
11	mêrû	394	1833	420	1844	427	1794	447	2040	499	2100
12	pêwîst	340	1873	352	1877	359	1964	497	1942	453	2074
13	čêž	406	1658	404	1828	425	1784	500	2096	540	1833
14	šêwâw	386	1828	387	2035	407	1840	517	1698	531	1472
15	šêlân	405	2167	414	1689	465	1888	540	2052	518	2227
16	ǰêgâ	396	1723	391	2063	390	2088	465	2096	521	2159
17	têr	388	1645	408	1950	405	2012	583	2161	573	2216
18	nâbê	377	1546	400	1670	373	1746	460	2023	585	2120
19	bêčû	372	1915	386	1935	387	1903	517	2052	455	2055
20	lêwâr	385	1885	383	1526	407	1626	545	2180	584	1920
	Mean	397.4	1868.5	399.2	1878.8	447.5	1881.8	533.9	2024.8	544.5	2058.9

3. Formant frequencies (in Hz) for the vowel/i/

Wôrd list		Male 1		Male 2		Male 3		Female 1		Female 2	
		F1	F2	F1	F2	F1	F2	F1	F2	F1	F2
1	âgir	400	2012	390	1967	341	2281	470	2409	462	2325
2	bird	419	1731	404	1609	426	1527	475	1971	479	2002
3	brinǰ	311	2314	302	1461	336	1852	485	2025	468	1990
4	čil	405	1745	417	1663	357	1772	486	1585	481	1907
5	čił	518	1150	423	977	463	1259	457	1149	473	1197
6	ḍił	466	1259	493	1383	394	909	500	1179	488	1128
7	ṗiř	517	1193	506	1195	513	1143	549	1197	514	1130
8	kird	387	1808	407	1781	359	1718	462	2234	455	2206
9	ṣiř	471	1272	497	1309	479	1383	509	1212	521	1224
10	mird	369	1796	387	1624	421	1714	484	1967	450	1681
11	šit	358	2026	407	1710	376	1738	348	1849	441	1981
12	biřyâr	444	1236	485	1144	539	1613	503	1286	499	1264
13	xist	389	1486	395	1449	423	1544	446	1726	456	1608
14	pišt	400	1601	382	1508	378	1658	565	1957	443	1882
15	žin	399	1706	348	1453	343	1447	465	1647	456	1931
16	wiryâ	342	1289	431	1156	350	1444	427	1793	441	1957
17	pird	429	1401	411	1166	445	1478	467	1983	480	1975
18	wird	379	1290	381	1284	385	1374	453	1392	469	1448
19	kip	375	1715	377	1614	345	1701	383	1613	358	1789
20	čirč	391	1850	380	1570	409	1855	444	1918	430	1858
	Mean	408.45	1594	411.15	1451.15	404.1	1570.5	468.9	1704.6	463.2	1724.15

4. Formant frequencies (in Hz) for the vowel/ʊ/

Wôrd list		Male 1		Male 2		Male 3		Female 1		Female 2	
		F1	F2	F1	F2	F1	F2	F1	F2	F1	F2
1	nust	329	1198	327	1262	375	1263	450	1548	447	1603
2	nustin	320	1268	388	1110	343	1001	409	1599	447	1620
3	guł	403	924	418	959	367	898	445	963	456	1071
4	puxt	441	958	444	1020	410	839	445	936	430	1002
5	tutin	310	1256	312	1021	318	1087	358	1384	361	1176
6	kurt	410	1045	404	990	458	1038	447	1323	468	1358
7	buxča	415	933	408	1075	384	906	451	1007	398	972
8	řunâk	384	952	382	994	317	906	390	1001	385	1082
9	xurmâ	360	911	384	1183	359	1128	400	1091	394	1095
10	kuř	426	955	419	981	415	1027	390	1000	466	1095
11	qurg	430	923	436	995	449	1082	420	1037	438	1084
12	qurs	381	1261	383	1148	389	1164	440	1272	463	1415
13	dužmin	378	1451	330	1088	387	1167	424	1705	422	2017
14	lutka	330	1196	323	1037	409	1198	416	1520	391	1484
15	murû	303	948	314	837	323	805	427	1121	430	1079
16	sirušt	329	1249	345	1088	431	1110	428	1311	421	1342
17	umêd	334	924	349	792	319	777	416	1103	404	1054
18	dirust	323	1201	365	110	328	1158	431	1434	411	1465
19	kužrâ	332	1142	343	956	387	1110	760	1742	406	1455
20	gulla	321	1072	356	978	321	1150	408	1108	380	856
	Mean	362.95	1088.35	371.5	981.2	374.45	1040.7	437.75	1260.25	420.9	1266.25

5. Formant frequencies (in Hz) for the vowel/u/

Wôrd list		Male 1		Male 2		Male 3		Female 1		Female 2	
		F1	F2	F1	F2	F1	F2	F1	F2	F1	F2
1	žûr	319	1222	406	1066	409	1176	334	1552	358	1255
2	tû	324	853	322	891	414	1094	336	1068	385	945
3	lût	304	1193	312	1066	321	1088	408	1352	434	1457
4	mû	376	917	380	755	355	714	334	987	395	1442
5	zû	317	1009	345	1010	390	890	352	1083	351	987
6	pûš	319	1042	329	1068	320	1021	354	1039	356	1068
7	ǰût	385	1159	343	1105	321	978	376	1304	382	1322
8	dû	316	984	321	954	312	790	364	1354	379	1274
9	pišû	347	1063	332	956	315	917	357	1115	380	1130
10	šûtî	387	1110	343	1458	368	1110	349	1437	350	1446
11	pûlaka	330	949	317	839	321	945	374	1071	402	936
12	dûrî	309	1205	332	1001	309	1035	356	1397	366	1411
13	čûn	333	978	332	1039	346	1066	419	822	422	1116
14	bûk	335	785	337	837	338	806	402	805	416	892
15	mêžû	325	927	334	935	352	1001	395	1049	412	1013
16	kûča	315	1051	308	1138	312	1268	340	1015	347	1097
17	pârû	333	906	345	858	339	911	379	983	403	984
18	qûłâyî	367	797	378	848	389	814	430	888	407	867
19	sûr	323	1031	337	1001	342	1127	390	1190	397	1073
20	astûr	320	1196	330	1044	338	1145	399	1197	401	1132
	Mean	334.2	1018.85	339.15	993.45	345.55	994.8	372.4	1135.4	387.15	1142.35

6. Formant frequencies (in Hz) for the vowel/o/

Wôrd list		Male 1		Male 2		Male 3		Female 1		Female 2	
		F1	F2	F1	F2	F1	F2	F1	F2	F1	F2
1	čirô	425	1026	438	1057	518	1189	492	1157	510	1196
2	čôł	453	937	454	971	535	967	498	999	484	1017
3	gôza	389	932	377	1056	439	1138	452	1216	446	1136
4	lôka	394	1072	404	987	489	1008	531	1338	535	1314
5	tô	422	926	428	994	454	951	498	1102	494	1086
6	bô	419	818	404	816	378	793	492	998	561	970
7	čôlaka	421	1070	418	1057	415	1085	533	1093	528	1107
8	qônâx	462	1021	452	1012	416	1030	503	1358	625	1244
9	xôr	445	1042	424	978	413	927	567	1075	609	1124
10	naxôš	431	1083	422	1065	431	914	494	932	544	1025
11	nôk	403	974	409	991	452	1011	528	1245	489	1296
12	kôł	456	848	464	846	468	876	659	1401	676	1708
13	rôžgâr	445	1075	454	1035	439	973	494	1116	489	1109
14	kôłân	459	900	459	857	468	907	531	1010	560	1005
15	kôn	449	979	444	949	518	913	499	1093	486	1139
16	zôr	439	1129	424	1153	475	1069	470	1231	486	1256
17	gôř	457	957	459	961	453	956	513	1028	539	1036
18	pôšâk	405	991	423	996	518	856	503	1100	488	1120
19	dirô	403	1012	398	989	584	825	493	1066	516	1139
20	hôš	427	997	457	990	540	908	492	1091	522	1122
	Mean	430.2	989.45	430.6	988	470.15	964.8	512.1	1132.45	529.35	1157.45

7. Formant frequencies (in Hz) for the vowel/a/

Wôrd list		Male 1		Male 2		Male 3		Female 1		Female 2	
		F1	F2	F1	F2	F1	F2	F1	F2	F1	F2
1	mâwa	537	1209	621	1245	651	1138	845	1400	857	1386
2	âʃ	620	1221	640	1165	607	1153	787	1511	786	1564
3	bârân	603	1326	646	1207	648	1248	815	1698	804	1712
4	sârd	634	1403	615	1340	518	1326	741	1570	646	1542
5	čâ	625	1297	613	1331	604	1409	794	1492	696	1494
6	dân	604	1444	633	1453	613	1435	801	1665	730	1620
7	tâm	628	1336	670	1351	603	1257	832	1582	744	1502
8	dâs	583	1396	637	1380	613	1349	844	1738	786	1662
9	tâw	622	1256	634	1311	580	1228	831	1467	809	1372
10	kânî	617	1441	596	1498	651	1451	627	1829	578	1802
11	ârd	694	1131	607	1238	559	1124	895	1620	760	1600
12	nân	561	1318	685	1373	669	1447	621	1634	650	1657
13	pân	650	1338	673	1366	633	1224	737	1638	794	1617
14	panĵâ	541	1303	565	1331	553	1264	626	1493	601	1356
15	pâr	643	1282	626	1310	647	1299	827	1760	843	1788
16	bâx	604	1212	578	1172	580	1193	915	1447	615	1346
17	sawar	556	1254	547	1225	650	1220	815	1547	786	1417
18	tâk	646	1474	637	1450	610	1407	847	1618	954	1873
19	dâr	600	1407	647	1399	636	1387	739	1700	799	1791
20	kâ	630	1339	628	1378	640	1308	803	1504	840	1500
	Mean	609.9	1319.35	624.9	1326.15	613.25	1293.35	787.1	1595.65	753.9	1580.05

8. Formant frequencies (in Hz) for the vowel/æ/

Wôrd list		Male 1		Male 2		Male 3		Female 1		Female 2	
		F1	F2	F1	F2	F1	F2	F1	F2	F1	F2
1	bad	605	1512	556	1547	544	1536	608	1756	612	1768
2	bard	630	1514	542	1535	533	1446	587	1811	641	1782
3	čak	514	1580	542	1525	477	1460	512	1661	552	1618
4	garim	589	1560	474	1680	694	1401	559	2150	539	2008
5	marij̆	567	1511	562	1482	538	1555	542	1557	577	1377
6	hałô	601	1160	564	1220	672	1110	645	1225	689	1222
7	kawt	512	1164	487	1133	650	1351	484	1316	502	1306
8	lagał	512	1465	399	1207	478	1504	537	1576	619	1832
9	nawak	508	1379	492	1263	628	1263	558	1354	536	1320
10	pala	557	1341	612	1458	519	1297	654	1937	664	1931
11	panjâ	578	1405	526	1393	716	1351	549	1187	615	1414
12	pat	569	1461	572	1478	567	1451	635	1849	631	1823
13	tak	625	1534	556	1703	528	1570	704	1878	628	1804
14	tam	672	1399	613	1485	549	1421	662	1580	672	1610
15	tanyâ	460	1318	430	1531	676	1687	560	2103	589	2102
16	êra	510	1548	595	1424	597	1580	579	1703	520	1530
17	čawir	502	1392	505	1418	481	1306	489	1350	497	1467
18	bafir	507	1375	488	1362	503	1349	579	1679	638	1568
19	lôma	463	1191	491	1198	465	1185	478	1350	439	1320
20	kawčik	476	1274	492	1197	459	1293	500	1282	472	1241
	Mean	547.85	1404.15	524.9	1411.95	563.7	1405.8	571.05	1615.2	581.6	1602.15

Appendix C: Formant frequencies (in Hz) for velarized vowels by 5 speakers (3 male, 2 female)

1. Formant frequencies (in Hz) for the vowel /â/ [ɑ]

Wôrd list		Male 1		Male 2		Male 3		Female 1		Female 2	
		F1	F2	F1	F2	F1	F2	F1	F2	F1	F2
1	ḅâł	641	1099	703	1165	637	1094	822	1291	843	1323
2	baṭâł	576	1079	610	1156	576	1121	563	1191	654	1151
3	ḍâł	631	1170	649	1206	597	1161	807	1385	750	1330
4	ṃâł	641	1044	666	1077	647	1073	692	1100	709	1107
5	mɨnḍâł	601	1166	625	1088	578	1097	514	1210	480	1155
6	ṗâk	645	1150	663	1139	628	1197	641	1167	693	1227
7	ṗâł	626	1043	705	1109	638	1069	744	1068	678	1015
8	ṣâł	608	1098	652	1125	603	1071	675	1004	782	1259
9	ṭâł	635	1209	640	1161	660	1201	783	1203	755	1220
10	ṭâłân	609	1078	587	1139	610	1201	690	1398	592	1395
	Mean	621.3	1113.6	650	1136.5	617.4	1128.5	693.6	1218.2	693.1	1201.7

2. Formant frequencies (in Hz) for the vowel /ô/ [ɒ]

Wôrd list		Male 1		Male 2		Male 3		Female 1		Female 2	
		F1	F2	F1	F2	F1	F2	F1	F2	F1	F2
1	ḅôła	511	867	473	909	471	868	686	1038	664	1067
2	ḅôřa	475	917	449	894	443	878	648	1154	660	1200
3	ḍôł	471	888	440	980	447	985	604	1069	505	978
4	ẓôł	455	996	459	928	458	989	432	868	490	899
5	ṗôř	488	890	475	990	457	904	487	941	454	914
6	ẓôŋ	434	908	429	980	382	965	469	1195	487	941
7	ṭôř	521	1283	490	1074	475	1125	414	923	631	1016
8	ṃôřa	469	959	472	1005	501	1011	523	1205	550	978
9	ṭôła	432	814	469	1021	465	987	450	987	604	891
10	ṭôłaka	541	914	486	899	478	917	530	880	562	874
	Mean	479.7	943.6	464.2	968	457.7	962.9	524.3	1026	560.7	975.8

3. Formant frequencies (in Hz) for the vowel /a/ [ʌ]

Wôrd list		Male 1		Male 2		Male 3		Female 1		Female 2	
		F1	F2	F1	F2	F1	F2	F1	F2	F1	F2
1	lâṗařa	571	1127	530	1128	548	1085	659	1030	630	1089
2	ṗař	580	1151	588	1152	597	1197	794	1284	831	1268
3	ṭała	567	1080	559	1106	549	1081	623	1025	785	1153
4	ṣag	510	1233	621	1334	522	1376	523	1307	527	1280
5	ṭař	568	1231	523	1225	567	1257	573	1311	562	1260
6	ṣad	506	1255	481	1254	482	1343	735	1336	689	1314
7	šaṣt	511	1197	505	1176	499	1103	718	1139	459	1257
8	kîṣał	519	1050	488	1036	477	1039	710	1102	699	1151
9	ṃař	593	1133	512	1051	565	1176	723	1285	753	1209
10	ẓaŋ	482	1296	477	1281	468	1305	777	1173	660	1176
	Mean	540.7	1175.3	528.4	1174.3	527.4	1196.2	683.5	1199.2	659.5	1215.7

Appendix C: VOT of word-initial obstruent consonants in SK

1. VOT of *p*

		Female 1	Female 2	Female 3	Male 1	Male 2
1	pêkanîn	44	38	34	54	52
2	pêwîst	45	44	52	64	66
3	pat	38	27	34	34	35
4	pyâw	61	59	65	67	63
5	pis	51	59	52	62	55
6	panîr	37	38	34	37	44
7	pîska	64	71	55	63	48
8	pûš	61	75	67	59	61
9	pâr	32	50	28	37	58
10	pâqla	28	32	27	43	48
11	pirč	32	41	33	47	42
	Mean	44.81818	48.54545	44.7	51.54545	52

2. VOT of *t*

		Female 1	Female 2	Female 3	Male 1	Male 2
1	têr	49	52	62	89	68
2	tam	40	42	34	47	44
3	tâk	36	31	27	48	47
4	tôw	53	64	61	61	53
5	tîšk	56	51	46	60	62
6	tamâta	23	30	27	43	36
7	tûr	68	75	59	72	52
8	tûtin	58	36	49	93	66
9	têkał	33	52	50	58	53
10	tîr	67	77	74	81	77
11	tôłaka	47	48	54	59	56
	Mean	48.18182	50.72727	49.36364	64.63636	55.81818

3. VOT of *k*

		Female 1	Female 2	Female 3	Male 1	Male 2
1	kâma	47	51	43	61	73
2	kûpała	77	64	73	93	81
3	kas	44	58	55	66	65
4	kwânê	65	69	71	65	70
5	kawar	72	68	53	44	61
6	kât	50	70	65	55	75
7	kôłân	51	66	68	61	56
8	kûča	62	83	84	87	106
9	kârakar	46	45	54	54	56
10	kêša	63	80	67	72	56
11	kîsał	68	70	91	81	79
	Mean	58.63636	65.81818	65.81818	67.18182	70.72727

4. VOT of *q*

		Female 1	Female 2	Female 3	Male 1	Male 2
1	qal	46	63	55	50	41
2	quřâw	69	56	39	63	80
3	qałâ	62	74	72	47	56
4	quris	64	70	57	53	42
5	qôpča	51	50	43	50	44
6	qâwirma	47	59	32	41	39
7	qurig	86	79	75	58	63
8	qaław	61	55	44	48	34
9	qârčik	50	58	38	51	52
10	qîža	63	69	54	79	66
11	qîn	64	72	51	56	59
	Mean	60.27273	64.09091	50.90909	54.18182	52.36364

4. VOT of *b*

		Female 1	Female 2	Female 3	Male 1	Male 2
1	bêška	-35	-72	-43	-96	-91
2	bard	-78	-89	-74	-99	-103
3	bôčî	-55	-54	-65	-53	-33
4	buxča	-45	-42	-55	-57	-52
5	bafir	-83	-79	-60	-87	-80
6	bârân	-52	-53	-64	-45	-33
7	bîr	-71	-74	-70	-88	-95
8	bûk	-46	-62	-66	-77	-103
9	birsî	-62	-71	-48	-29	-34
10	bô	-60	-64	-59	-74	-50
11	bâx	-70	-47	-56	-47	-62
	Mean	-59.7273	-64.2727	-60	-68.3636	-66.9091

5. VOT of *d*

		Female 1	Female 2	Female 3	Male 1	Male 2
1	dîsân	-81	-82	-57	-72	-82
2	dîwâr	-57	-78	-63	-89	-134
3	dam	-86	-92	-109	-102	-143
4	darzî	-59	-51	-56	-83	-79
5	dôšâw	-68	-63	-88	-32	-82
6	dûkał	-45	-70	-31	-29	-86
7	dast	-102	-87	-90	-105	-139
8	dû	-74	-53	-88	-80	-99
9	dargâ	-118	-78	-83	-80	-61
10	dôst	-76	-72	-86	-82	-133
11	dôšak	-57	-67	-46	-64	-71
	Mean	-74.8182	-72.0909	-72.4545	-74.3636	-100.818

6. VOT of *g*

		Female 1	Female 2	Female 3	Male 1	Male 2
1	gêž	-56	-55	-61	-66	-89
2	gawra	-40	-22	-20	-52	-56
3	gôm	-54	-68	-65	-68	-83
4	gałâ	-60	-43	-48	-106	-53
5	gø	-48	-58	-52	-84	-91
6	gwâra	-60	-49	-78	-62	-52
7	galâwež	-43	-62	-32	-54	-69
8	ganim	-45	-78	-71	-66	-87
9	gašt	-61	-80	-67	-114	-108
10	gôšt	-38	-47	-48	-32	-47
11	guł	-49	-50	-58	-55	-75
	Mean	-50.3636	-55.6364	-54.5455	-69	-73.6364

7. VOT of *č*

		Female 1	Female 2	Female 3	Male 1	Male 2
1	čiyâ	154	130	165	127	135
2	čašin	79	81	73	89	86
3	čâra	88	79	95	80	85
4	čâł	87	80	79	92	97
5	čôlaka	94	87	98	93	99
6	čâw	77	97	109	89	91
7	čił	108	103	95	118	112
8	čarim	87	120	92	99	108
9	čîn	140	102	129	128	143
10	čî	148	156	131	126	130
11	čôł	83	123	78	91	88
	Mean	104.0909	105.2727	104	102.9091	106.7273

8. VOT of *ǰ*

		Female 1	Female 2	Female 3	Male 1	Male 2
1	ǰiyâ	-71	-78	-82	-92	-100
2	ǰažin	-50	-87	-92	-103	-98
3	ǰâr	-75	-51	-60	-49	-79
4	ǰêga	-42	-57	-41	-39	-45
5	ǰôga	-60	-45	-71	-109	-65
6	ǰîř	-61	-52	-50	-39	-53
7	ǰang	-52	-92	-71	-85	-58
8	ǰigar	-60	-76	-61	-102	-86
9	ǰôr	-39	-50	-56	-84	-56
10	ǰil	-79	-69	-55	-94	-98
11	ǰîřa	-79	-66	-107	-122	-80
	Mean	-60.7273	-65.7273	-67.8182	-83.4545	-74.3636

4. VOT of Velarized Consonants

ṗ

		Female 1	Female 2	Female 3	Male 1	Male 2
1	ṗâk	26	28	35	25	27
2	ṗała	41	51	33	34	30
3	ṗař	27	25	35	53	42
4	ṗôłâ	51	58	50	65	68
5	ṗôř	47	46	38	93	73
	Mean	38.4	41.6	38.2	54	48

ḅ

		Female 1	Female 2	Female 3	Male 1	Male 2
1	ḅâł	-50	-51	-40	-48	-51
2	ḅałâ	-65	-72	-99	-70	-58
3	ḅôła	-50	-63	-60	-76	-65
4	ḅâng	-39	-79	-37	-62	-59
5	ḅařa	-73	-47	-53	-59	-71
	Mean	-55.4	-62.4	-57.8	-63	-60.8

ṭ

		Female 1	Female 2	Female 3	Male 1	Male 2
1	ṭôła	34	60	48	56	62
2	ṭâł	54	50	34	44	63
3	ṭała	47	45	46	45	41
4	ṭař	20	32	31	74	59
5	tôř	25	27	38	53	69
	Mean	36	42.8	39.4	54.4	58.8

ḍ

		Female 1	Female 2	Female 3	Male 1	Male 2
1	ḍâł	-51	-41	-53	-67	-76
2	ḍang	-67	-60	-55	-81	-76
3	daṣiř	-82	-65	-39	-31	-58
4	ḍił	-57	-75	-67	-71	-55
5	ḍôł	-75	-43	-51	-87	-115
	Mean	-66.4	-56.8	-53	-67.4	-76

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