THE PROSODIC PHONOLOGY OF CENTRAL KURDISH

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Abstract

This thesis investigates the prosodic structure of Central Kurdish; a language whose phonology and prosody is poorly studied. Within the framework of Optimality Theory, rhythmic categories (mora, syllable and foot) and prosody-morphology interface category (Prosodic Word) of the language is addressed. The thesis also includes comparing the prosodic units (below phonological phrase) with the parametric variation for each constituent. This study fills the gap in the work of the prosodic system of Central Kurdish and on its phonology as such. Based on the data, the thesis also assesses the conflicting sub-theories of prosodic phonology: the view which sees phonological representation as a hierarchical organisation of units of which the higher prosodic units are defined in terms of lower ones against a different view which argues against constituency in phonology.

Being theoretical in nature, the researcher's intuition as a native speaker of the language under study is used for the description of the data. The validity of the data is being supported and cross-examined by the descriptive literature on the language. As it is described as the best method for interpreting prosodic phonology, Optimality Theory is used as the framework to analyse the data. The supporting evidence for each prosodic constituent is drawn from the (morpho)phonological processes that use the categories as the domain of their application.

As the research question investigated covers a broad area in the prosody of Central Kurdish, the findings were wide-ranging and multi-layered. First, it was found that sequences of speech sounds are organised into constituents, which serve as the domain of certain phonological processes. Each prosodic constituent consists of at least a constituent of the lower constituent. Similar to syntactic categories, it was shown that prosodic categories (above syllable and foot) can be recursive and parsing can be non-exhaustive. Mora, though not a prosodic constituent within the prosodic hierarchy, can be sensitive to certain morphological processes and insensitive to phonological processes, i.e. sensitivity of processes can be a process-specific rather than language-specific. The significance of the findings of this thesis is twofold. First, it is the first analytical prosodic study of Central Kurdish. Second, which is theoretical, Prosodic structure, at least for Prosodic Word, matches a syntactic constituent.

Declaration

The material contained within this thesis has not previously been submitted for a degree at Newcastle University or any other university.

Signed Twana

Twana Saadi Hamid

Date 2015

What fetters the mind and benumbs the spirit is

ever the dogged acceptance of absolutes.

EDWARD SAPIR 1924

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Finally, I record my acknowledgement to my family. What I could possibly say? I gave all the time and attention they deserve to thinking on and writing this thesis. To them, this thesis is dedicated.

List of Abbreviations

C: Consonant

CG: Clitic group

CK: Central Kurdish

CL: Compensatory Lengthening

Fnc: Function word

OT: Optimality Theory

PWG: The Prosodic Word Group

QI: quantity insensitive

QS: quantity sensitive

SLH: Strict Layer Hypothesis

SPMH: The Syntax Prosody Mapping Hypothesis

V: Vowel

μ: Mora

σ: Syllable

F: Foot

ω: Prosodic Word

φ: Phonological Phrase

ι: Intonational Phrase

υ: Utterance

§: section indicator

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Chapter One Introduction

1.1 Research Problem, Aims and Objectives

This thesis is an empirical study of the prosodic structure of Central Kurdish (CK) and provides an overview of the different levels of prosodic structure in the language. This dissertation is the first to provide a detailed investigation of CK prosody which addresses the smaller rhythmic units (mora, syllable and foot) as well as the bigger constituents that interface with morphological structure (Prosodic Word). Following Ladd (1986) and Nespor and Vogel (1986), who regard the Intonational Phrase as an exact match of the syntactic clause (Tense Phrase), this study excludes the Intonational Phrase and also leaves the phonological phrase for further research. As Kurdish has not been well studied, it is hoped that the findings of this study can fill the gap in the absence of studies of prosodic structure in CK and shed light on the different versions of the theory of Prosodic Phonology by applying it to new data.

The thesis has two main goals. The first goal is to fill the gap in the work of the prosodic system of CK and on its phonology as such. Its focus is mainly the smaller prosodic units in the prosodic category: the set of domains that are phonological and the prosodic units that interface with morphology. Although it is known that CK has stress and intonation but no lexical tone, its position within the prosodic typology is unstudied and therefore unknown. The second goal, which is more theoretical in nature, assesses the basic claims of prosodic phonology (Selkirk 1978[1981]; Nespor and Vogel 1986 inter alia) against a different view, which argues against constituency in phonology. The data of this thesis test the hypothesis that denies the existence of prosodic hierarchies in its entirety (Pak 2008; Samuels 2009) or in its particulars, (Prince 1983; Gordon 2002; Hulst 2009) against foot as a prosodic constituent, (Kaisse 1985; Odden 1995) for higher prosodic categories that interface with morphosyntax such as prosodic word.

Following Itô and Mester (2012:281), I divide the prosodic categories into two group categories: rhythmic categories and interface categories that interface with morphology and syntax. One departure from Itô and Mester's account is the exclusion of mora as a prosodic unit. I exclude mora as a prosodic constituent (see § 2.1 for reasons) but highlight its role in the phonology of CK as a weight bearing unit. Further, the interface categories can be divided into those interface with syntax and the constituent that interface with morphology as shown in Figure 1.1.

The scope of this thesis is limited to the rhythmic categories and the category that interfaces with morphology, namely prosodic word. The prosodic constituents can be divided into two different major groups. The first group subsumes the constituents that are in principle made available by morphosyntactic structure. These categories include prosodic word, which mainly interfaces with morphology, and Phonological Phrase, Intonational Phrase and Utterance, which interface with syntax. The other prosodic constituents consist of localized domains that are purely phonological in nature. Part one of this thesis revolves around word-internal units (mora Chapter Two, syllable Chapter Three and foot Chapter Four) that are intrinsically defined in terms of segmental phonological processes and speech rhythm. Part Two (Chapter Five), in contrast, investigates the prosodic category that interfaces with morphology. The morphology–prosody interface is limited to prosodic word.

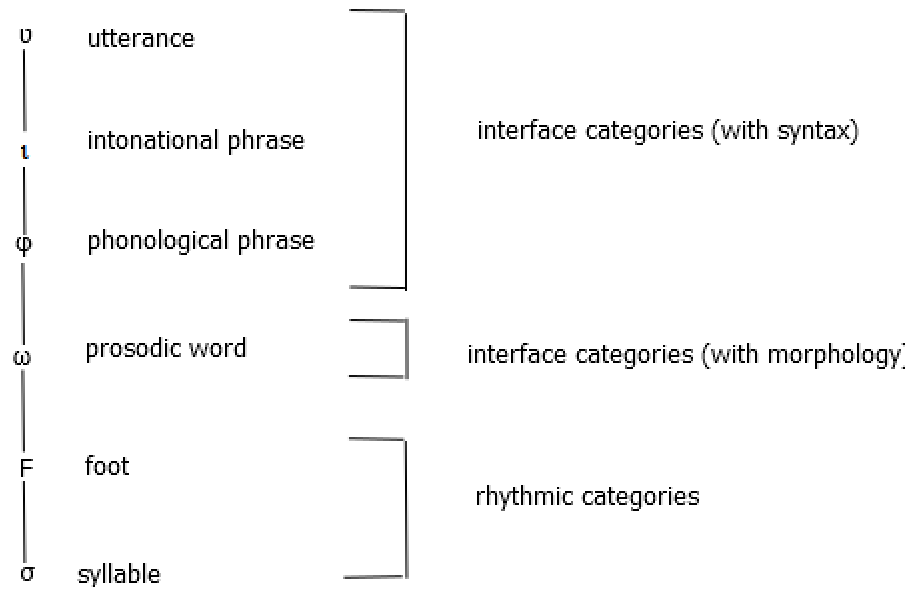


Figure 1.1 Interfaces of prosodic hierarchy

The hypotheses, i.e. assessing the basic claims of prosodic phonology, can be tested through an examination of the interaction between the phonological processes and the domains of their application. The phonological processes make reference to prosodic constituents of the grammar. The basic tenet of prosodic phonology, as stated by Nespor and Vogel (1986:1), is the division of mental representation of speech into hierarchically arranged chunks (prosodic constituents) that trigger segmental modification or subtle phonetic changes. Prosodic constituents, thus, serve as domains of surface processes: i.e. they are the underlying principle that governs the application of most phonological processes. The basic assumption of prosodic phonology is that the output of surface syntax interfaces with the prosodic domains that cue surface phonetic modification.

An inevitable by-product of the data complying with prosodic constituency would be to determine which of the available theories of prosody can best interpret the data. For instance, we can determine whether the data of CK syllables support the categorical division of quantity (in)sensitivity. The basic assumption of the relatedness of syllable weight to phonological processes is that, based on parametric variation, phonological processes are either sensitive or insensitive to syllable weight (McCarthy and Prince 1996 [1986]; Hayes 1989). Another hypothesis is that there can be inconsistency between rhythmic and prosodic morphology in terms of sensitivity to syllable weight (Gordon 2004; Fitzgerald 2012). The central issue here is which hypothesis is supported by the CK data? This question is answered in chapter two. Chapter three will also look into the constituency of syllables to see whether syllables in CK can serve as a domain for the application of phonological processes.

Another hypothesis tested (in chapter four) is related to the foot as a prosodic constituent. Does the foot structure in CK fall into one of the cells in Hayes' (1995) typology? After in-depth analyses of stress patterns of a large number of languages, Hayes argues, among many other things, that the universal foot inventory is asymmetric. That is, the syllables of a foot in languages of trochaic (strong-weak) rhythm have even duration; it contains either two light syllables (moraic trochee) or two syllables of indiscriminate weight (syllabic trochee). Iambic (light-heavy) languages, in contrast, contain a light syllable followed by a heavy syllable which results in an uneven phonetic duration between the elements of a foot. Equal duration of syllables in trochaic languages and unbalanced duration in iambic languages stems from the widespread cross-linguistic correlation between rhythm type and duration. The central issue addressed here is whether the three foot types suffice to account for the CK data.

For higher prosodic categories that interface with morphology, the thesis examines which one of the following can best account for the data: Nespor and Vogel's (1986) Relational theory (non-isomorphism), Selkirk's (1986) Edge-based theory, Selkirk's

(2011) Match Theory. This issue, tested by interface of prosodic word with morphology, is addressed in chapter five. Nespor and Vogel put forward the claim that although the construction of prosodic constituents depends on morphological elements, they are not necessarily isomorphic to constituents of morphology or syntax. This claim implies that the rules that build the phonological constituents should have access to morphological elements (stems and affixes) and syntactic elements (heads and phrases) but that these morphosyntactic constituents are not directly available to the phonological processes. In fact, one piece of confirmatory evidence they provide for the existence of phonological constituents is the non-isomorphic relation between prosodic and morphosyntactic constituents.

Further research in this area includes Selkirk (1986) whose basic argument is that the relation between morphosyntactic structure and prosodic structure above the foot and below the intonational phrase is defined in terms of the ends of syntactic constituents of designated types. The idea is that for some unit of phonological structure, based on parametric variation, its left or right edge is demarcated by the right or left edge of some surface syntactic unit. Thus, according to edge-based theory, the syntax-phonology mapping can be simply defined by reference to the edges of the syntactic constituents. Any phonological processes that refer to syntactic constituents, insertion of tone boundary at the right end of maximal projection for instance, are understood as the insertion of tone boundary at the right edge of phonological phrase.

Both Nespor and Vogel's (1986) Relational Theory and Selkirk's (1986) Edge-Based Theory assume the prosodic structure representation to be layered (nonterminal units are composed of lower units), headed (each unit must dominate at least one unit of the lower category), exhaustive (units are not skipped in parsing) and nonrecursive (units are not repeated). These four categories together form the Strict Layer Hypothesis (SLH) which stipulates that the prosodic hierarchy is strictly arranged. SLH defines the nature of the prosodic subsystem in phonology by assuming no inherent isomorphism between prosodic constituents with the categories of syntactic structure.

Subsequent research in this area, especially after the inception of Optimality Theory has taken different direction. The most recent and compelling of these is Selkirk (2011), a prominent contribution to the literature on prosody. Selkirk's main argument in Match Theory is that syntactic constituents must be matched by a corresponding prosodic constituent and vice versa. In particular, a syntactic clause is matched by an intonational phrase, a phrase in syntactic constituent must be matched by a phonological phrase and a word in syntactic constituent structure must be matched by a prosodic word. Match Theory is premised on the assumption that prosodic constituents can have properties of syntactic constituents. Two syntactic properties which are reflected in prosodic structure are prominent: recursivity in which a constituent of a particular prosodic category dominates another of the same category and non-exhaustivity in which a prosodic unit can skip its immediate superordinate level to be dominated by a unit of two levels higher. Thus, a prosodic word can be parsed into an intonational phrase bypassing the phonological phrase.

The structure of phonological representations (prosodic units) in CK is gauged against the three hypotheses mentioned above to see which one is supported. In particular, it is a test of the assumption of Match Theory that prosodic categories are universally syntactically grounded. Thus, the thesis aims both to describe the prosodic structure of CK and to test the applicability of the available theories on prosodic phonology and its relation to morphology.

1.2 Language and dialect under study

The Kurdish language is spoken mainly in Turkey, northern Iraq, western Iran, Syria and Central Asia. The borders of homogeneous Kurdish speaking territory cannot be defined in political terms, since they do not coincide with international borders or internal administrative borders. Kurdish is a west Iranian language which belongs to the Proto-Iranian language family. Estimates of the total number of the Kurdish speakers vary widely, between 15 and 40 million. According to The Ethnologue (2009), Kurdish has 30 million speakers and a sizable community in diaspora.

As a result, what constitutes Kurdish is far from clear. Considerable differences among Kurdish varieties along with the lack of a state to represent the Kurdish speakers have precluded the development of a standard dialect and have resulted in controversy on whether the varieties should be classified as different languages or dialects of the same language. Further, degrees of mutual unintelligibility among Kurdish varieties has complicated the situation. As far as linguistic evidence is concerned, the Kurdish sparchbund (area of linguistic convergence) cannot be easily explained or classified into its components. Five varieties are usually recognised as dialects of Kurdish: Northern Kurdish, Central Kurdish, Southern Kurdish, Gorani and Zazaki (Fattah 2000; Haig and Öpengin 2014). However, researchers often disagree on how to subgroup these varieties or even to regard them as dialects of the same language or different independent languages. As Haig and Öpengin (2014) explain, the confusion mainly arises from not explicitly distinguishing the criteria used to group different language varieties as dialects of the same language or separate languages.

A common diagnostic test for distinguishing between languages and dialects is mutual intelligibility of the speakers of the two varieties. Kurdish varieties are not characteristically mutually understandable but as Haig and Öpengin convincingly argue, there are three reasons for mutual intelligibility not to be a reliable diagnostic for distinguishing between languages and dialects. First, speaker attitude cannot be an objective measure for understanding a language. Moreover, speakers of a dialect vary in how to describe intelligibility. Second, speakers of two geographically adjacent varieties (dialect continua) may understand each other, but those of either end of the continua may not. Third, intelligibility is a dynamic process; exposure to a variety often dramatically increases its intelligibility. An example from Kurdish is that speakers of northern Kurdish (Kurmanji) and Gorani varieties in Iraqi Kurdistan often understand central Kurdish as they are excessively exposed to CK through education and mass media but not the other way round. As the exposure is often from one direction, intelligibility is also from one direction.

Not surprisingly, scholars have introduced a socially-oriented benchmark for defining language and dialect. Crystal (1997:248) added common cultural history for language varieties to be labelled as dialects. Kurdish speakers, regardless of the linguistic features of the dialects, perceive their identity as a unified nation with a unified language. Kurdish speakers are those who claim Kurdish identity for themselves. They also have a shared culture and a common history that separate them from the ruling nations in the states where the Kurds live. Historically, the notion of group identity and the perception of Kurdishness among Kurdish varieties were well established in the sources of Ottoman era around 500 years ago.

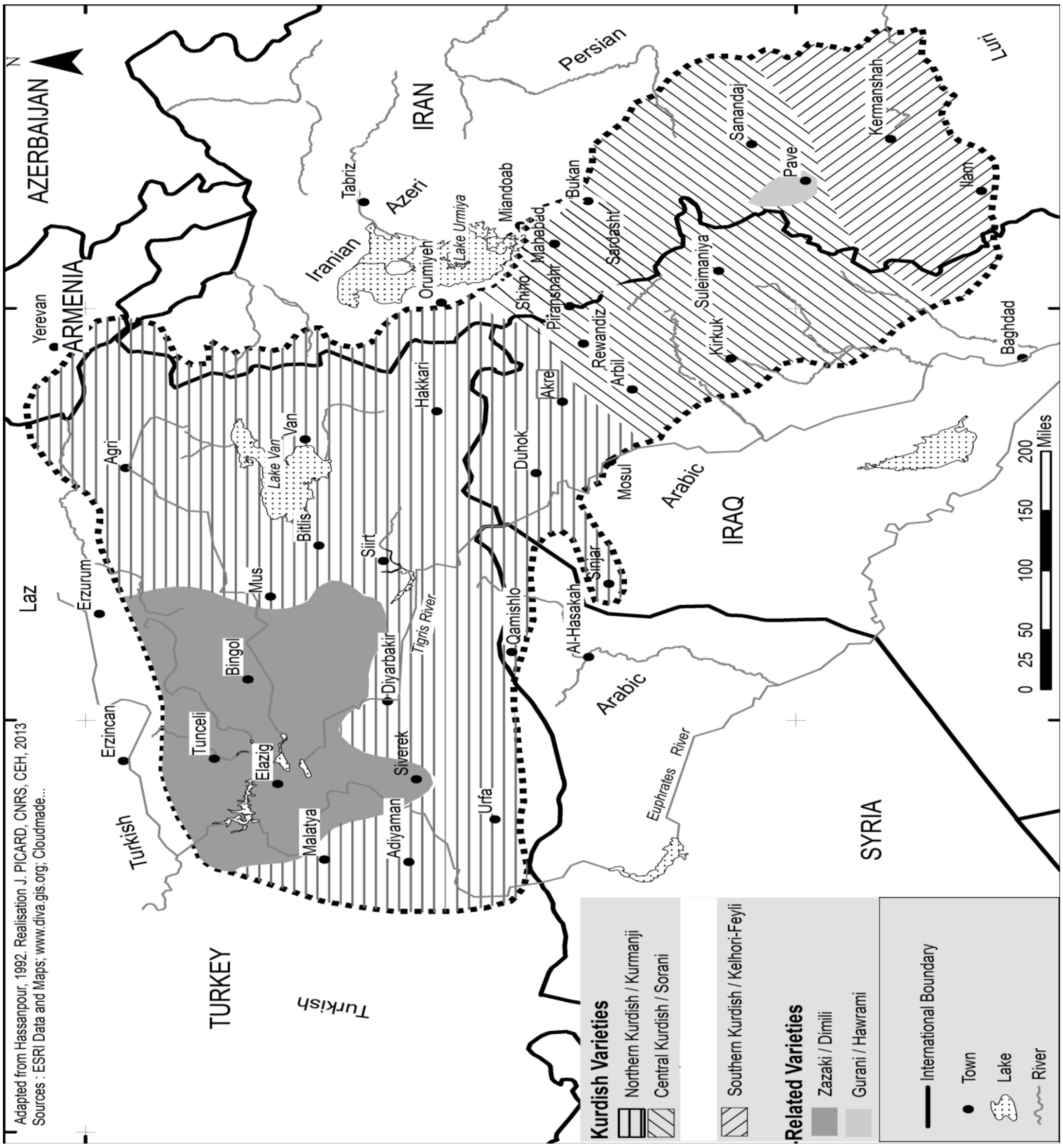
Another notion that unites the Kurdish varieties into one language is their linguistic and socio-political distinctiveness from the national language of the countries where the

Kurds live. Linguistically, Kurdish dialects have much more in common with each other than with the state languages. In Turkey, Kurmanji (Northern Kurdish) and Zazaki have many common grammatical features that separate them from the Turkish language which is from a distant language family. Similarly, Kurmanji and Sorani (Central Kurdish) in Iraq have a common origin and shared grammatical features that separate them from Arabic; the majority language of the country. Thus, there is enough evidence to group Kurdish dialects as one language.

As far as linguistic evidence is concerned, it is difficult to group Kurdish varieties into similar subgroups. Northern, Central and Southern Kurdish have an immediate common origin and show more phonological similarities. Thus, they are often classified into a subgroup. These three dialects share the phoneme /w, v/ in contrast to the Persian phonemes /m/ as in *nam ~ naw, nav* 'name' and *nim ~ niw, niv* 'half' while Gorani and Zazaki have phonological similarities that sets them apart from other dialects such as *waʃ* 'pleasant' and *waɾd* 'eat' in contrast to *xoʃ* and *xwaɾd in* other dialects. Based on these similarities and various other morphosyntactic similarities of Gorani and Zazaki with Caspian languages, Fattah (2000) propose to classify Kurdish dialects into two groups:

Kurdish Group	Kurdo-Caspian Group
Northern Kurdish (Krmanji)	Zazaki
Central Kurdish (Sorani)	Gorani
Southern Kurdish	

The data of this study are exclusively from Central Kurdish whose prosodic structure is not studied as far as I am aware. CK is spoken across a large contiguous area spanning the International borders of northeast of Iraq and northwest of Iran. Accurate numbers of CK speakers is not available but it is estimated to have (6.750.000) speakers. CK is spoken in the Provinces of Sulaimani, Kirkuk and Erbil in Iraq and Kurdistan province in Iran. The regional distribution of CK speakers is shown in Map 1.1. According to Haig and Öpengin (2014), it has the main regional sub-dialects of Mukri, Hewleri, Silemani, Garmiyani and Sineyi. However, this division seems more administrative than dialectal division. MacKenzie (1962:50), based on linguistic differences, classifies the sub-dialects of CK into Sulaimani, Warmawa, Bingird, Pizhdar, Arbil, rewandiz, Xoshnaw and Mukri. Due to the internal displacement and the prestige associated to the urban dialects of Sulaimani and Erbil, the first four sub-dialects are reduced to Sulaimani dialect and the second four are reduced to Arbil (Hawleri) sub-dialect. Particularly, Sulaimani sub-dialect, which is the focus of this study, has gained official status within the CK sub-dialects in Iraq. It has been served as an officially recognised regional language of instruction, media and commerce in the Kurdistan region of Iraq and unofficially in the Sorani-speaking areas of Iran.



Map 1.1 Speech zones of CK and other Kurdish dialects (from Öpengin 2013)

1.3 Methodology

The data of this thesis come from three different sources. First, the researcher's intuition as a native speaker of the dialect under study serves as the main source for the data. The native speakers' intuitions are the only legitimate source of grammatical data. Since this study is theoretical, there is consensus in principle in the use of intuition as evidence for theoretical claim. A given linguistic expression's well-formedness and its meaning can be simply judged by native speakers (Wasow and Arnold 2005). The second sources of my data come from reviewing the literature of CK phonology. Cross-examining intuition with other sources can undoubtedly add to the validity of the data of a scientific source.

Intuition of a single researcher or a group of researchers, however, cannot sometimes accurately identify some linguistic features. Take, for example, the articulatory features of the vowels of a poorly-studied language, intuition cannot pinpoint exactly the quality (formants) of the vowels. Therefore, the third source of data comes from an acoustic study of the vowels. A word list of 15 vocabulary items per each vowel whereby the CK vowels occur both in open and closed syllables were recorded by five male CK speakers and acoustically analysed. The result is Figure 1.2 where the formants and length of the vowels are identified.

The Theoretical framework for investigating the data is Optimality Theory (Prince Smolensky 2004 [1993]). The rationale for using OT is that it best analyses prosodic and metrical phonology (Kager 1999). The advent of new approaches to OT through modifying classic OT not only helps to explain phonological processes that pose challenges for classic OT, but also can account for processes such as compensatory lengthening that has remained unaccounted for within the rule-based phonology (see Kiparsky (2011:37).

Finally, this thesis looks at the rhythm and the prosody of declarative expressions to the exclusion of interrogative, non-neutral focused contexts and exclamatory expressions which can have various prosodic structures. Parenthetical expressions and relative clauses are also excluded from the data of this thesis.

1.4 A Brief Review of Literature on CK Phonemes

The study of the Kurdish language is relatively new. Excluding some orientalists' general description of the language, it started with Wahby (1929) who formulated the phonemization of the writing system by proposing one letter for each sound. Thus, the

Kurdish alphabet is perceived as encoding the phonemic system of the language. However, in Kurdish writing, similar to many other languages, some letters have more than one sound, or two juxtaposed sounds form a special different phoneme, and occasionally, based on syllable structure, a sound is epenthesised which has no spelling counterpart in the writing system. Another problem of the phonemic inventory of Kurdish language, as Hassanpour (1992) suggests, stems from the extensive lexical borrowing of the earlier decades which introduced into the written language several phonological features, usually associated with unassimilated loan words.

The phonology of this variety of Kurdish in general and its prosody in particular has not been well-studied. Scholarly work on this variety dates back to McCarus' (1958) impressionistic description of the grammar of the Sulaimani sub-dialect. Then, MacKenzie's (1962) dialectal study aims to give an account of classifying Kurdish dialects. Needless to say, none of these two pre-prosodic phonology studies touched upon the prosody or, in fact, any supra-segmental aspects of the language. Later, Ahmad (1986) gives a phonetic account of aspects of CK phonology, but he mostly focuses on segmental description without alluding to phonological representations. Fattah (1997), on the other hand, gives a precise descriptive overview of CK phonology within the framework of rule-based approach. Of particular interest to this study, he outlines the stressable and unstressable suffixes in CK. Nevertheless, as his work tackles all components of grammar (phonology, morphology, syntax); it fails to address the particulars of CK phonology. More recently, Hasan (2012) describes the intonation system of Northern Kurdish (Kurmanji) by using the ToBI system. However, her work differs from the current study in two significant ways. First, data from her work are from Northern Kurdish which is a drastically different variety from CK. Second, the focus of the study is more on intonational patterns and cross-speaker and cross-utterance variations rather than on the prosodic structure addressed in the current study.

The number and type of CK phonemes have not been previously established. There is disagreement among linguists, both Kurdish and foreign, on what sound constitutes a phoneme in Kurdish and how many phonemes are there in the language (McCarus 1958, 1997; MacKenzie 1962; Wais 1984; Ahmad 1986; Fattah 1997; Mahwi 2009). The disagreement includes both consonants and vowels: some linguists consider particular consonants phonemic, while the same consonant is analysed by others as an allophone. Further, some linguists argue that the Kurdish vowel system includes diphthongs while others exclude diphthongs from the vowel system. The lack of agreement on a phonemic inventory is partly attributed to how the language has been studied and partly to the linguists who studied the language.

Linguists have arrived at dissimilar accounts of the CK phonemes for two different reasons. Foreign linguists who studied Kurdish did not have enough experience with the language in general and the phonology of the language in particular to give an accurate account of the phonemes of the language. McCarus (1958), for example, regards the velarized alveolar fricative /sˠ/ as a separate phoneme in CK without providing minimal pairs for this phoneme because simply such minimal pair does not exist. Most local linguists who studied CK, on the other hand, lacked the appropriate conceptual framework and knowledge of how to appropriately apply it. Fattah (1997) gives several minimal pairs for /ŋ/ and /n/ but denies giving /ŋ/ the status of phoneme with the excuse that it mostly occurs as a sequence of two consonant letters. For these reasons, this study does not adopt any of the phonemic inventories of CK reported in the literature. Instead, I will establish the phonemic inventory in the following sections.

1.5 Consonants

The interest of this section in phonemic features centres around the question of how the articulatory features are used to contrast meaning. So, the focus is only on articulatory features rather than on all the distinctive features. As mentioned above, an accurate list of consonants is still debatable; there are 25 established uncontroversial consonants occurring in native Kurdish words that can occur in syllable margins. The 25 consonants are /p, b, m, w, f, t, d, s, z, n, l, ɫ, r, ɾ, ʧ, ʤ, ʃ, ʒ, j, k, g, ŋ, χ, h, ʔ/. These consonants have rather free distributions in the syllable margins and provide minimal pairs involving words of Kurdish origin.

On the other hand, there are some other consonants in the language with debatable status. These segments have made their way into CK through loan words. The loan words are established in the lexicon of the language and have brought with them phonemes that do not exist in the native phonemic inventory of the language. However, the loan words are mostly used in spoken language compared to written language. Following Paradis and LaCharité (1997), who view a language's lexicon as divided into a core and a periphery, it can be said that loan words, in particular the unadapted loans, are in the periphery of the lexicon as the periphery is the domain where some constraints of the core are eliminated or weakened. The extensive lexical borrowing especially from Arabic, and to a lesser degree from Persian and Turkish, introduced several other phonemes into the language. These are mainly gutturals (pharyngeal and uvular) phonemes borrowed from Arabic. CK speakers have no problem in pronouncing some of these phonemes similar to the speakers of the languages they borrowed the phonemes from—the articulatory features of pharyngeal phonemes are preserved without adjustment. Moreover, CK children can correctly articulate gutturals naturally.

Thus, it can be said that loan words sit in the periphery of the lexicon while native words are in the core. There are distinct contexts for using the loan lexical items of the lexicon. Loan words are quite common in slang and in everyday conversation in informal situations. Nevertheless, in written language, there is a tendency not to use loan words and replace them with words of Kurdish origin. The reduction of loan words is encouraged by the Kurdish nationalistic movement in the last century. As Abdulla (1980) notes, loan words in the corpus of Publication in Iraqi Kurdistan reduced from 46 per cent in (1924-1939) into 4.4 per cent in (1958-1973). Further, prescriptivists sometimes suggest borrowing words from other dialects of Kurdish to replace words borrowed from other languages. In any case, similar to most languages, a certain portion of the CK lexicon consists of loan words and these loans are deeply rooted in the lexicon. In turn, these loan words brought some phonemes which either preserved their features or adapted to match the phonological features of Kurdish.

Languages tend to preserve segmental information of loanwords maximally, while any repair of loan phonemes are minimal and subject to constraints set by the recipient language. Paradis and LaCharité (1997) emphasise that repair of loan phonemes is minimal and it happens when the segment is ill-formed in the recipient language. Repair is not limited to segments; it can include other phonological processes. Similarly, Kenstowicz (2010) states that speakers of the recipient language try to match segmental, phonotactic and prosodic structure of the loan words into their language while preserving as much information as possible. So, loan phonemes are either preserved or adapted to match the phonological system of the recipient language. The relative saliency of a sound is the decisive factor in preserving or adapting a borrowed segment.

Salient features of a sound are used to account for distinctive features that identify the articulatory and perceptive features.

The preservation and adaptation of the loan segments depends on the relation between the features of the loan segments with the phonological system of the recipient language. CK borrows words that contain uvular, pharyngeal, emphatic (pharyngealised) and dental consonants. The uvular phoneme /q/ and pharyngeal phonemes /ʕ,ħ/ have preserved their features and entered into the phonemic inventory of CK. The occurrence of uvular and pharyngeal phonemes is highly frequent and forms minimal pairs with other phonemes. Another piece of evidence for the inclusion of pharyngeal phonemes is the fact that, in some loan words (from Farsi and Arabic), the glottal stop and glottal fricatives, which are native phonemes, are realised as pharyngeal phonemes as shown in the examples in (1).

(1)

a. haf.ta 'week' ⟶ ħaf.ta
b. haft 'seven' ⟶ ħawt
c. ʔɑs.mɑn 'sky' ⟶ ʕɑs.mɑn
d. ʔarɗ[3] 'earth' ⟶ ʕarz

The interdental and pharyngealised coronal consonants, on the other hand, are adapted to match the phonemic system of CK. The interdental phonemes are realised as the alveolar in (2) while the emphatic phonemes lose their pharyngealised features (3).

(2)

a. ma. θal 'example' ⟶ ma. sal
b. ʔɑ. θɑɾ 'heritage' ⟶ ʔɑ. sɑɾ

(3)

a. tˤa. jɑ.ɾa 'aéroplane' ⟶ ta. jɑ. ɾa
b. tˤɑ.hɨɾ 'proper name' ⟶ tɑ. jaɾ
c. dˤa.ʕif 'weak' ⟶ za.ʕif
d. rɑ.dˤi 'content' ⟶ rɑ.zi
e. mɨ. ðˤɑ.ha.ɾa 'demonstration' ⟶ mɨ.zɑ.ha.ɾa
f. mɨ.ħɑ.fɨðˤ 'mayor' ⟶ mɨ.ħɑ.fɨz

As the examples above show, dental and pharyngealised phonemes are repaired minimally (disallowed features are adapted) to conform to the segmental structure of Kurdish while preserving as much information as possible from the donor language, i.e. adaptation is minimal and triggered by the phonological structure of recipient language.

In brief, the adaptation of dental fricatives /θ,ð/ and pharyngealised phonemes /tˤ, dˤ, ðˤ, sˤ/ and their absence in native vocabulary is taken as an exclusion of these phonemes in CK. The pharyngeal phonemes/ʕ,ħ/ and the voiceless uvular stop /q/, on the other hand, are included within the phonemic inventory of CK as they preserve their features and alternate with native phonemes in phonological processes.

A characteristic of the Sulaimani sub-dialect of CK consonant system is a phonemic contrast between trill /r/ and flap /ɾ/ and between velarised /ɫ/ and non-velarised /l/ laterals. Another feature of the consonants is the borrowing of phonemes from the contact languages. The following sections present an overview of the articulatory features of CK consonants along with Allophonic variations and their distributions.

1.5.1 Stops

CK has nine stops five of which are voiceless /p, t, k, q, ʔ/ and the remaining four are voiced /b, d, g, ʕ/. /p,b/ are bilabial, /t,d/ are alveo-dental (tip of the tongue touches back of upper front teeth), /k,g/ are velar, /q/ is uvular, /ʕ/ is pharyngeal and /ʔ/ is glottal. Apart from the glottal stop /ʔ/ that can occur only word initially, all other stops have the wider distribution of occurring word initially, medially and finally. The voiceless stops are aspirated with varying strength depending on the place of articulation and their distribution in the word. The voiceless series /p, t, k/ are usually strongly aspirated word initially and to a lesser degree word medially when they are followed by a vowel as in (4). However, they are unreleased when they are not followed by a vowel as shown in (5). /ʕ/ is a stop since its articulated with a plosion similar to other stops.

(4)

a. p^hɑ.p^hor ‘ship’
b. t^ham ‘fog’
c. k^haɾ ‘donkey’
d. t^he.k^ho.ʃaɾ ‘toiler’

(5)

a. pʰɑk̚ ‘clean’

b. tʰip̚ ‘team’

c. nawt̚ ‘oil’

d. ʃɨ t̚ ‘thing’

On the other hand, the voiceless stops with back feature — articulated behind the palate — have a weaker degree of aspiration as in (6).

(6)

a. qɑp̚ ‘plate’

b. ma.qast ‘scissors’

c. ʔasp ‘horse’

d. ʔɑw ‘water’

The voiced pharyngeal /ʕ/ which entered the language through loan words is a stop regardless of its manner of articulation in the donor language. It has a wide distribution of occurring word initial and word final and is followed by most vowels when it is initial.

(7)

a. ʕa.ɾa.bɑ.na ‘carriage’

b. ʕin.wɑn ‘address’

c. ʕu.zɨɾ ‘excuse’

d. ʕɑ.qɨɫ ‘wise’

e. nawʕ ‘type’

1.5.2 Affricates

The two consonant affricates voiceless /ʧ/ and voiced /ʤ/ have broad distribution in the core lexicon of CK. They occur word initially, medially and finally as shown in (8). The affricates are single phonemes rather than a combination of stops /t/ and /d/ followed by /ʃ/ and /ʒ/ for two reasons. First, the phonotactics of CK does not allow such combinations. Second, the affricates form minimal pairs with other consonants. They are produced by complete blockage of the air stream in an area just behind alveolar (post-alveolar), then, part of the trapped air is released with one burst and the rest is released gradually. There is only one set of affricates with delayed release feature, geminate affricates are not attested in CK.

(8)

a. ʧak˺ ‘weapon’

b. pʰan. ʧaɾ ‘puncture’

c. kɨʧ ‘girl’

d. ʤe.gɑ ‘bed’

e. ba. ʤe ‘suitable’

f. sɑʤ̥ ‘teak’

1.5.3 Fricatives

Similar to most languages, fricatives in CK are numerous and with various places of articulation. It has eight fricatives which are /f, s, z, ʃ, ʒ, χ, ħ, h/ four of which form voiceless-voiced pairs. The voiceless labio-dental, uvular and glottal fricatives /f/, /χ/, /h/ have no voiced counterpart phoneme. /f/ occurs in the onset and coda of syllables and word initially, medially and finally. It can be followed by all vowels except /o/.

(9)

a. fɨʃ ‘deflated’

b. fil ‘elephant’

c. feɫ ‘trick’

d. le.fa ‘quilt’

e. na.fɑm ‘ignorant’

f. mɑf ‘right’

Although the labio-dental voiced fricative /v/ has a limited distribution in CK, the sound cannot be established as a phoneme since it looks to be the allophone of the labio-dental voiceless fricative /f/. the voiced fricative /v/ is very common in northern Kurdish, diachronically, the labial nasal /m/ in Farsi developed to /v/ in northern Kurdish and into /w/ in the central Kurdish (see 10a and 10b). So, the phoneme /v/ in northern Kurdish seems to be cognate with the /w/ in CK. As shown in (11a and 11b), the sound is realised as /v/ when it occurs inter-vocalically or between a vowel and a voiced consonant. Sometimes it is in free variation with its voiceless counterpart /f/ especially when it is word final (11c and 11d). Crucially, no minimal pair or near minimal pair is available in CK to contrast /f/ with /v/.

(10)

	Farsi	Northern Kurdish	Central Kurdish
a.	nim	niv	niw ‘half’
b.	nɑm	nɑv	nɑw ‘name’

(11)

a. tɑv.ga ‘waterfall’

b. ħav.da ‘seventeen’

c. mɨ.ɾov ~ mɨ.ɾof ‘human’

d. bɨ.zɑv ~ bɨ.zɑf ‘movement’

For the next pair /s, z/, the tongue has double contact with the passive articulators: alveolar ridge and teeth. The front of the tongue forms the stricture with alveolar ridge while the tip of the tongue rests behind the upper front teeth. This tongue position gave some linguists the impression that /s, z/ are dental (see McCarus 1958) or alveo-dental (see Fattah 1997). However, I regard them to be alveolar since the friction responsible for producing the sound comes from stricture between the front of the tongue and alveolar ridge. The alveolar fricatives /s, z/ and the alveodental stop /t, d/ are often pharyngealised when they are followed by a back or central vowel + the velar consonants as in (12).

(12)

a. sˠɑł ‘year’

b. zˠɑł ‘dominant’

c. tˠɑł ‘bitter’

d. sˠag̥ ‘dog’

e. zˠoł ‘cunning’

f. tˠał ‘string’

g. dˠɑł ‘vulture’

In the examples of (12), velarisation spreads leftward beyond an adjacent vowel as long as the vowel has [+back feature]. Feature spreading is blocked when the intervening vowel is [+front] or when the velar phoneme is [-voice] as in *saχ* ‘intact’; *daq* ‘text’.

The voiceless /ʃ/ and the voiced /ʒ/ are articulated with the blade of the tongue in contact with the area behind alveolar ridge. /ʃ/ and /ʒ/ have a wide distribution as they occur word initial, medial and final.

(13)
a. ʃaw ‘night’
b. ke.ʃa ‘problem’
c. χoʃ ‘pleasant’
d. ʒɑn ‘pain’
e. ʔɑ.ʒał ‘animal’
f. qɑʒ ‘slice’

When word initial, they are followed by all vowels, except /o/ that does not follow /ʒ/.

(14)
a. ʃiɾ ‘milk’
b. ʃɑɾ ‘city’
c. ʃar ‘fight’
d. ʃum ‘omen’
e. ʃeɾ ‘lion’
f. ʃɨt ‘thing’
g. ʃoχ ‘pretty’

(15)
a. ʒiɾ ‘wise’
b. ʒɑn ‘pain’
c. ʒam ‘meal’
d. ʒuɾ ‘room’
e. ʒeɾ ‘under’
f. ʒɨn ‘woman’

The next fricative pair, the voiceless /χ/ and the voiced / ʁ/, are uvular as the back of the tongue forms the stricture with the area behind the soft palate. The voiceless fricative uvular /χ/ has a wide distribution, which occurs word initial before all vowels except /i/ and word medial and final. The voiced fricative uvular /ʁ/ can only be found in loan words mostly borrowed from Arabic. No minimal pair is found between /χ/ and /ʁ/ and the two phonemes are sometimes neutralised. Similar to other voiced obstruents, in prosodic word final position, the voiced uvular fricative is devoiced (see §5.2.2), but the neutralisation can be seen word initial and word medial as seen in (16).

(16)

a. χam ~ ʁam ‘ sorrow’

b. bɑ.χa.wɑn ~ bɑ.ʁa.wɑn ‘farmer’

/χ/ occurs in free variation with /ʁ/ as shown in (17).

(17)

a. ʁam ‘sorrow’ ⟶ χam

b. bɑʁ̥ ‘orchard’ ⟶ bɑχ

So, as /χ/ and /ʁ/ do not contrast in analogous environments and they show considerable phonetic similarity, they can be grouped as allophones of the same phoneme.

The next phoneme /ħ/ is mostly found in loan words. For its production, the root of the tongue touches the back wall of the pharynx. /ħ/ has a wider distribution: apart from being retained in loan words from Arabic, in some loan words from Persian, the voiceless glottal fricative /h/ is sometimes realised as /ħ/.

(18)

a. haft ~ ħawt ‘seven’

b. haf.tɑd ~ħaf.tɑ ‘seventy’

c. haf.ta ~ ħaf.ta ‘week’

d. hama ~ ħamu ‘all’

When /ħ/ is word initial, it can be followed by all vowels except /e/ and /o/ this can be an accidental gap rather than a grammatical rule. Further, it occurs word initial, medial and final as in (19).

(19)

a. ħaz̥ ‘desire’

b. ħuʃ.tɨɾ ‘camel’

c. la. ħim ‘solder’

d. ħɑ.ʤi ‘pilgrimage’

Finally, the voiceless glottal fricative /h/ is fully voiced when it occurs intervocalically as in (20a, 20b). /h/ has defective distribution as it does not occur syllable or word finally. However, this sound is an established phoneme as it has common occurrence and forms minimal pairs with other phonemes as in (20c and 20d).

(20)

a. ba.ɦ̬ɑɾ 'spring'

b. ba. ɦ̬ɑ.na 'justification'

c. ba.hɑɾ 'spring' vs ba.jɑɾ 'moor'

d. hal 'chance' vs ħal 'solution'

1.5.4 Nasals

There are three nasal phonemes in CK /m, n, ŋ/ with bilabial, alveo-dental, and velar places of articulation, respectively. /m, n/ have wide distribution. However, /ŋ/ has a defective distribution as it does not occur word initially. The fact that in the process of syllabification, mainly through onset maximisation, /ŋ/ becomes the onset of the next syllables serves as an evidence that this sound is an individual phoneme rather than two segments consisting of the combination of nasal + stop as shown in (21). These examples also show from the retention of the velar phoneme after adding another morpheme, that /ŋ/ has the underlying representation.

(21)

a. mɑŋ 'moon' ⟶ mɑ ŋa. ʃaw 'full moon'

b. raŋ 'colour' ⟶ ra.ŋɑw. raŋ 'colourful'

/n/ + /g/ obligatorily and /n/ + /d/ optionally are realised as /ŋ/ if they are in the same syllable and are preceded by a central or back vowel as in (22).

(22)

a. rang /raŋ/ 'colour'

b. dang /daŋ/ 'sound'

c. zong /zoŋ/ ' pool'

d. mang /mɑŋ/ 'moon'

e. darband /daɾ.baŋ/ ~ /daɾ.band/'gorge'

f. hoshmand /hoʃ.maŋ/ ~ /hoʃ.mand/ 'vigilant'

Nevertheless, if the combinations /n/ + /g/ or /n/ + /d/ come after a front vowel, they are not realised as /ŋ/. Yet, the nasal before the velar stop is palatalised under the influence of the following velar as shown in (23).

(23)

a. gɨɾɨnʲg ‘important’

b. gɨzɨnʲg ‘dawn light’

c. bɨɬɨnd ‘high’

d. ʔɑw. ɾinʲg ‘dew’

On the other hand, due to sound changes in the language, in a handful of words, combinations of /n + ʤ/ and /n + z/ are realised as / ŋ/ as shown below[1].

(24)

a. penʤ. sad ‘five hundred’ ⟶ peŋ.sat

b. jɑ.nzda ‘eleven’ ⟶ jɑŋ.za

1.5.5 Rhotics

Cross-linguistically, rhotics are a heterogeneous set of trills, taps, fricatives and approximants. They are made with tip and blade of the tongue with passive articulators as varied as bilabial, alveolar, and uvular. Therefore, there is no articulatory similarity among the rhotics that group them into one class. Accordingly, Ladefoged and Maddieson (1996:216) note that similar phonological behaviours of rhotics such as occupying privileged place with regard to the nucleus in a syllable is the link which group them into a family. CK rhotics include both trill and a flap which are in contrastive distribution. Minimal pairs can show that the rhotics are a sequence of two phonemes as shown in (25). It should be noted that the trill and flap in CK do not differ in terms of degree of stricture; they differ, however, in terms of sustainability of articulation. The /ɾ/ in CK is a flap as the articulator (tip of the tongue) moves forward in contrast to tap phoneme wherein the articulator moves backward.

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[1] This diachronic change includes these numbers: eleven, twelve, thirteen, fifteen sixteen [jɑŋ.za, dʉ .wɑŋ.za, sɨ.jɑŋ.za, pɑŋ.za, ʃɑŋ.za] respectively.

(25)

a. bɨ.ro 'go away' vs bɨ.ɾo 'eye brow'

b. wa. ra 'barking' vs wa.ɾa 'come'

c. kar 'deaf' vs kaɾ 'donkey'

In articulating the voiced alveolar trill /r/, the tip of the tongue repeatedly strikes the alveolar ridge and is held loosely against it. The duration of tongue vibration in pronouncing intervocalic /r/ is shorter than when it is word initial or final. /r/ has a wide distribution, when it is initial, it is followed by all vowels and it occurs word medial and final as in (26).

(26)

a. raʃ 'black'

b. rɑst 'true'

c. run 'clear'

d. re 'road'

e. ron 'oil'

f. riʃ 'beard'

g. pa.ra 'paper'

h. kor 'forum'

As for the voiced alveolar flap /ɾ/, the tip of the tongue strikes an area in the alveolar ridge that is slightly advanced than the alveolar area for the trill. This means the tip of the tongue is near the upper front teeth. /ɾ/ does not occur word initially, but it can occur freely in the onset of the syllable, it can occur in word medial and final position preceding most vowels as shown in (27).

(27)

a. ba. ɾa 'front'

b. kɑɾ 'work'

c. sa. ɾɑ.na 'tax'

d. sa.ɾok 'president'

1.5.6 *Approximants*

Approximants, also called frictionless continuants, are articulated with constrictions that are typically greater than that required for the vowels but not strong enough to produce friction noise. Approximants include lateral and central approximants.

Lateral Approximants

CK has two lateral phonemes: voiced alveo-dental lateral /l/ and a velarised voiced alveolar /ɫ/. For /l/, the tip of the tongue is behind the upper front teeth and the front of the tongue rests on alveolar ridge. The body of the tongue is unraised and slightly advanced. As for /ɫ/, the tip of the tongue touches alveolar ridge while the body of the tongue is slightly retracted and raised towards the velum. For the laterals, the contact between the active and passive articulators completely block the air passage in the centre of the oral cavity, leaving free passage for the air to escape either from both or one side of the mouth by lowering tongue side(s). It is the back of the tongue that is responsible for the distinction between /l/ and /ɫ/. Context and adjacent vowels influence articulatory features of the laterals. When followed by a back vowel, the alveo-dental lateral /l/ is realised as alveolar, while the alveo-velar lateral /ɫ/ is realised as alveo-dental when followed by a front vowel.

The alveo-dental lateral has a wider distribution which is followed by all vowels. It occurs word initially, medially and finally; while /ɫ/ does not occur word initially and it can only be followed by two vowels /a/ and /ɑ/ when it is medial. Numerous minimal pairs serve to give phonemic status for both sounds as shown in (28).

(28)

a.	ʧɨl ‘forty’	vs	ʧɨɫ ‘branch’
b.	pa.la ‘haste’	vs	pa.ła ‘stain’
c.	gul ‘dirty’	vs	guł
d.	ʧɨl ‘forty’	vs	ʧił ‘branch’

Occasionally, the term *liquid* is used as a cover term for laterals and the rhotics. CK has four liquids: two lateral consonants and two different phonemes for the rhotics.

Central Approximants (glides)

The glide phonemes in CK are phonetically vowels as their articulation involves no significant obstruction to the airstream. Phonologically, however, they function as a consonant by occurring freely at syllable margins and never form the nucleus of a syllable, i.e. they are always [–syllabic]. Their distribution in the syllable is the crucial factor in classifying these phonemes as consonants or vowels. They serve as intervening consonants to separate vowels in hiatus.

In articulating the voiced labio-velar glide /w/, there are two points of articulation in the front and back of oral cavity. The back of the tongue is raised to touch the velum while the lips are rounded and firmly in contact (29a and b). However, when it is followed by a front vowel, there is one point of articulation. In that case, /w/ is realised as the voiced high front rounded glide allophone /w̜/ as shown in word initial and medial as in (29c and d).

(29)
a. wa.ɫɑm ‘answer’
b. ʔɑw ‘water’
c. w̜e.ɾɑn ‘courage’
d. lɑ. w̜i. ‘youth’

While for the production of the voiced palatal glide /j/, the front of the tongue is raised towards a broad area of the roof of the mouth but the closest point of semi-contact is with the palate. The voiced palatal glide /j/ occurs word initially freely, but when it is word medial, it is usually inter-vocalic as in (30).

(30)
a. jɑ.ɾi ‘game’
b. jak ‘one’
c. bo.ja ‘paint’
d. pa.jɑm ‘message’

The glides do not have distinct phonological status and independent intrinsic quality in CK. It is the syllable context that requires the phonemes to occur as glides or their counterpart vowels, i.e. they are essentially the non-syllabic equivalents of vowels. Thus, the high back vowel /u/ for voiced labio-velar glide /w/, and the high front vowel /i/ for the voiced palatal glide /j/. For example, the conjunction *w* and the ezafe marker *j* are classified as glides when they follow a word ending with a vowel as in (31a and 31b) while they are regarded as vowels when they follow a word ending with a consonant as in (31c and 31d).

(31)

a.	/ta.mɑ.ta	w	χa.jɑɾ/		[ta. mɑ. taw. χa. jɑ ɾ]
	‘tomato’	CON	‘cucumber’		CV.CV. CVC . CV. CVC
b.	/ʧɑ	j	sɑɾd/		[ʧɑj. sɑɾd]
	tea	ezafe	cold		CVC. CVCC
c.	/nɑn	w	paniɾ/		[nɑ. nu. pa. niɾ]
	bread	CON	cheese		CV. CV. CV. CVC
d.	/nɑn	j	gaɾm/		[nɑ. ni. gaɾm]
	bread	ezafe	hot		CV. CV. CVCC

Thus, the phonemic system of CK has twenty-eight consonants including two glides. The description of the phonetic consonant inventory of CK is summarized in Table 1.1.

Table 1.1 CK consonants and their articulatory features

		Bilabial	Labiodental	Alveodental	Alveolar	Postalveolar	Palatal	Velar	Uvular	Pharyngeal	Glottal
Stops		p b		t d				k g	q	ʕ	ʔ
Nasals		m		n				ŋ			
Affricates						ʧ ʤ					
Fricatives			f		s z	ʃ ʒ			χ	ħ	h
Trill					r						
Flap					ɾ						
Approximants	Centrals						j	w			
	Laterals			l	ɫ						

1.6 Vowels

Considering that vowel features are more difficult to describe than consonants, it is unsurprising that the disagreements among linguists concerning the phonemicisation of CK vowels are much bigger than the differences we have seen above for the consonants. As an indication of the range of differences, (McCarus 1958, 1997; Ahmad 1986 and Fattah 1997) do not include diphthongs in the CK vowel inventory. However, Mackenzie (1962) and Aziz (1976) include the diphthongs in the vowel inventory of CK, while the former lists (19) diphthongs, the latter lists (8) diphthongs.

At first glance, it seems that CK has diphthongs as the examples below indicate.

(32)

a. ʧɑi. sɑɾd ‘cold tea’
b. kɑi.kon ‘old hay’
c. pɨ.jɑu ‘ man’
d. ʧɑu ‘eye’
e. kau ‘partridge’
f. ʃau ‘night’
g. keu ‘mountain’
h. ziu ‘silver’

On second thought, when a suffix is added to the words, under the influence of syllable structure[2], the second part of the vowel becomes the onset of the following syllable.

(33)

a. ʧɑ.ja. sɑɾ.da.ka ‘the cold tea’
b. kɑ.ja.ko.naka ‘the old hay’
c. pɨ.jɑ.wa.ka ‘the man’
d. ʧɑ.wek ‘an eye’
e. ka.wek ‘a partridge’
f. ʃa.wek ‘a night’

---

2 There is no onsetless syllable in Kurdish (see 3.3.1).

g. ke.wek ‘a mountain’

h. zi.wek ‘a silver’

The examples in (33) suggest that the diphthong vowels of (32) are vowel + glide combinations. Another supporting argument for the absence of diphthongs in CK is that no minimal pair is observed between the examples in (32) with any of the monophthongs. Thus, CK has only monophthongs.

The differences among linguists also include the number and features of the monophthongs as well. Another diphthong-like segment combination is where the labio-velar glide /w/ is followed by the mid-front vowel /e/. The /w/ + /e/ combination found in words such as *χʉ.wen* ‘blood’, *gʉ.we* ‘ear’, *kʉ.we* ‘where’ are regarded by some linguists as a front rounded vowel */ø/* when they follow an onset (Mackenzie 1962; Fattah 1997; Mahwi 2009). Although the combination undergoes some erosion but it never reduced to one vowel. The combination is regarded as two phonemes when they are in the onset of a syllable. It is not desirable for a combination to form one phoneme in a certain context and two phonemes elsewhere. Further, there are two pieces of evidence from syllable structure that suggest the combination /w/ + /e/ is a glide + mid-front vowel combination rather than a single phoneme. First, whenever the combination /w/ + /e/ follows an onset, an epenthetic vowel breaks the consonant cluster pushing /w/ + /e/ into a new syllable as in *ʃʉ.wen* ‘place’. Second, It is common for /w/ + /e/ to be the only component of a syllable in CK. Counting the combination as one single vowel results in an ungrammatical onsetless syllable as in *we.na* ‘picture’ but not */ø.na/, *bɨz.wen* ‘vowel’ but not * */bɨz.øn/.*

Segments typically group themselves into phonetically definable classes. Vowels are distinguished by modifying the oral cavity through moving the tongue, jaw and the lips. Two of the CK vowels, /u/ and /o/, are pronounced with lip rounding but roundness is not a contrastive feature in CK vowels. Although the phonetic degree of rounding of vowels can vary greatly, there is at most a two-way phonological distinction. Thus, all the other vowels can be regarded as [-round].

As for quality, CK vowels are contrastive along the parameters of height and backness of the tongue in the oral cavity intersected by lip rounding and length. In terms of tongue height, the vowels are classified in terms of gradual opposition. That is, they are characterised by three different gradations of height: high, mid and low. High vowels /i,u/, /mid vowels /e,o/ low vowels /a,ɑ/.The opposition between high-mid vowels are in height only while the mid and low vowels have distinct distribution along the primary axes of height and backness. As for the horizontal axis, the high and mid front vowels contrast with their mirror image in the back, while the two low vowels rest in the central area; one of them /ɑ/ in the area between centre and back and the other /a/ in the central area which is higher than the back vowel as shown below:

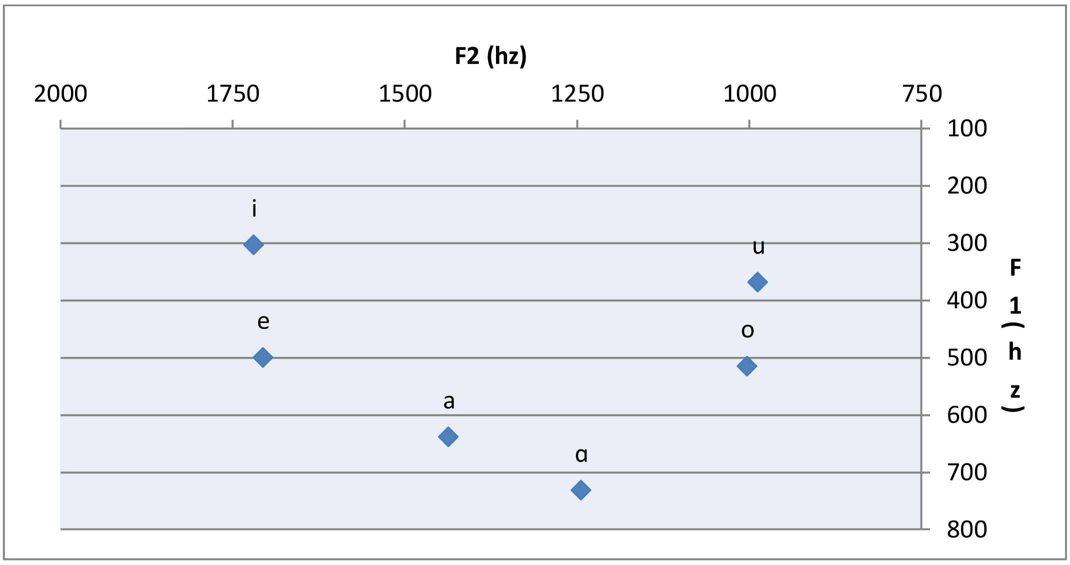


Figure 1.2 Formant values for CK vowels

Vowels have allophonic variations in different contexts. /a/, for instance, is realised higher and in a much fronted position when followed by glides. It is particularly very front when it is followed by the palatal glide as in: *na̰j*, 'flute', *k*ʰ*a̰j* 'when'. In unmarked context, the accurate area of this vowel in the vowel quadrilateral is very close to the centralised cardinal vowel /ɐ/, but following the practise of many linguists, the symbol /a/ is used to denote a low central unrounded vowel. This centralised vowel is the only lax vowel among the CK vowels.

Due to inconsistency of their quality reported in literature and the absence of the accurate description of the CK vowels, an acoustic study has been used to locate the exact position of the vowels. The phonetic description gives a more accurate account of the vowel features. Nonetheless, it should be kept in mind that the phonetic description of the vowels depends primarily on the abstract phonemes. Five[3] Native speakers of CK accent are recorded reading a word list of 15 tokens for each vowel. After measuring and plotting the vowels (see Appendix A for the formant values of the vowels), the result yields the vowel chart in Figure 1.2. above.

Therefore, CK has a 5 –quality system, which has high–mid and front–back opposition for high and mid vowels, while the low vowels are central and contrasts in length. There are phonological, rather than phonetic reasons, for regarding the low vowels as having similar quality (see §2.6.3 and 5.3 for phonological evidence and the appendices for the phonetic evidence i.e. duration of low vowels). CK vowels make three distinctions in the height of the vowels (high, mid, low) and three distinctions in the frontness of the vowels (front, central and back). The asymmetrical vowel inventory in CK is consistent with Crother's typology of world's languages. The 5-quality vowel system, according to Crother's (1978) typology of vowels, is the commonest vowel system and it is consistent with his account of 5-vowel systems where the vowels contrast in two heights in front and back with a low central vowel contrasting in length with a similar vowel.

1.6.1 Vowel Length

As vowel length correlates directly with phonological processes that determine the prosodic categories, it is crucial to finalise the nature of vowel length: whether vowel length is in contrastive or complementary distribution. To be more precise, it should be determined whether vowel length is the intrinsic quality of the phoneme or contextual influence interacts closely with processes like stress assignment, which in turn, has implications on prosodic categories.

As Lass (1984) notes, phonology, similar to other sciences, imposes certain aesthetic constraints on the description of a set of data. Hence, trying to sketch the vowel system of a language as simple and as symmetrical as possible is a potential pitfall. When the data from CK vowels interacts with the conditions mentioned above (tendency for simplicity and symmetry), it often leads to problems in handling the data. There is no

[3] Though the subject of the acoustic study is a small group, but the formant values of different speakers were consistent (see appendix B and C).

consensus on what constitutes an active feature of contrast among vowels. In the literature on CK vowels, most sources advocate the involvement of both quantity and quality as the opposition factor between pairs of vowels (Ahmad 1986; Fattah 1997; McCarus 1997). Mahwi (2009), on the other hand, argues that long and short vowels are in complementary distribution stating that vowel length is not contrastive in CK.

Based on their context, CK high and mid vowels exhibit length differences, but the length is not contrastive. A class of phonetically similar phones of long and short vowels seem to be in complementary distribution. The phonetics of the vowels shows that all the vowels (the long and short ones) have almost similar length in similar context. The length distinction is contextual; long vowels are found in open stressed syllables, or stressed syllables closed with single sonorants as in (34). It should be noted that lengthening of stressed vowels does not result in changing the quality of the vowel or type of the syllable. The relatively shorter vowel variants, on the other hand, are found in closed syllables with simple coda obstruents or complex coda clusters as in (35). The vowels in unstressed syllables are relatively shorter (but do not undergo vowel reduction) than the vowels of stressed syllables regardless of the presence or feature of the consonants in the coda, compare (cf. 34c and 35c).

(34)

a. du: ‘two’
b. sɨ.ˈnu:ɾ ‘border’
c. pi:s ‘dirty’
d. le:ɫ ‘murky’
e. ro:n ‘oil’
f. ʃɑ:ɾ ‘city’

(35)

a. kuɾt ‘short’
b. lut ‘nose’
c. pis.ˈka ‘stingy’
d. ʃet ‘fool’
e. nok ‘chickpeas’
f. pɑk ‘clean’

If the generalisation of vowel length is given a formal rule, it will look like (36).

(36)	[+syllabic] ⟶	___ + short /coda	(a)
	[+syllabic] ⟶	___ +long elsewhere	(b)

Nevertheless, the relation between long and short vowels is not as straightforward as the data in (34) and (35) show: there are three phenomena that complicate the length relation of vowels. First, there is at least one minimal pair and some near minimal pairs for the short and long high back rounded vowel /u/ as in (37).

(37)

a.	kur 'boy'	vs.	ku:r 'hunchback'
b.	guł 'flower'	vs.	qu:ł 'deep'
c.	kul 'blunt'	vs.	lu:l 'coil'

Attesting the list of words in (37) in which the phones are in parallel distribution is an instance of the failure of allophonic rules. This has induced some linguists to regard the short and long vowels as different phonemes in the language. As Lass (1984:36) states, whenever synchronic description is not self-contained enough to account for failure of allophonic rules, the abnormal phenomena can be regarded as the debris left behind the historical change. CK might seem to serve as a good example for how language contact and sound change may come to produce processes that are not explicable by regular synchronic phonological descriptions. CK has undergone an influx of loan words from Arabic and Farsi as they have been the language of law, education, army, government, and administration in the countries where the Kurds live. The socio-cultural domains such as religion also play a role in providing CK with yet more loan words. As Zhyan (1972 cited in Hassanpoor,J. 1999) records, one-third of these loan words were pronounced as in the source language while the other two thirds endured some modification.

The historical sound change process may be regarded as another factor for the existence of a minimal pair for allophones of back high vowels. Paul (2008) notes that Kurdish sound change developed irregularly by the preponderance of loans from Farsi. Taking into consideration the intense contact of CK with neighbouring languages and the dialectal diversity along with the interrupted process of sound change, a few examples cannot spoil the generalisation made about the allophonic variations of back, high vowels. In other words, apart from /a/ and /ɑ/ explained below, quality is the primary contrast among the vowels while quantity (length) is conditioned by environment and not contrastive.

A case of contrastive length distribution is between the low short and long vowels /a/ and /ɑ/. These two vowels are contrastive as shown by numerous minimal pairs available in the language as exemplified in (38). The active distinctive feature that distinguishes these two vowels is quantity: /a/ is phonologically short while /ɑ/ is long.

d. ka 'that'	vs.	kɑ 'hay'
e. kaɾ 'donkey'	vs.	kɑɾ 'work'
f. kam 'few'	vs.	kɑm 'which'
g. ʔaw 's/he'	vs.	ʔɑw 'water'

Thus, vowel length between /a/ and / ɑ/ are contrastive and phonemic, whereas the length distinction between other vowels are complementary and allophonic.

1.6.2 The Epenthetic Vowel

A pervasive feature of CK vowel system is the abundance of underlyingly vowelless words, roots and affixes. An epenthetic vowel is inserted to break impermissible consonant clusters and provide nucleus for vowelless words. The epenthetic vowel is a very short central high vowel /ɨ/ which is in parallel distribution with other vowels especially with the high front vowel /i/ as shown in (39).

(38)

a. ʒɨn 'woman'	vs.	ʒin 'life'
b. mɨn 'I'	vs.	min 'mine'
c. mɨl 'neck'	vs.	mil 'mile
d. tɨɾ 'other'	vs.	tiɾ 'arrow'

There exists in the language abundant minimal pairs between the epenthetic vowel and the other vowels of CK. The fact that the epenthetic vowel /ɨ/ is contrastive with other vowels induces most linguists to categorise the epenthetic vowel /ɨ/ as a phoneme within the CK vowel inventory (for example Ahmad 1986; Fattah 1997). Nonetheless, in what follows, I propose that /ɨ/ is not a distinctive sound unit and therefore not a phoneme.

In most cases, the function of vowel epenthesis is to repair an illicit structure in the language. The motivation for epenthesis may be the syllabification of stray consonants (Itô 1989), or a sequence of consonants may trigger the epenthesis (Broselow 1982) or to make consonants perceptible (Cote 2000). Hall (2006) makes a distinction between two types of epenthetic vowels: *intrusive vowels* are actually phonetic transitions between consonants rather than being phonological units and does not form syllable nuclei at any level of representation. The intrusive vowel is usually optional; its function can be described as an acoustic release between two adjacent consonants in the onset or coda of the same syllable. The second type, which she calls an *ordinary epenthetic vowel*, can form syllabic nuclei and thus functions as a phonological unit.

I argue that /ɨ/ in CK is an ordinary epenthetic vowel in contrast with both intrusive and lexical vowels. The epenthetic vowel cannot be an intrusive vowel for two reasons. First, phonetically, it is not gestural retiming between consonants as the articulation of the vowel is felt and perceived by native speakers. Second, it forms the syllable nuclei which the intrusive vowels cannot form according to Hall (2006) (see 39).

While it is easy to rule out /ɨ/ as an intrusive vowel, the choice between an epenthetic or lexical vowel is rather problematic. There are two pieces of evidence consistent with the epenthetic vowel having the role of lexical vowel. It forms minimal pairs with other lexical vowels and it can be the only vowel in the word (see 39 for both). However, cross-linguistically, underlyingly vowelless words have not been ruled out. Foley (1991:48) argues that a pervasive feature of the Yimas language of New Guinea is roots without underlying vowel. Bensoukas and Boudlal (2012: 17), on the other hand, report underlyingly vowelless roots for Moroccan Arabic and Moroccan Amazigh. These languages, similar to CK, break underlyingly impermissible consonant clusters with an epenthetic vowel. There are yet stronger indications that support the position of this vowel as an epenthetic vowel and not a lexical vowel.

Based on the Exhaustive Syllabification Principle of Selkirk (1981) and the Prosodic Licensing Principle formulated in Itô (1989) which requires that every segment be assigned to a higher-level prosodic constituent, I assume that /ɨ/ is an epenthetic vowel inserted to syllabify an otherwise impermissible consonant cluster. As explained below, the epenthetic status of /ɨ/ is based on its phonetic and phonological behaviour.

First, in morphologically related words as in (40), /ɨ/ is either absent in one of the forms or located in different places. That is, in two morphologically related words, /ɨ/ occurs in one of them or occurs in two different places.

(39)

a.	ʔaj.kɑt: PRES	kɨɾ.di: PAST	‘do’
b.	ku.ɬɑn: INT	ku.ɬɑn.dɨn: TRANS	‘boil’
c.	ʃoɾ.dɨt: 2SG	ʃoɾ.di: 3SG	‘wash’
d.	ba.fɨɾ (N)	baf. ɾin (ADJ)	‘snow’

Phonologically, /ɨ/ has a very predictable distribution. For example, in (41a), /ɨ/ appears between bi-consonantal roots and the first two consonants of tri-consonantal roots with falling sonority consonants, while in quadri-consonantal forms it splits every cluster. Predictably, in forms with lexical vowel and consonant cluster, /ɨ/ splits the cluster as in (41b).

(40)

a. underlying form	surface form	gloss
i. kʧ	kɨʧ	‘girl’
ii. ʃl	ʃɨl	‘liquid’
iii. ʧl	ʧɨl	‘forty’
iv. gʃt	gɨʃt	‘all’
v. pɾd	pɨɾd	‘bridge’
vii. χɾpn	χɨɾ.pɨn	‘chubby’
viii. ʧɬkn	ʧɨɬ.kɨn	‘dirty’
ix. bɾdn	bɨɾ.dɨn	‘taking’

b.

i. ʤaʒn	ʤa.ʒɨn	‘feast’
ii. ʧatɾ	ʧa.tɨɾ	‘umbrella’
iii. bafɾ	ba.fɨɾ	‘snow’

Second, the epenthetic vowel is not a distinctive sound unit with certain quality. The default case for lexical vowels is to be uniquely associated with a group of gestures most importantly tongue position. Although the epenthetic vowel is assumed to be a mid-high central vowel, but it seems not to correspond with a distinct articulatory gesture. Moreover, epenthetic vowels can have allophonic variations under the influence of the context more than lexical vowels. /ɨ/ is realised as rounded when it is next to a labio-velar consonant (42a and b) while the lexical vowels keep their articulatory features in similar distributions as in (42c and d).

(41)

a. wʉɾʧ ‘bear’

b. wʉʃk ‘dry’

c. wist ‘want’

d. na.wi ‘low’

Third, the epenthetic vowel plays certain roles in certain conditions; when the situation is changed through phonological processes such as syllabification or morphological processes such as affixation, the vowel is no longer realised. That is, phonological requirement triggers the realisation of the epenthetic vowel. The epenthetic vowel in CK serves to break consonant clusters and form syllable nuclei. However, it disappears when a lexical vowel plays this role in the syllable as shown in (43).

(42)

a. ko.tɨɾ ‘pigeon’ ~ kot. ɾa.kɑn ‘the pigeons’

b. ka.pɨɾ ‘shack’ ~ kap.ɾek ‘a shack’

Fourth, as has been shown cross-linguistically, phonetic and psycholinguistic properties of epenthetic vowels are different from those of lexical vowels. Gouskova and Hall (2009) show that epenthetic vowels are shorter and have a lower second formant compared to lexical vowels. The epenthetic vowel in CK is so short that it is hardly perceived as a vowel by native speakers and its second formant value in unmarked contexts is significantly lower than the lexical vowel /i/. Further, the epenthetic vowel does not have certain intrinsic vowel qualities compared to the lexical vowels. Moreover, psycho-linguistically, CK native speakers do not give the epenthetic vowel a phonemic status. One type of evidence comes from the fact that in orthography, there is no symbol to represent it. CK writing system is phonemic, i.e. each letter represents a phoneme but no letter is given to represent the epenthetic vowel. Another type of evidence comes from native speakers’ segmentation of words. The canonical form of segmentation by the majority of native speakers does not include /ɨ/ in segmentation. For example, the examples in (44) above would be typically segmented into /ko.tɾ/ and /ka.pɾ/ by Kurdish speakers.

Fifth, the epenthetic vowel never triggers phonological processes in the same way that lexical vowels condition them. For instance, voiceless stops are strongly aspirated when followed by lexical vowels; the epenthetic vowel on the contrary never prompts aspiration. Likewise, the velar stops are palatalised when followed by front vowels, but the epenthetic vowel after the velar stops never triggers palatalization as shown in (44).

(43)

a.	pɑ.ʃɑ 'king'	~	[pʰɑ.ʃɑ]
b.	tar 'wet'	~	[tʰar]
c.	pɨr 'full'	~	[pɨr]
d.	tɨɾʃ 'sour'	~	[tɨɾʃ]
e.	ke 'who'	~	[kʲe]
f.	kɨɾm 'worm'	~	[kɨɾm]
g.	giɾ.fɑn 'pocket'	~	[gʲiɾ.fɑn]
h.	gɨɾ. jɑn 'cry'	~	[gɨɾ.jɑn]

It is still unknown how the epenthetic vowel in general interacts with phonological processes that are the topic of this thesis such as metrical phonology and issues like, whether the epenthetic vowel is weightless (lacking mora) and how it interacts with processes like stress assignment. Such problems are dealt with in (chapters 2 and 4).

Part I Rhythmic Categories

Chapter Two   Mora and Prosodic Inconsistency in CK

This chapter demonstrates the inconsistency of syllable weight to different processes. For instance, the rhythm of CK is insensitive to syllable weight which will be explained in section five. In contrast, certain processes of prosodic morphology are sensitive to syllable weight. These processes include contrastive vowel length, minimal word and compensatory lengthening (CL) which will be presented in section six. Section four reviews the literature on syllable weight in the context of prosodic morphology and rhythm, explaining the nature and position of CK syllable weight. While section three addresses the representation of syllable weight, section two defines syllable weight and how it fares cross-linguistically. First, section one examines the constituency of mora.

2.1 Constituency of the Mora

There is no general consensus amongst scholars on the status of the mora as a prosodic unit. In the early stages of the development of prosodic phonology, the mora was not regarded as a prosodic constituent (Selkirk 1981 [1978]; Nespor and Vogel 1986). Later, some scholars introduced mora to the hierarchy (Itô and Mester 2003 [1992]; 2012; Piggot 1995; Zec 2003). Itô and Mester base the inclusion of mora into the prosodic hierarchy on principles of mora confinement (μ is licensed only by σ) and proper headedness (every nonterminal element of the prosodic category must have a head). Their inclusion of mora to prosodic hierarchy is based on the theory rather than being supported by empirical evidence.

In the light of CK data, the inclusion of mora as a constituent is ruled out for two reasons. Empirically, if we assume the prosodic units to be the domain of application phonological processes, mora, unlike other prosodic categories, cannot serve as a domain where phonological processes apply. Moreover, unlike other constituents, edges of moras cannot be sensitive to phonological processes. Given the small size of mora, this reason can also be true for other languages. However, this should not be understood to exclude mora in the phonology of CK. The role of mora is crucial as a measuring unit to explain phonological processes and capture generalisations about the size of prosodic units. For instance, moraic representation, in contrast to other representations can handle preserving the weight of prosodic word (see §2.6).

Second, the principles of mora confinement and proper headedness alone cannot be a valid argument for the mora to be a constituent. As for mora confinement, it is generally agreed that every mora should be licenced by a syllable but not the other way round. That is, syllable weight and hence mora is not a necessary component of well-formed syllables. Open epenthetic syllables in CK are a good example of non-moraic syllables (see §2.7). As for proper headedness, it requires nonterminal categories to be headed by a lower category. Taken into consideration the theory of domains where constituents need to be the domain of application of phonological processes, syllable is the terminal element of the prosodic category and headedness is a requirement for only nonterminal elements. The status of syllable as the lowest category in the prosodic hierarchy is also argued for in the early stages of Prosodic Phonology. Thus, mora is excluded as a prosodic constituent in the phonology of CK.

2.2 Syllable Weight: An Introduction

Syllable weight is difficult to define, mostly because the inherent structure of a syllable is not enough to unambiguously identify its weight. Gordon (2006: 1) broadly defines syllable weight as the property that differentiates syllables with respect to their prosodic behaviour. The difficulty in giving an exact definition of syllable weight lies in determining which prosodic aspects of language is sensitive to or classified under the rubric of weight. Moreover, phonological processes sensitive to weight are language-specific, i.e. a process related to weight in some languages may not depend on weight in others. Heavy syllables, for example, attract stress in quantity sensitive languages while stress is assigned positionally, irrelevant to the weight of the syllable in other languages.

Cross-linguistically, the general form of the rhythmic categories is relatively uncontroversial especially the properties of syllable and foot as prosodic units and their internal structure. As for the mora, its role as a formal representation of syllable weight in quantity sensitive languages is established. Languages are assumed to be either sensitive or insensitive to syllable weight in which mora is used as a measuring unit (McCarthy and Prince 1996 [1986]; Hayes 1989). Later, researchers showed that languages can be inconsistent with regard to syllable weight. In the same language, there can be (morpho)phonological processes that are sensitive to syllable weight and other processes that are insensitive to syllable weight (Gordon 2002; Fitzgerald 2012).

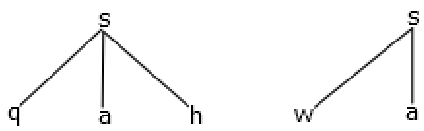
As the internal structure of the syllable is not insightful to the weight of syllable, the weight of a syllable is usually measured by weight sensitive phonological processes. Accordingly, inconsistency of weight in CK should be demonstrated with regard to weight sensitive phenomena. For the most part, the phonological processes which observe certain weight criteria and prosodic morphology processes behave quite differently. I argue that syllable weight in CK is inconsistent with regard to rhythm (stress pattern and syllable types) and prosodic morphology. Stress is insensitive to syllable weight in CK, but as far as prosodic morphology is concerned, the language demonstrates quantity sensitive behaviour. The sensitivity of syllable weight to aspects of prosodic morphology includes contrastive vowel length, compensatory lengthening and minimal word. The quantity insensitivity, on the other hand, stems from the language's stress system which is inserted positionally regardless of syllable weight. The small number of syllable types and the absence of vowel reduction in unstressed syllables in the language are also traits of syllable weight independency from stress.

The distinct syllable weight patterning with regard to rhythm and prosodic morphology not only explains the syllable weight in CK but can also shed light on the theoretical context by filling a slot in the gap of prosodic inconsistency which has been identified recently (Rosenthall and van der Hulst 1999; Morén 2000; Gordon 1999; 2006; Fitzgerald 2012). The once common assumption that a single language observes the same weight criterion for weight sensitive phenomena, which Gordon terms *moraic uniformity hypothesis*, has begun to slacken in the 1990s. However, an alternative theory is yet to take shape. The syllable weight measurement in CK tends to be informative with regard to the new approach to the dependency of syllable weight and morpho-phonological processes. While most scholars' reflection on weight inconsistency focused on the moraic status of the coda in CVC syllables, CK syllable weight divides rhythm and prosodic morphology into two different realms. As far as I know, apart from Tohono O'odham, a Uto-Aztecan language spoken in North America (cf. Fitzgerald 2012), this neat division is not otherwise attested.

2.3 Formal Representation of Weight

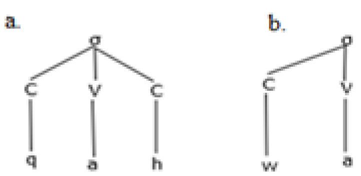
The basic proposal that phonological representation should extend individual segments to involve syllables dates back to (Kahn, D. 1976) who suggests that the syllable tier is linked to the segment nodes. Kahn's introduction of the syllable as a level of representation and his observation of the facts that a number of segment-level phonological processes can be accounted for by reference to syllable was a ground-breaking work at the time. However, his work suggested a flat structure to the syllable —having syllable tier and segment tier only—failed to explain long and short segments and hence heavy and light syllables. It also fails to account for peak and non-peak segments. Kahn's model of the syllable tier for the CK underlying form *qah.wa* 'coffee' will be as shown in (1).

(1)



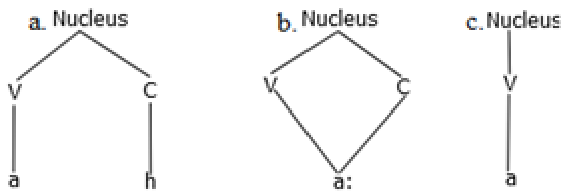
Later, Clements and Keyser (1983) introduced a mediating tier between the syllable and the segmental tier which they called the CV tier. CV theory can distinguish between nucleus and margin consonants and dispense with Kahn's syllabic feature which disregards the internal structure of syllables. In this model, any segment dominated by V is regarded as a nucleus whereas the Cs in the mediating tier dominate margin consonants. Perhaps the crucial contribution of Clements and Keyser's proposal, which is more relevant to our discussion here, is the use of CV tier to define the units of timing at the sub-syllabic level of phonological representation. The basic idea is that short vowels and singleton consonants correspond to single instances of C or V while long vowels and geminates correspond to two units of the CV tier. They also rightly observed that assigning a timing unit to the coda consonant is subject to language-specific considerations. So, the example in (1) can be represented in CV tier as in (2).

(2)



In this model, light and heavy syllable are defined in terms of nucleus which is taken to be a vowel represented by V and can be followed by C which represents either another vowel or a consonant. A branching nucleus is assumed to be a heavy syllable as in (3a and b.) whereas a non-branching nucleus as in (3c) is assumed to be a light syllable.

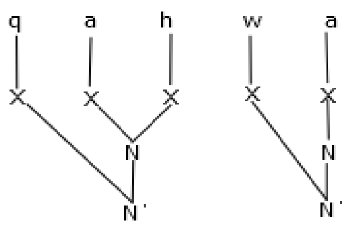
(3)



Thus, a long vowel or a short vowel followed by a moraic coda is a branching nucleus that represents a heavy syllable. A Light syllable, on the other hand, is represented by a non-branching nucleus with a short vowel.

An alternative representation to CV theory is Levin's (1985) X theory. Without reference to segmental features, Levin uses syllable-based rules of skeletal tier which is similar to X-bar theory of syllable. In this model, X does not distinguish between vowels and consonants but the designated heads distinguish the nucleus and the margin segments. Short vowels, together with the following tauto-syllabic consonant, form the rhyme constituent which counts towards the weight of the syllable. Short vowels project one timing position while long vowels project two timing positions. Coda consonants, in some languages, project one timing position as well. The skeletal tier for the word in (1) will be as in (4).

(4)

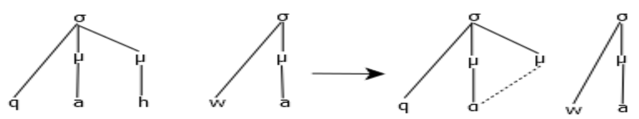


This model of representing weight does away with [+syllabic feature] and the weight of a syllable mostly depends on the number of the X tiers associated with each syllable. However, similar to the CV tier, it cannot convincingly account for why deleted onsets, in contrast to weight bearing codas, are not compensated for. This is particularly visible when the weight of the whole prosodic word is preserved through CL (see §5.3).

Another representation of syllable weight comes from moraic theory where a prosodic tier is represented by a mora (Hyman 1985; Hayes 1989). Moraic theory is similar to the segmental theories (CV theory and X theory) in providing two moras for long vowels and one mora for the short ones. Hence, mora represents the contrast between the light and heavy syllables: a light syllable has one mora, a heavy syllable has two. However, this should not be understood as each segment equals a mora. Coda consonants are assigned a mora later in the derivation by Weight by Position rule which renders closed syllables heavy in certain languages whereas prevocalic consonants are assumed to be moraless (Hayes 1989). One advantage of the moraic theory over the segmental theories, as McCarthy and Prince (1996[1986]) argue convincingly, is the fact that many phonological processes count moras but no phonological processes refer to segment count.

Another phonological process that is best explained in moraic theory is CL. Crucially, segmental theories fail to account for the compensatory lengthening where the mora of a deleted coda consonant is preserved and linked to the nucleus vowel to cause vowel lengthening as shown in (5) below for the example (1) above. Segmental theories give representation of CL but they cannot answer the question why some deleted segmented are compensated for while others are not. Moraic theory distinguishes between a prevocalic weightless consonant from a moraic coda. That is, it explains why a deleted coda, in contrast to a deleted segment is compensated for by lengthening the preceding vowel. Further, it distinguishes between the deletion of an entire segment including its associated mora which does not trigger CL from the deletion where only the segment is lost and its mora is left stranded. So, moraic theory distinguishes between a coda-deletion that includes the mora from a coda-deletion that leaves a stranded mora.

(5)



Thus, moraic theory accounts more insightfully for phonological processes such as CL and integrates phonological material into the next higher level of prosodic structure. Therefore, this study adopts moraic theory over segmental syllabic theories to represent syllable weight.

2.4 A Review of Standard Syllable Weight

The early treatments of syllable weight state that weight criteria (i.e. what syllables count as heavy or light) may vary from language to language; but that all phonological processes within a given language will employ a uniform weight criterion (Hyman 1985, McCarthy and Prince 1996[1986]; Hayes 1989). According to this hypothesis, languages are parameterised based on their sensitivity to weight. In a single language, all weight sensitive phenomena observe the same weight criterion and thus employ the same weight representation. McCarthy and Prince (ibid), for example, state that in Mohawk, as the size of minimal word is insensitive to weight, all prosody of Mohawk is insensitive to weight and in that case, a μ is equal to a σ. Further, Hayes (1989) argues that a language that allows CL is a language that has syllable weight distinction (for all phonological processes).

As stress figures important among those phenomena considered involving syllable weight, languages with syllables that are insensitive to stress are regarded as quantity insensitive languages. Thus, the interaction between stress assignment and syllable weight are overgeneralised to other (morpho)phonological processes that involve syllable weight. CK is a quantity insensitive language in terms of stress assignment, i.e. stress assignment in CK and in the northern dialect of Kurdish (Kahn, M. 1976) is positional. Stress is on the last syllable of the word regardless of the weight of the syllable. Hence, the independence of stress assignment to syllable weight in CK gives the impression that the whole prosody of CK is insensitive to syllable weight. According to the early treatments of syllable weight outlined above, it is predicted that there should be no weight-sensitive morpho-phonological processes in CK.

More recently, scholars (Steriade 1991; Crowhurst1991; Kager 1992; Hyman 1992; and Hayes 1995) have shown that languages do not behave uniformly in terms of syllable weight. Steriade (1991), for example, shows that in Ancient Greek, certain syllable structures are regarded as light syllables for some phonological processes and as heavy for others. Crowhurst (1991), on the other hand, reports another dual criterion of weight in moraic theory; she observes that in Tubatulabal, closed syllables count as light for stress but as heavy for purposes of reduplication. The inconsistency of syllable weight is taken one step further when on the basis of a typological survey, Kager (1992) suggests that quantitative distinctions in quantity insensitive systems may be partly ignored, but never completely disregarded. Further, Hyman (1992) observes that in three Bantu languages (Luganda, Cibemba and Runyambo-Haya) the pre-consonantal nasal does not show uniformity in terms of mora counting. In Cibemba, for instance, the pre-consonantal nasal is moraic for CL and non-moraic for tone bearing purposes.

Hayes (1995:103) observes a rather different kind of syllable weight inconsistency for a variety of languages. He categorises Pintupi, Anguthimri, Garawa, Mansi, Votic, Manjiltjara and Icelandic as quantity insensitive languages (with syllabic trochee foot) that nevertheless do not violate minimal word condition. The non-uniformity of syllable weight in these languages demonstrates that syllable weight is process-specific rather than language-specific.

Gordon (1999) systematically addresses the question of conflicted weight criteria. A central argument of Gordon is that different phenomena often diagnose inconsistent weight criteria and exhibit different typological patterns. In fact, Gordon tackles conflict weight criteria as a process-driven phenomenon rather than a language-driven phenomenon. According to this view, variation in weight criteria is to be attributed to weight-based phenomena rather than to differences among languages. Gordon suggests shifting from why and how languages differ in terms of their weight criteria to addressing how and why weight criteria differ between weight sensitive phenomena.

Gordon answers the above question by attributing the divergent weight criteria of stress and tone to different phonetic bases that are applied by stress and tone. He also claims that the answer to the question of why different languages use different weight criteria for a given process lies in phonetics. In particular, Gordon (2004:294) cites sonority, voicing of coda consonants and the [high/low] feature for the nucleus vowels as decisive in weight distinctions. Syllables with lower vowels tend to be heavier than syllables with high vowels. For stress, the entire energy of syllable rhyme is relevant. An important reason for characterising CVC syllables as heavy or light for attracting stress hinges on the features of coda inventory. A language that treats CVC syllable as a light syllable has more voiceless consonants in their coda than voiced consonants. Heavy CVC syllables in other languages, on the other hand, are counted as heavy for having more voiced coda syllables than voiceless ones. Gordon acknowledges that along with phonetic and perceptual distinction, phonological factors such as structural simplicity play role in determining syllable weight.

While Gordon's account of conflict weight criteria as process specific insightfully answers syllable weight in CK (see the next two sections), his phonetic interpretation of syllable weight has faced criticism for being limited to CVC syllables, in particular the weight-by-position rule. As Curtis (2003) observes, Gordon's phonetic interpretation for syllable weight cannot account for the inherent quantity of vowels and geminates nor can it challenge the structural representation of syllable weight. Moreover, the syllable weight of quantity insensitive languages invalidates the phonetic basis of syllable weight. As the data in (6) and numerous other examples show, Gordon's phonetic interpretation for syllable-weight inconsistency is irrelevant to quantity insensitive languages, i.e. the phonetic content of the syllables is irrelevant to attracting stress.

(6) Syllable-weight irrelevant to Phonetic properties

a.	gɑł.ˈta	'joke'
b.	bɑχ.ˈʧa	'garden'
c.	kɑɾ.ˈga	'factory'
d.	ʃɑ.ˈna	'brush'
e.	χam.ˈnɑk	'sad'
f.	was.ˈtɑn	'stand'
g.	ha.ˈwɑ	'air'
h.	pɑɾ.ti	'party'

As for the vowel feature [high/low], the stressed vowels in (6a-d) are higher than the unstressed vowels, while the vowels in the stressed syllable in (6e-h) are lower than the unstressed vowels. As for sonority of coda consonants, in (e), the coda of stressed syllable is obstruent and the coda of the unstressed syllable is sonorants while in (6f), it is the opposite. As for voicing, voiced or voiceless coda can be in stressed syllable (6e and f). So, weight inconsistency cannot be attributed to phonetic factors, at least in CK.

Finally, another case of syllable-weight inconsistency is Tohono O’odham. Fitzgerald (2012) observes that in Tohono O’odham, syllable-weight is inconsistent in terms of rhythm and prosodic morphology. The stress system is insensitive to syllable weight (syllabic trochee foot), whereas the language displays characteristics of quantity-sensitivity such as gemination, minimal word, reduplication. Fitzgerald hypothesises that languages differ as to whether syllable weight matches or mismatches along the lines of rhythm and prosodic morphology as shown in Table 2.1. Fitzgerald’s characterisation of syllable weight inconsistency is important in the sense that it systematises the aberrant syllable weight behaviour with regard to different processes.

	QI Rhythm	QS Rhythm
OI Prosodic Morphology	Diyari, Gooniyandi	unattested
QS Prosodic Morphology	Tohono O’odham, Central Kurdish	Choctaw,Chicksaw, Arabic

Table 2.1 The interaction between QI and QS in rhythm and prosodic morphology.

Following Gordon (1999; 2006), I propose that in CK, syllable weight is a feature of individual processes. While stress assignment is independent of syllable weight, there are (morpho)phonological processes that are sensitive to weight such as CL, minimum word, and constraint on maximum weight of the syllable. Further, I argue that the syllable weight in CK, similar to Tohono O’odham, partitions the domains of rhythm and prosodic morphology. The syllabic Iamb rhythm of CK, in contrast to Tohono O’odham rhythm which is syllabic trochee, demonstrates that inconsistent languages can also vary across the foot typology.

2.5 Quantity-Insensitive Behaviour

There is robust evidence that rhythm in CK is insensitive to syllable quantity. Rhythm is used to mean the distribution of stress (prominent syllables) and the number and type of syllables. Primary stress is final in CK while secondary alternates from right to left regardless to the quantity of the syllable. This has been reported in the literature of CK

(Ahmad 1986; McCarus 1997; Fattah 1997). Besides, the number of syllable types and the relation between syllable types (internal structure) with stressed and unstressed syllables is another piece of evidence in support of quantity insensitive nature of syllable weight in CK. Moreover, not only most types of syllables are allowed in all positions, but also no phonological processes such as reduction, deletion are reported to correlate between syllable types and (un)stressed syllables.

2.5.1 Eurhythmic Stress Pattern

Primary stress falls on the final syllable of prosodic word with secondary stress iterating on every other syllable from right to left. This kind of stress assignment yields an iambic pattern for CK rhythm. The data in (7a) (for open syllables) and in (7b) (for closed syllables) show that there is no constraint on the fixed stress position by syllable types. Note that CK vowels, except the low central vowel [a] and the epenthetic vowel [ɨ], are long but the length marker (:) is not employed throughout this thesis as length is not contrastive in CK except for [a] and [ɑ]. And my transcriptions are phonemic.

(7) Final stress assignment in CK

a. open syllables	Gloss	b. closed syllables	Gloss
i. ba.ˈʤe	appropriate	i. ba.ˈɫen	promise
ii. sɨ.ˈpi	white	ii. ʃi.ˈɾin	sweet
iii. pa.ˈla	quick	iii. ʃaɾ.ˈbat	juice
iv. pɑ.ˈɾa	money	iv. χɑ.ˈwan	owner
v. sa.ˈmɑ	dance	v. ʃa.ˈqɑm	street
vi. ʧa.ˈqo	knife	vi. sa.ˈɾok	president
vii. kɑ.ˈhu	lettuce	vii. bɑ.ˈɾut	gun powder
viii. ʔu.ˈtu	iron	viii. ʃɑ.ˈʒɨn	queen

The data above in (7a) show that any kind of vowel in open syllables can occur in stressed and unstressed syllables. Vowels in closed syllables, on the other hand, can also be in stressed syllable as in (7bi-viii) or unstressed syllable as in (7biii). Epenthetic vowels can also be the nucleus of stressed syllable provided that it is in a closed syllable as in (7bviii). While words with the phonemic structure such as *bafɨɾ* ’snow’ and *sɨ.za* ‘punishment’ are abundant in CK, words such as **bafɨ* is ungrammatical.

Secondary stress is on every other syllable from the primary stress (Abdulla and McCarus 1967; Fattah 1997). They can, then, be on any syllable regardless of the weight of the syllable, as shown in (8).

(8) Right to left iterative secondary stress assignment

	Data	Gloss
a.	(na. ˌχoʃ) (χɑ.ˈna)	hospital
b.	(bɑ.ˌzɨɾ)(gɑ.ˈni)	commercial
c.	(qu.ˌtɑb) (χɑ.ˈna)	school
d.	(kɨ.ˌteb) (χɑ.ˈna)	library
e.	(ʃɑ.ˌɾa)(wɑ.ˈni)	municipality
f.	(ˌʃɑ)(ɾɨs.ˌtɑ) (ne.ˌti)(ja.ˈkɑn)	the civilisations
g.	(be.ˌhi)(wɑ.ˈbun)	disappointment

The data above from (8a–d) show that closed syllables with any kind of vowel can attract secondary stress. Similarly, open syllables with any kind of vowel except the epenthetic vowel can be stressed (8e-g). This means that syllable types do not disrupt the eurhythmic nature stress assignment in CK. The rationale for the data in (7 and 8) is to demonstrate that stress assignment is insensitive to the quantity of mora in syllable.

2.5.2 Syllable Types: Numbers and Freedom of Distribution

CK, similar to other quantity insensitive languages, has fewer syllable types compared to quantity sensitive languages. Syllables in CK have the features of what were traditionally known as syllable timed languages. Unstressed syllables remain intact as the vowels never display reduction (see 7 and 8). Moreover, CK, unlike stress timed languages, has small variety of syllable types. Every potential consonant cluster in the onset is broken by an epenthetic vowel while in the coda only bi-consonantal clusters are allowed provided that sonority is not violated. This intolerance for consonant clusters reduces the syllable types only to three forms: CV,CV(C)(C)[4] and CVV.

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[4] Note that CK does not have complex coda, i.e. the second coda is extra-syllabic (see § 3.2.2.3).

Typologically, there seems to be a correlation between the number of syllable types and vowel reduction in unstressed syllables with the (in)sensitivity of syllables to stress assignment. As Nespor et al (2011) observe, it appears to be the case that syllable-timed languages have three related properties. First, they have fewer syllable types. Second, their unstressed syllables do not undergo vowel reduction. Finally, their stress assignment seems to be usually insensitive to syllable weight, examples of such languages such as Kurdish, Farsi, French, Italian, and Spanish. Stress-timed languages, on the other hand, have a larger inventory of syllable types; unstressed syllables often undergo vowel reduction and their stress assignment is sensitive to syllable weight. In fact, in quantity sensitive languages syllables fall into two types: heavy syllables that usually attract stress and light syllable that are typically unstressed and often display vowel reduction.

This classification of syllables into heavy and light syllables in quantity sensitive languages entails larger syllable types than quantity insensitive languages. English and Dutch are two examples of quantity sensitive languages with large inventories of syllable types. The English sentence in (9) explains the number of syllable types as an example of quantity sensitive language, and (10) for the translation of the same sentence in CK as an example of a quantity insensitive language.

(9) The next local elections will take place during the winter.

CV.CVCCC.CVV.CVC.V.CVC.CVCC.CVC.CVVC.CCVVC.CCVV.CVC CV.CVC.CV

(10) /hał.bɨ.ʒɑɾ.dɨ.n-a. nɑw.χo.ji. ja. kɑ.n-i. dɑ.hɑ.tu. la. zɨs.tɑn. dak.ɾe-t/
election DEF local DEF PL EZ future in winter make 3rd person

CVC.CV.CVVC.CV.CV.CVVC.CVV.CVV.CV.CVV.CVV.CVV.CVV. CVV. CV.CVC.CVVC.CVC.CVVC

There are nine different syllable types in the English sentence in (9), as an example of a quantity sensitive language. English syllable types can have these various types: (C) (C) (C) V (C) (C) (C) (C). While the translation of the same sentence in CK, as an example of quantity insensitive language, yields only three syllable types (CV, CVV and CVC). However, this correlation between syllable types and quantity sensitivity is not by any means universal. Iraqi Arabic, which is a quantity sensitive language, has very limited syllable types as most of consonant clusters are broken by epenthetic vowels. In brief, the number of syllable types and their immunity to stress impact suggest that syllables in CK are insensitive to quantity as far as stress is concerned.

Crucial to the point under discussion here is the positional freedom of syllable types. Syllables with short or long vowels, closed and open syllables can freely occur in stressed and unstressed positions (see 7 and 8 above). Moreover, the unstressed syllables do not undergo any kind of vowel reduction or consonant deletion to match the position. However, syllable types show two cases of sensitivity in CK in relation to quantity and stress. First, the vowels in closed syllables are phonetically shorter than the vowels in the open syllables particularly in monosyllabic words. This shortening can be attributed to the moraic status of the coda consonants in CK since apart from observing word minimality, there is no phonological process that refers to or requires shortening of closed syllables (see §2.6.2 below). Second, vowels in stressed syllables are longer compared to their peers in unstressed syllables. This can be regarded as bolstering the prominence of stressed syllable. Thus, syllable type is another indicator of the quantity insensitive nature of syllable weight in CK as far as rhythm is concerned.

2.6 Quantity-Sensitive Behaviour

This section sketches the quantity sensitive behaviour of CK. First, it shows that contrastive vowel length and geminate consonants, two properties of quantity sensitive languages, are observed in CK. Then, some quantity-dependent behaviours of CK will be proposed that following Fitzgerald (2012), can be categorised under the rubric of prosodic morphology; these include contrastive phoneme length, CL and the minimal word.

2.6.1 Contrastive Vowel Length and Geminate Consonants

In a quantity insensitive system where weight criterion is irrelevant, vowels are assumed to have similar length in closed and open syllables and also in stressed and unstressed syllables. In most quantity sensitive systems, as Steriade (1991) suggests, long vowels do not occur in closed syllables reflecting a constraint on the maximum weight of syllables. Likewise, Perlmutter (1995) maintains that languages with contrastive segment length are said to have contrasts in phonological quantity. The vowel length in closed syllables of quantity systems is also influenced by the weight of the coda consonant(s) that follow it. However, the bifurcation of vowel length between sensitive and insensitive systems to quantity is not clear-cut. That is, syllable weight, manifested through vowel length, cannot be totally ignored in quantity insensitive systems.

This subsection presents the contrastive length behaviour of the low vowels (mid and high vowel length are non-contrastive, see §1.6.1) and geminate consonants as argument for quantity sensitive behaviour in CK. Languages that exhibit phoneme length contrast, according to Hayes (1989), typically have syllable weight distinction and vice versa. In other words, the existence of contrastive vowel length in languages implies phonological processes dependent on weight, though this is not absolutely true for all languages. Nevertheless, as I will explain in (§2.6.2), the prosody of CK makes reference to syllable weight distinction. First we start with the vowel length contrast. In (11), minimal pairs of contrastive vowel length involving the low vowels are listed.

(11) Minimal pairs of low vowel length

a. χaw ‘sleep’	vs	χɑːw ‘slow’
b. ʃan ‘rake’	vs	ʃɑːn ‘shoulder’
c. daɾ ‘out’	vs	dɑːɾ ‘stick’
d. ka ‘that’	vs	kɑː ‘hay’
e. kaɾ ‘donkey’	vs	kɑːɾ ‘kid’
f. baɾ ‘product’	vs	bɑːɾ ‘load’
g. ʧaw ‘pebble’	vs	ʧɑːw ‘eye’
h. tam ‘fog’	vs	tɑːm ‘taste’
i. ba ‘with’	vs	bɑː ‘wind’
j. mast ‘drunk’	vs	mɑːst‘yogurt’

It should be noted that /a/ and /ɑ/ do not differ considerably in quality; they have relatively similar formant values as both are low central vowels (cf. §1.6.1).

As the occurrence of the long vowels in the examples above is all in mono-syllabic words, one may argue that the long vowels are variations of the short vowels but lengthened by a morpho-phonological process—the requirement of minimal word for example. However, as shown in (12), the long vowels can occur freely in polysyllabic words which explain long vowels have underlying form and even can form minimal pairs with short vowels in polysyllabic words.

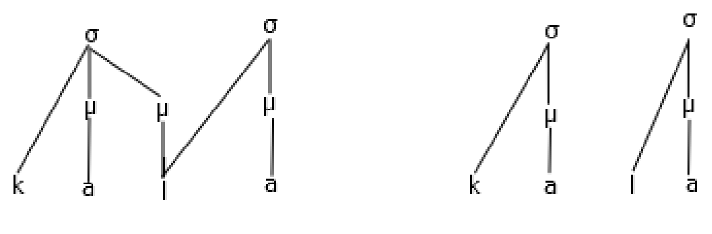
(12) Long vowels in polysyllabic words

a.	nɑ:.χoʃ ‘unpleasant’	vs	na.χoʃ ‘ill’
b.	dɑ:. nɑ ‘wise’	vs	dɑ.na ‘item’
c.	bɑ:.łɑ ‘height’	vs	ba.łɑ ‘calamity’
d.	pɑ:. ɾa ‘money’	vs	pa.ɾa ‘growth’

The minimal pairs between long and short open vowels and the freedom of occurrence for both vowels in monosyllabic and polysyllabic words verify contrastive vowel length in CK (see appendix B for the duration of both vowels).

In the same vein, gemination is another argument for a syllable weight distinction. Following Hayes (1989), geminates are underlyingly moraic while singleton consonants are underlyingly non-moraic. However, later in the derivation when certain coda consonants are adjoined to the syllable, they are given a mora by a language-specific rule that supply weight by position. Hayes also assumes that attesting gemination in a language is one of the basic requirements of assigning moras underlyingly. Thus, the claim is that attesting gemination in CK, as it is shown in (13a), serves as another piece of evidence for contrastive syllable weight. Syllable weight contrast, in turn, can be used for phonological processes that are sensitive to weight.

(13)
a. kalla ‘header’ vs b. kala ‘it is broken’

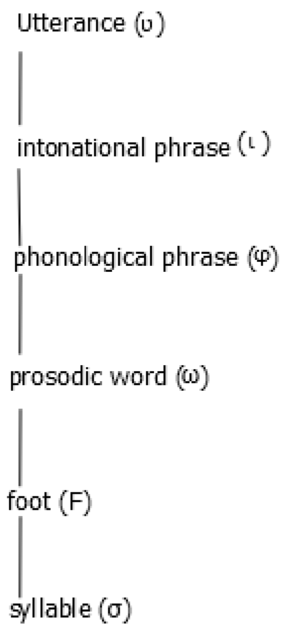


The moraicity of the geminate consonant /l/ in (13a) and non-moraicity of the singleton consonant in (13b) implies that the first syllable in (13a) is bi-moraic (heavy) while the first syllable of (13b) is monomoraic (light). Another argument for the moraic role of geminates in CK is the fact that their distribution is limited to short (mono-moraic) vowels as in *zɨlla* ‘slap’, *kălla* ‘skull’. The constraint on syllable weight (syllables should not be trimoraic) bans geminates in the codas of a syllable with a long vowel. The post short vowel distribution of geminates can be interpreted as the moraic status of geminates and hence support syllable weight distinction in CK.

2.6.2 Minimal Word

In many languages, content words are required to have at least two moras. The word minima condition stems from the SLH of the prosodic hierarchy. If a prosodic word contains at least one foot, and the foot should be no smaller than two moras, then the prosodic word, by transitivity, should be at least bimoraic. The prosodic hierarchy, first evolved from Selkirk (1981 [1978] et seq), states that phonological representation is in a hierarchical organisation that includes, syllable, foot, prosodic word, phonological phrase, intonational phrase and utterance. The higher prosodic units are defined in terms of lower ones.

(14) Prosodic Hierarchy



Hence, the higher units should consist of one or more of lower units. Selkirk (1984 among others), for example, suggests that the prosodic word should be equal to or bigger than the foot. McCarthy and Prince (1996[1986]), on the other hand, state that various languages impose a minimum on the size of the lexical word. They also make a distinction between quantity sensitive and quantity insensitive languages in terms of the size of minimal word. While the minimal word in quantity sensitive languages should be bimoraic as mentioned above, in quantity-insensitive languages (for stress), all syllables are presumably monomoraic, and so the minimal word is disyllabic (McCarthy and Prince 1986 [1996]). According to this claim, if a language is insensitive to a phonological process, it should be insensitive to all other morpho-phonological processes. However, as it will be shown below, minimal word in CK is sensitive to syllable weight. In contrast to McCarthy and Prince's generalisation, syllable weight is a process-specific rather than a language-specific phenomenon.

CK tends not to violate Minimal Word condition requiring content words to be bimoraic. Under the assumption that CK vowels, except [a], are potentially bimoraic and realised longer when they are in open monosyllabic words, the bimoraicity condition of the minimal word is met as shown in (15ai).

(15)

a. long realisation of vowels in open monosyllable words

i	ii	iii
ʧɑː 'tea'	ʧɑk 'good'	ʧɑ.ɾa 'solution'
siː 'lung'	sil 'tuberculosis'	si.na.mɑ 'cinema'
meː 'female'	meʃk 'brain'	ta.me 'punish'
muː 'hair'	mus 'razor'	pa.mu 'cotton'
koː 'addition'	kon 'old'	sa.ko 'podium'

b. ka 'that'; ba 'with'; la 'in';

As McCarthy and Prince observe, the minimal word condition typically holds for content words (lexical categories), such as verbs and nouns. Grammatical words such as prepositions, complementisers are phonologically bound to a neighbouring content word and need not be independently footed. Hence, they can be sub-minimal.

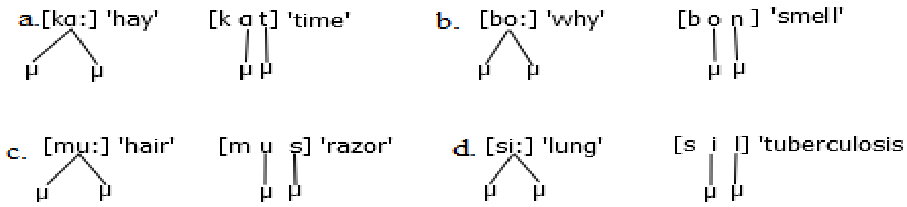
The minimal word condition, as explained in the examples above, is sensitive to the weight of the syllable. The bimoraicity requirement of the minimal word is confirmed by the lengthening of open mono-syllable vowels (as in 15ai) and absence of short and epenthetic vowels in open monosyllable words. Cross-linguistically, CVV syllables are invariably bimoraic, while CV syllables are invariably monomoraic. CK is not a departure from this general rule. Five of the six CK lexical vowels are potentially long and hence bi-moraic. Crucially, the other vowel, i.e. /a/, is short and never forms a content word in codaless syllables. Note that the words in (15b) are all grammatical words. Throughout the thesis, the length mark (ː) is not employed for potentially long vowels, i.e. /i, e, ɑ, o, u/. Length mark is not employed for two reasons. First, apart from the low vowels, length is not contrastive. Rather, length difference of vowels is phonetic. Second, the transcriptions are broad, i.e. phonemic. So, these vowels are meant to be bimoraic in open monosyllable words without using length mark.

An alternative reading of the size of minimal word in CK is to argue that CK makes no reference to the mora. Rather, the size of minimal word is disyllabic but violable as the data in (15ai) show. However, if we rule out the satisfaction of minimal word as the cause of vowel lengthening in open monosyllable words, then, we would miss out the generalisation as to why vowels in open monosyllable words are realised longer than the same set of vowels in closed monosyllabic (15aii) or disyllabic words (15aiii). Further, the absence of lexical words with short vowels in open monosyllable words would not be explained.

With regard to closed monosyllabic words, the weight of the coda in a CVC syllable may vary across languages and within the same language. The moraic status of a coda consonant is determined by the phonological context (Hayes 1995; Rosenthall and van der Hulst 1999). In CK, it seems that sonorants [m, n, ŋ, l, ɫ, r, ɾ, j, w] and voiceless obstruents [p, t, k, s, ʧ, χ, ħ[5]] are weight bearing segments for two reasons. First, they shorten the vowels in the nucleus of their syllables. Long vowels are shortened in closed syllables as a constraint on maximum weight of syllable. In other words, the vowel need not be long to meet the bimoraic condition of the minimal word, as in (16).

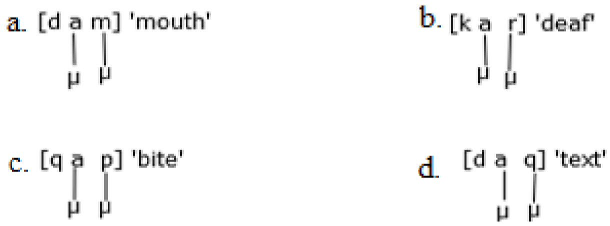
[5] There are certain words with a voiced obstruent in the coda but I do not regard them moraic as vowels in mono-syllables with voiced obstruent coda are not shortened, thus, keep their bimoraicity condition.

(16)



Second, the short vowel /a/ and the epenthetic vowel /ɨ/, when they are followed by the consonants constitute a well-formed minimal word. Thus, in closed monosyllabic words when the vowel is short, the vowel and the coda each project a mora as shown in (17).

(17)



The internal structure of the minimal word cannot be accounted for without reference to the weight of syllable. Shortening long vowels in closed monosyllabic content words and relatively longer realisation of vowels in open monosyllabic words can be interpreted as securing the bimoraity of word minima.

2.6.3 Compensatory Lengthening

Hayes (1989) observes that CL is subject to prosodic constraint within the moraic theory. He also claims that only languages with a syllable weight distinction allow CL. This latter claim divides the sensitivity to syllable weight across languages: languages are either sensitive or insensitive to syllable weight, or rather; in languages that undergo CL, all their weight-sensitive phonological processes are sensitive to syllable weight. The auto-segmental analysis of CL is derivational as it derives the process into two steps. First, a segment associated with a mora is deleted. In a second step, a floating mora re-associates with a preceding segment triggering the lengthening of the adjacent vowel. Hayes claims that CL is part of the syllabification process of individual languages when empty prosodic positions are provided with segmental content. Nevertheless, CL cannot be always part of syllabification particularly when it is triggered by a vowel loss (see §5.3). The words in (18a) are borrowed words which serve as the underlying representation for the surface forms. These are loan words which can be pronounced faithfully or undergo CL. The choice of a variant is dependent on sociolinguistic factors. CK speakers vary in using the underlying or the surface form owing to the influence of the donor language and literacy. Educated CK speakers in Iran may pronounce the underlying forms of the loan words from Farsi (18a iv and vi) while CK speakers in Iraq may use either form for Arabic loan words. Uneducated speakers, on the other hand, who are not under the influence of orthography, tend to use the surface form where CL is attested.

(18)

a. i. qaħt ⟶ qɑt ‘drought’

ii. maʕ.nɑ ⟶ mɑ.nɑ ‘meaning’

iii. tˤaʕ.na ⟶ tɑ.na ‘criticise’

iv. naʕl ⟶ nɑɫ ‘shoe’

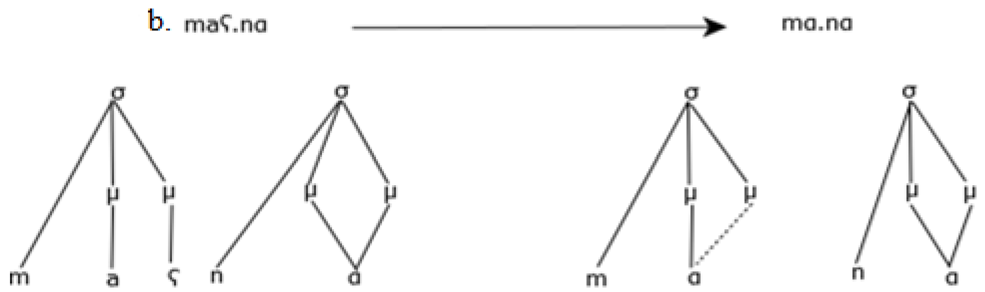
v. ʧah.ɾa ⟶ ʧɑ.ɾa ‘face’

vi. rah.baɾ ⟶ rɑ.baɾ ‘leader

vii. ʃahɾ[6] ⟶ ʃɑɾ ‘city’

viii. kah.ɾa.bɑ ⟶ kɑ.ɾa.bɑ ‘electricity’

(18b) schematically shows CL for the CK word *maʕna* ‘meaning’.



According to the moraic representation of weight, a stranded mora (from a deleted consonant) is filled by spreading from the immediately preceding vowel. The fact that

[6] It seems that the constraint that bans glottals and pharyngeals in coda position triggers CL for most cases in CK as in the examples in (18).

the deletion of the coda in the examples in (18), results in the lengthening of the preceding vowel explains the moraicity of the deleted coda consonant in its underlying representation. It also shows that the syllables that undergo coda deletion and consequently CL are heavy syllables in contrast to light syllables.

CL is notoriously problematic for classic OT which mainly disregards intermediate levels between underlying and surface levels. OT's evaluation of outputs in a parallel system cannot handle opaque processes such as CL that stem from the intermediate derivations between input and output. Classic OT, which is a one-step derivation, cannot deal with CL for two main reasons. First, there is no way to delete a segment and then lengthen an adjacent segment; instead, the deletion and the lengthening must happen at once. Second, Richness of the Base (a principle that requires all non-contrastive inputs to be considered) entails that predictably moraic codas cannot be guaranteed to be underlyingly specified as moraic. Therefore, it is impossible to tell from the input whether a given segment will be syllabified as an onset or coda (inputs are not guaranteed to be syllabified as syllables are not contrastive in the lexicon see §3.2.1) or whether a consonant is moraic or not. As the input is not syllabified and hence onset and coda are not specified, the (non)moraicity of each is not guaranteed. Crucially, as Kiparsky (2011:37) explains, when segments are not syllabified and moras are not present, there can be no faithfulness to them and CL should not be triggered.

As stated by Samko (2011), the problem for parallel OT is that two successive processes incurring two separate faithfulness violations must occur in the same derivation. Deletion and lengthening incur two separate faithfulness violations making the desired CL candidate to be harmonically bounded by two competitors. Harmonically bounded candidates, according to McCarthy (2008:80), are the losers that cannot win no matter how the constraints are ranked. There is no way to delete a segment and then lengthen an adjacent segment in one step. Thus, a ranking paradox prevents the building of prosodic structure from intrinsically preceding deletion of segments as shown in the following tableaux for the example (18).

(19) deletion (no lengthening)

$ma^{\mu}ʕ\ na^{\mu\mu}$	MAX	DEP(μ)
☞ a. $ma^{\mu}.na^{\mu\mu}$	*	
☹b. $ma^{\mu\mu}\ na^{\mu\mu}$	*	*

(20) Lengthening (no deletion)

$ma^{\mu}ʕ\ na$	MAX	DEP(μ)
☞ a. $ma^{\mu\mu}ʕ.na$		*
☹ b. $ma^{\mu\mu}.na^{\mu}$	*	*

As the tableaux (19 and 20) show, there is no way to a tableau can account for a two step process such as CL. The sad faces in (19b and 20b) indicate that the desired candidates are also unselected. Therefore, many adjustment versions have been proposed for classic OT to accommodate opacity. As McCarthy (2007:5) states, most of the amended versions of OT share the characteristic of introducing a third level of representation between surface and underlying representations. Among the most important refinements that have been introduced to overcome opacity are Sympathy Theory, Correspondence Theory (output-output correspondence), Stratal OT, and Harmonic Serialism. In addition to handling some cases of opacity, these improved versions of OT can improve the whole theory in two different ways. They severely limit the size of the candidate set as there is no natural limit on the number of candidates GEN can produce in classic OT. This is due to the fact that the refined versions of OT recognise intermediate stages where the candidate set have already been chosen. It is the output of the intermediate stage that serve as the input to the ultimate stage. They also impose limitations on the mapping from the input to the output.

Following, I briefly argue that Stratal OT satisfactorily handles opacity in general and CL in particular better than other versions of OT. Starting from the faithfulness-based theories, i.e. Correspondence Theory and Sympathy Theory, it seems they cannot account for CL. As for Correspondence Theory, presented in McCarthy and Prince (1995: 14), a relation is established between two structures, such as base and reduplicant or input and output. Faithfulness constraints in Correspondence Theory require two segments to stand in a relation with one another. McCarthy and Prince define correspondence as ‘given two strings S1 and S2, correspondence is a relation R from the elements of S1 to those of S2. Elements αϵS1 and βϵS2 are referred to as correspondents of one another when α R β.’

In Sympathy Theory, on the other hand, the winning candidate is selected, in part, for looking more like a faithful candidate, compared to transparent candidate which looks less like the faithful candidate (McCarthy 1997). The basic idea here is to deal with opacity without serial derivation in which the input passes through the intermediate stage. An example from Hebrew is the opaque case where /ʃʔ/ in *deʃʔ* triggers epenthesis *e* yielding the intermediate stage *deʃeʔ* then /ʔ/ is deleted in surface form resulting in *deʃe*. Hence, *deʃe* outranks *deʃ* for being more like the faithful candidate than *deʃ*. Thus, both Correspondence Theory and Sympathy Theory require a relation between input and output in which both of them are known.

However, as explained above, the presence of the mora of the deleted coda is not guaranteed. Basically, according to OT’s principles such as Freedom of Analysis and Richness of the Base any input from GEN can map the output. In other words, the input is not specified for the output to correspond with (according to Correspondence Theory) or for the output to be more similar to it than other candidates (according to Sympathy Theory). The input of CL is not the underlying form, it is the output itself as the strings of segments are syllabified and moras are assigned.

Harmonic Serialism (HS) or (single-grammar serial OT) is another version of OT that combines serial derivation with constraint interaction. In HS, the output of an OT grammar is returned as the input to the same grammar. This process continues until *convergence* when the input is identical to the output indicating that no further harmonic improvement is possible (McCarthy 2002:159; Elfner 2009). HS imposes a requirement on GEN which allows candidates to differ from their input only by the application of a single operation with the same constraint ranking in each stage. As mentioned above, for any version of OT to be able to handle CL, it is crucial that syllabification and assignment of moras happen before segmental deletion. In HS, there is no guarantee that the correct syllabic and moraic structure will be built before segmental changes occur. In other words, the derivational component ensures that metrical structure is built before segments are deleted. However, the HS's assumption that the input makes multiple passes within the same constraint ranking and the winning candidate incurs only faithfulness violation necessitates a ranking paradox. At the early stages of the derivation, the ranking MAX >>*CODA must hold to prevent a segment from deletion before a mora can be inserted to be associated with it. For the segment to be deleted later in the derivation, *CODA must outrank MAX. This ranking, however, is against the basic principles of the same ranking constraint in HS.

Stratal OT (Multi-grammar serial OT) draws heavily on the tradition of Lexical Phonology which, for the purposes of phonological interpretation, divides morphosyntactic constituents into three levels: stem-level, word-level, and phrase-level. Each level is associated with its own ranking of phonological constraints (Bermúdez-Otero 2006). However, Stratal OT does not adopt every aspect of Lexical Phonology. In particular, it rejects the two principles of *structure preservation* and the *Strict Cyclicity Condition.* The principle of structure preservation states that rule application in lexical strata cannot create segments or structures that are not already present in underlying representation. This principle is against the OT's Richness of the Base which states that everything is possible underlyingly. The Strict Cyclicity Condition, on the other hand, indicates that a phonological rule at a given stratum affects strings of sounds that undergo a morphological rule at the same level. This principle is empirically not possible as phonological rules, epenthesis and syncope for example, persists in all strata.

Maintaining a restrictive and well-defined constraint inventory, Stratal OT genuinely explains opacity by relating the stratification to the intrinsic morphological and prosodic constituency of words and phrases, as characterised by the Stem, Word, and post lexical levels of Lexical Phonology and Morphology (Kiparsky 2000: 351). In Stratal OT, each stratum is a different OT grammar and hence allows different permutations of the universal constraint set CON. This is regarded as one advantage of Stratal OT (over HS) in dealing with opaque phonological processes since different constraint rankings constraints are needed in stem and word level to account for opaque cases. Therefore, this thesis adopts Stratal OT to handle opaque phonological processes such as CL and interaction between stress and epenthesis where parallel OT is powerless to tackle.

As far as CL is concerned, Stratal OT imposes syllable structure on inputs at the stem level (including assigning mora for codas) takes place at the first pass through the constraint system. At the word level, underlying moras (from vowels) and moras assigned at the stem level (from codas) are indistinguishable and they serve as the input. Word-level faithfulness effects apply to both alike. The main competing constraints in CK are a markedness constraint that bans glottals and pharyngeals in coda position. With a little adjustment of McCarthy's (2008:224) *CODA/X which bans segments in the coda that belongs to the sonority class X, the markedness constraint that bans pharyngeal and glottals in coda is introduced. X is any glottal or pharyngeal segment.

(21) *CODA/X

Segments in the coda should not belong to pharyngeals and/or glottals.

*CODA/X competes with the faithfulness anti-deletion constraint MAX-C. A high ranking faithfulness constraint that requires preserving the input moras in the output is also involved. Preserving a mora is preferred over preserving certain segments in coda position, i.e. MAX-μ >> MAX-C. Tableau (22) demonstrates how the input *maʕ.na* 'meaning' fares with the constraints after moras are assigned at the stem level.

(22)

$ma^{μ}ʕ^{μ}$.nɑ (from stem)	*CODA/X	MAX-μ	ONSET	MAX-C
☞ a. $mɑ^{μμ}$.nɑ				*
b.$ma^{μ}$.nɑ		*!		
c.$ma^{μ}n^{μ}$.ɑ			*!	*
d.$ma^{μ}ʕ^{μ}$.nɑ	*!			

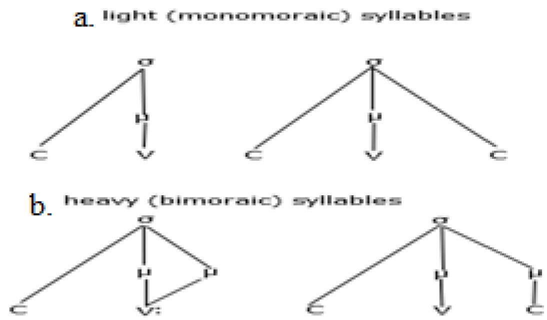
The Tableau above assumes that at the stem level the word is syllabified and moras are assigned. It also explains that the candidate (22a) is optimal as it incurs the least violation compared to the other candidates.

The syllable weight distinction for CL on the one hand, the insensitivity of syllable weight to stress on the other hand, supports our proposal that weight is not consistent across phenomena within the same language. So, the claim of this thesis which regards weight as a process-specific phenomenon is in contrast to (McCarthy and Prince 1986; Hayes 1989) which regard weight as a language-specific, rather than process-specific, phenomenon. Following is another phonological process that supports syllable weight inconsistency in CK.

2.7 The Weight of the Epenthetic Vowel

The standard assumption of the moraic theory of syllable weight, first proposed by Hyman (1985) and further developed by Hayes (1989) and others, divides syllables into heavy and light in terms of the number of moras (weight units) as shown in (23) below[7].

(23)



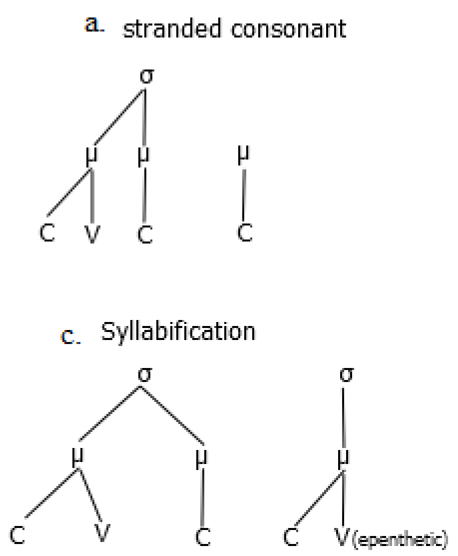
According to the above typology in (23), CV and CVV syllables are consistently monomoraic and bimoraic respectively while for CVC syllables, languages differ in assigning a mora to the coda consonants. This means that CVC syllables can be monomoraic as in Lardil or bimoraic as in Latin. Even within the same language, the moraic status of a coda consonant may vary. Some consonants, usually the sonorants, can be moraic while others are not. (Zec 1995; Davis 2011).

The issue of whether epenthetic syllables are moraic and how they fit the diagram in (23) above have been controversial among phonologists. There appears to be two opposing proposals on the weight of epenthetic syllable. Based on the original moraic theory of Hyman (1985) who permits every consonant to have a mora, Itô (1989) claims that a syllable inserted to license a stranded consonant should be moraic. She suggests that every consonant, including stranded consonants, are moraic and when an epenthetic

7 Some languages distinguish more than two degrees of weight (Hayes 1989).

vowel licenses stranded consonants, the onset and the epenthetic vowel share the mora as shown in (24). Archangeli (1991) also makes similar suggestion to that of Itô. To her, the insertion of an epenthetic vowel has three stages: the insertion of a syllable, the insertion of a mora and the insertion of the epenthetic vowel. Itô and Archangeli's account of giving moraic status to epenthetic syllables is based on the assumption that all syllables have mora (as shown in 23), epenthetic syllables are syllables, and therefore, epenthetic syllables are moraic.

(24)



This argument, however, lacks empirical evidence. Later developments of moraic theory render this proposal untenable as there is considerable cross-linguistic evidence that onset consonant(s) are not moraic (see Alderete 1999 for some examples). Hayes (1989), on the other hand, does not include epenthetic vowels within the sources of syllable weight as shown below in (25).

(25) Sources of syllable weight

a. For every language, short vowels contribute one mora and long vowels two moras to the weight of a syllable.
b. Weight by-Position (WBP): coda consonants are moraic (language specific).

Both of the above categorisations are based on theoretical consequences of the hypothesis that all syllables (of certain type) have mora(s) or not. Nevertheless, both proposals, as Piggot (1995) notes, ignore empirical implications of assigning weight to epenthetic vowels. To put it another way, to see whether the phonological processes that target syllable weight treat all syllables including the epenthetic syllables as containing mora. In fact, the interaction of epenthetic syllables with weight processes can serve as a litmus test for the claim that all syllables, including syllables with epenthetic vowel nucleus, always have mora.

The weight of epenthetic vowel is usually determined by its (in)sensitivity to stress. Even though stress is insensitive to syllable weight in CK, there is an interesting relation between epenthetic syllables and stress. Epenthetic vowels in closed syllables are visible to stress, i.e. behave identical to lexical vowels while epenthetic vowels in open syllables cannot be stressed. As I suggested earlier, the stress assignment process assigns an Iamb to the right edge of the word in CK (26a). While epenthetic vowels never occur in final open syllables as the direction of syllabification is leftward, closed syllables with epenthetic vowels are stressed when they are in normal location of stress as shown in (26b).

(26)

a.	ta.mɑ.ˈta ‘tomato’	qa.ˈɫam ‘pencil’	ʧɑ.ˈkat ‘coat’
b.	ʃa.ˈkɨɾ ‘sugar’	ga.ˈnɨm ‘wheat’	ʤa.ˈʒɨn ‘feast’

Underlying complex codas (as the examples in 26b) that violate sonority are not allowed and deleting consonants is not usual to enforce licit syllable structures in CK; therefore, complex codas that violate sonority are broken by an epenthetic vowel at the stem level. Stress assignment, on the other hand, is assigned at the word level. This means that the epenthetic vowel is inserted one level before stress assignment.

The stratification of epenthesis and stress assignment guarantees the visibility of epenthetic vowels to stress assignment and meets the predictions of Stratal OT. An epenthetic vowel that is stressable must be inserted lexically, either at the stem level or at the word level. I assume both epenthesis and stress are inserted lexically with epenthesis inserted at the stem level and stress at the word level. The assumption is based on the fact that stress is lexically contrastive in CK. For example, *roʃ.ˈtɨn ‘going’ vs ˈroʃ.tɨn ‘they went’*. The constraints that are in action is the markedness constraints that require parsing of segments into syllables (PARSESEG) and parsing syllables into feet (PARSEσ). The latter constraint requires assigning stress to syllables. So, it is highly ranked in the word level where stress is assigned. *COMPLEX is the constraint that militates against the consonant clusters either in onset or coda. Along with the anti-epenthesis faithfulness constraint DEPV, these constraints compete to syllabify and yield well-formed syllables at the stem level. Tableau (27) shows the epenthesis insertion in the stem level for the input *kotɾ* ‘pigeon’ which has a coda cluster underlyingly.

The round brackets separate syllables while the square brackets separate feet.

(27) Stem Level: syllabification and epenthesis insertion

kotɾ	*COMPLEX	PARSESEG	DEPV	PARSEσ
☞a. (ko) (tɨɾ)			*	**
b.(kot) ɾ		*!		*
c.(kotɾ)	*!			*

As the output of each stratum serves as the input to the following one, the winning candidate (27a) serves as the input in the word level stratum where stress is assigned. In Stratal OT, different constraints in different levels can be employed with different constraint permutations. The flexibility of constraint ranking is regarded as an advantage of Stratal OT over harmonic Serialism. PARSEσ and PARSESEG are from the stem level while the constraint *σ/C assigns one violation mark for every syllable whose head is a consonant. Tableau (28) shows the word level stratum where stress is assigned.

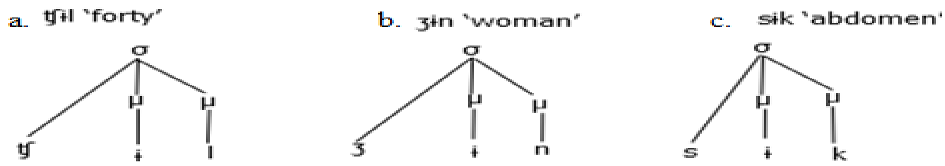
(28) Word Level: Stress assignment

(ko) (tɨɾ) (from stem)	PARSEσ	PARSESEG	*σ/C
☞ a. [(ko) (ˈtɨɾ)]			
b.(ko) (tɨɾ)	*!*		
c.[(ko) (tɾ)]			*!
d. [(kot)] ɾ		*!	

The epenthetic vowel changes the input /kotɾ/ from one syllable to two syllables /ko.tɨɾ/. Then, the second syllable will be visible to stress assignment. Syllabification and hence epenthesis precedes stress assignment. Note that as the constraints in (28) are equally inviolable, they are equally ranked.

The Minimal word condition can provide further explanation about the weight of epenthesis. As I suggested earlier in (2.6.2), CK observes a minimal word condition. That is, content words are at least disyllabic or bimoraic (see 15). Monosyllable words with epenthetic vowels demonstrate that the epenthetic vowel is moraic as far as the minimal word is concerned. The epenthetic vowel in closed syllables and the following coda consonant each bears a mora to meet the requirement of bimoraic minimal word condition of CK as schematically shown in (29).

(29)



However, the open epenthetic syllables, in contrast to closed epenthetic syllables, are never moraic. The interaction between stress and epenthesis gives insight into the weight of open epenthesis. Open epenthetic vowels do not occur in final syllables which is the normal location of stress in CK as leftward syllabification rules out any open epenthetic syllable in the rightmost syllable of prosodic words. Yet, through morphological processes, open epenthetic syllables appear in the position where they should receive stress. One such process is the addition of the clitics /ek, /m/, /t/ which are typically unstressable as shown in (30).

(30)

a. qa.ˈła.mek ‘a pen’
b. ʧɑ.ˈka.tek ‘a coat’
c. ˈmɨʃ.tek ‘a fist’
d. qa.ˈła.mɨt ‘your pen’
e. ʧɑ.ˈka.tɨm ‘my coat’
f. ˈmɨʃ.tɨm ‘my fist’

Nevertheless, when the clitics occur after open epenthetic syllables, they attract stress as the latter cannot bear stress. So, normally unstressed clitics bear stress since the open epenthetic syllables cannot be stressed at all as in (31):

(31)

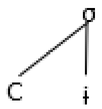
a.	ˈmɨl ‘neck’	vs	mɨ.ˈlek ‘a neck’
b.	ˈʃɨt ‘thing’	vs	ʃɨ.ˈtek ‘a thing’
c.	ˈkɨʧ ‘girl’	vs	kɨ.ˈʧek ‘a girl’
d.	sɨk ‘abdomen’	vs	sɨ.ˈkek ‘an abdomen’
e.	ˈmɨl ‘neck’	vs	mɨ.ˈlɨm ‘my neck’
f.	ˈʃɨt ‘thing’	vs	ʃɨ.ˈtɨm ‘my thing’
g.	ˈʒɨn ‘wife’	vs	ʒɨ. ˈnɨt ‘your wife’
h.	ˈkɨʧ ‘girl’	vs	kɨ.ˈʧɨm ‘my daughter’

In brief, epenthetic syllables do not behave in a uniform way in relation to stress. Stress assignment in CK conspires to avoid open epenthetic syllables while closed epenthetic syllables are stressable.

The relevant question here is why closed epenthetic syllables are visible to stress while open ones are not. In other words, what is the difference between open and closed epenthetic syllables in CK? The dual status of epenthesis moraicity can be interpreted from two different perspectives. First, the weight distinction can be based on vowel quality rather than vowel length or segment count. However, the epenthetic vowel /ɨ/ in closed and open syllables is the same, i.e. does not change quality to cause changing its moraicity. Second, epenthetic vowels cannot have weight unless it is in a closed syllable.

One way to compare them is to look into their weight through the weight bearing unit, viz. mora. The moraicity of epenthetic vowel in monosyllable words with epenthetic vowel (see 29) and stressability of closed epenthetic syllable (see 28) implies that the epenthetic vowel bears weight. The unstressability of open epenthetic syllables, on the other hand, shows that it does not bear weight. This assumption implies two different kinds of syllables: (a) A Major syllable which carries mora, this include syllables with lexical vowels and closed epenthetic syllables. (b) A Minor syllable (non-moraic), on the other hand, includes only open epenthetic syllables. Support for the treatment of the syllable in (32) as minor syllable is provided by CK stress assignment: minor syllables are never stressed.

(32) Minor syllable



The source of the mora of epenthesis in closed syllables can be one of three possibilities: (a) the vowel is associated with an underlying level. (b) The mora is from the coda through WBP. (c) The mora is the requirement of prosodic licencing.

Taking into consideration (25) above, the epenthetic vowel cannot have underlying presence. The mora cannot also be the result of WBP (sharing the mora between the consonant and the epenthesis) as in monosyllable words with epenthesis as the only vowel in the word, the word should be at least bimoraic according to the principles of foot binarity and headedness of the word. The third possibility, i.e. prosodic licensing, is inspired by SLH and argued for by Zec (1988) who suggests that the root node and the syllable node should be mediated by a mora node as shown below.

(33) Phonological Phrase

Prosodic Word

Foot

Syllable

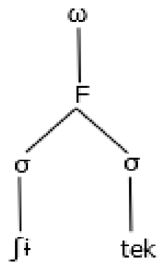
Mora

The non-moraicity of open epenthetic syllables suggests that they are invisible to stress assignment as the *raison d'être* for such syllables is to licence consonants. Weight is not a necessary component of well-formed syllables. As Piggot (1995) explains, epenthesis inserts vowels to syllabify stray consonants but not necessarily insert an accompanying mora. This implies that even in quantity insensitive languages, stressed syllables should have weight: either monomoraic or bimoraic; non-moraic syllables are never stressed. Thus, non-moraicity of open epenthetic syllables explains their avoidance of stress.

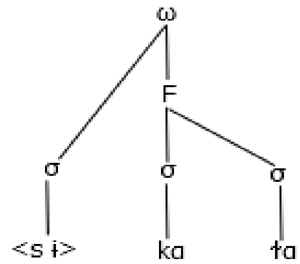
The open epenthetic syllables are unstressed; however, they should be incorporated into the prosodic structure. The unstressability of the unstressed open epenthetic syllable and the clitics has consequences for the prosodic structure in CK. The open epenthetic syllable /ʃɨ/ in (34a) is parsed into foot as it is in unstressed position while /sɨ/ (in the word /sɨkɑłɑ/ ‘complaint’) in (34b) is left unparsed. Note also how the closed epenthetic syllable /mɨʃ/ in (34c) is parsed into foot while the unstressable clitic <tek> is parsed into higher prosodic structures (extrametrical).

(34) weightless open epenthetic syllables

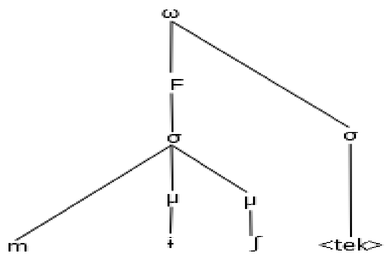
a. parsed



b. unparsed



c. closed epenthetic syllable



Non-uniformity of epenthesis to stress poses problem for pre-OT theories of epenthesis-stress relation. In Chomsky and Halle (1968), stress-epenthesis interaction depends on rule ordering, if epenthetic vowel is inserted before stress, the resultant syllable will be stressed. Conversely, if the epenthetic vowel is inserted after stress assignment, the syllable will be unstressed. The prosodic theory of epenthesis (Itô 1989), on the other hand, claims that epenthetic vowels are inserted to parse the unsyllabified segments, then these syllables are parsed into feet, i.e., epenthesis is syllabically conditioned. However, none of these two treatments (Chomsky and Halle 1968; Itô 1989) can handle non-uniformity of epenthesis-stress interaction. Stratal OT, however, can aptly handle the inconsistency of the weight of epenthetic vowel as explained below.

The interaction of the unstressable indefinite article with open epenthetic syllables requires serial derivation: a problem for parallel OT. However, Stratal OT can deal with the multiple derivations. First, the underlying form /ʒn/ ‘woman’ with the suffix /ek/ is re-syllabified into /ʒɨ.nek/ ‘a woman’. The high-ranking constraint that militates against complex onset triggers the epenthetic vowel as the anti-epenthetic constraint DEPV is outranked by other constraints. The two other high ranking markedness constraints; PARSESEG which parse every segment into syllables and *σ/C, which assign one violation mark for every syllable whose head is a consonant, renders (ʒɨ)(nek) as the optimal output in tableau (35).

(35) Stem Level: syllabification and epenthesis

ʒnek	*COMPLEX	PARSESEG	*σ/O	DEPV
a.(ʒnek)	*!			
b.ʒ(nek)		*!		
c. (ʒ)(nek)			*!	
☞ d. (ʒɨ)(nek)				*

The output of the stem level serves as the input to the word level where stress is assigned and the syllables are parsed into feet. Two competing stress-related constraints are active in CK: a constraint prohibiting the stressing of open epenthetic vowels takes precedence over the constraint dictating the location of stress. HEAD-DEP[8] bans open syllables with epenthetic vowel (minor syllables) to attract stress even if they are in the regular place of stress. This constraint, in turn, competes with a constraint that requires the edges of lexical word to align with the edges of prosodic word; such constraint can be called LEX-TO-ω (L/R) (Itô and Mester 2009).

(36)

LEX-TO-ω (L/R): Every lexical word is left/right aligned with a prosodic word.

The ranking between these two constraints determines the location of stress. Hence, the winning candidate violates the constraint PARSEσ that requires parsing syllables into foot.

[8] This constraint is adapted from Alderete (1999:36). Originally, HEAD-DEP bans stressing of epenthetic syllables. However, I adapt it here to incur aviolation for each stressed open epenthetic syllable.

Thus, there is a non-moraic syllable. The SYLL-HEAD constraint assigns one violation mark for every syllable that does not dominate at least one mora.

(37) Word Level: stress assignment

(ʒɨ)(nek)	HEAD-DEP	PARSEσ	LEX-TO-ω R	SYLL-HEAD
a.(ʒɨ)(nekμμ)		**!		*
☞b.(ʒɨ)[(ˈnekμμ)]		*	*	*
c.[(ˈʒɨ)(nek)]	*!			*

To conclude, epenthetic vowels in open syllables is non-moraic while they are moraic in closed syllables. Stress assignment and minimal word condition provide evidence for the (non)moraicity of epenthetic vowel. Stratal OT, in contrast to other versions of OT, has the apparatus to explain opaque processes of epenthesis and stress assignment.

Chapter Three The Syllable as a Prosodic Constituent

This chapter addresses the role of syllable as a constituent in the prosodic structure. To this aim, the syllable is assessed against the criteria that make a linguistic unit a constituent. Certain phonological processes are used to test the constituency of the syllable. Derivation of syllables, i.e. how the syllable is built and the adherence of syllable to general principles of prosody is discussed in section two. Section three outlines the role of the syllable as a domain for phonological processes such as phonotactics, epenthesis while section four outlines syllable-based segmental processes such as allophonic variation and glide formation. Whether rhythmic structure of speech and stress assignment is applied within the domain of syllable or different alternatives apply is addressed in section five.

3.1 Introduction

As a constituent, the syllable has a central role in prosodic structure and phonological theory. Segments are organised into syllables which themselves are organized into higher-level rhythmic units. Recognition of the syllable can account for the pervasive cross-linguistic similarities of permissible segment sequences. The syllable is perhaps the most wide-ranging and therefore, most well-studied constituents amongst prosodic categories. As a consequence, this chapter cannot cover all aspects of CK syllables. Rather, those aspects of the syllable are considered that use it as a constituent, i.e. as a domain of application of phonological processes.

Nespor and Vogel (1986:59) list four types of motivation for recognising the syllable or any other phonological representation as a constituent in the prosodic hierarchy.

a. Rules need to refer to it in their formulation.

b. Rules have it as their domain of application.

c. It is a domain of phonotactic constraints.

d. It is the bearer of prominence relations.

Earlier, Selkirk (1982) proposed three similar motivations for the establishment of syllable as a constituent. First, Phonotactics may be the most relevant syllable-dependent phonological phenomenon. Since it interacts with the syllable closely, phonotactics is usually applied within the syllable and it dictates the basic syllable types at the same time. Phonotactics can also identify syllabic constituents, i.e. subgrouping of segments within the syllable edges. Second, the syllable is the domain of application of segmental rules. That is, based on language specific operations, tauto-syllabic segments interact resulting in processes such as aspiration, palatalization, vowel shortening, etc. Consonantal feature distributions have also been explained as a syllable-based phenomenon. This summarises (a) and (b) above. Voicing Assimilation is a typical example in CK for feature distribution (see §3.4.1). Third; supra-segmental phenomena such as tone and stress are the property of syllable rather than individual segments. The motivations given to establish the syllable in phonological theory overlap with the kind of justifications that have been offered for its role in prosodic phonology.

3.2 Derivation and Constituency of Syllable

This section discusses two main aspects of syllable. First, where do syllables originate? Second, it assesses the arguments of syllable constituency in the light of CK data.

3.2.1 Derivation of Syllables: Where do Syllables Come from?

There are two basic proposals on the emergence of syllables: either lexical items are syllabified in the lexicon, or syllabification starts later in the course of phonological derivation. As Blevins (1995) explains, the first option has been ruled out in many languages for all or one of these three reasons: (1) the rarity of minimal pairs that differ only in syllabification. (2) Segments in many languages, underlying high vowels for example, alternate for syllabicity which can be viewed as derived syllabification. (3) Many individual morphemes fail to comply with the licit syllable structure of the possible syllable structure types of a language. Data from CK support all three reasons to refer the emergence of syllables to phonological derivation rather than existence in the lexicon. CK lacks minimal pairs based on syllabification and it provides example of alternating glides (cf. §3.4.2.1). Finally, as epenthesis abounds in CK, surface syllable structure of individual morpheme should be derived in the course of derivation.

Adopting the general assumption that the syllable is non-existent in the lexicon, it should be generated in the course of phonological derivation. There are two basic algorithms for the derivation of the syllable: Syllable-building rules, also known as skeletal insertion rule which uses rule-based approaches to build syllable subparts (Kahn, D. 1976; Steriade 1982; Levin 1985). Syllable-building rules, as stated by Steriade (1982), involve a series of ordered steps. (1) Core syllabification: scanning a string of unparsed segments to build CV syllables known as core syllables. (2) Coda rule: assign a post-vocalic single consonant to the preceding CV syllable. (3) Complex sub-syllabic constituency: build complex onset and/or coda where necessary. The syllable-building algorithm, similar to other phonological rules, is applied in an ordered fashion. So, the rules (1, 2, 3) are assumed to be applied respectively.

However, as Itô (1989) points out, the universality of CV syllables is not a prerequisite for it to apply first or across word boundaries. Further, onset and coda rules may apply once or iteratively, i.e. the iterative nature of syllabification which leaves no segment unparsed is not included in the algorithm. Another problem of syllable-building approach, as Itô notes, is its prediction of unattested epenthesis sites because it is intrinsically unrelated to syllable structure. In CK the underlying form of *gɾft* ‘problem’ syllable building algorithm cannot categorically predict the correct syllabification as by following the syllable building algorithm the second consonant may be syllabified to the coda of the first syllable yielding the ungrammatical form **gɨɾ.fɨt* rather than the grammatical *gɨ.ɾɨft*.

Moreover, syllable building rules fail to account for the syllabification of VCV in languages where the intervocalic consonant syllabifies to the coda of the first syllable rather than the onset of the second syllable. The first step in the ordered fashion of the syllable building rules is to create [CV] syllables from a string of segments; this entails the syllabification of VCV into V.CV rather than VC.V. Languages with VC.V syllabification, though rare, do nevertheless exist. Kunjen and Barra dialect of Gaelic are two examples of VC.V languages (Blevins 1995 and references cited therein). Further, syllabification across word boundaries tends not to create CV syllables in all languages.

In a template-based algorithm of syllabification (Itô 1989), however, the well-formedness of a syllable is based on templates and sonority. According to this algorithm, segments should be syllabified in order to be licensed by the prosodic structure. On a parametric basis, languages either license stray segments by epenthesis or delete them by *stray erasure*. As it will be made clear in (§3.2.2.1, §3.2.2.2 and§3.2.2.3), the principles of template-based algorithm such as directionality of the syllabification, ensuring maximum syllabification along with extra-syllabicity account for the licit structures of CK syllables. Further, based on prosodic licencing, template-based algorithm assumes phonological units belong to higher prosodic structure: segments to syllables, syllables to higher prosodic categories. The occasional unlicensed lower phonological units are often accounted for within the notion of extra-prosodicity.

Even though template-based algorithm started before the inception of OT, it gives an OT-like account of syllable structure. For instance, similar to OT, it is interested in the output of phonological derivation, in this case the structure of the syllable, more than the processes that produce the syllable. It also proposes a violable constraint having different ranking in different languages. The coda filter and onset constraint (then called principle) were two such constraints. Itô (1989) suggests that onsetless syllables are avoided whenever possible. She also proposes that there is a parametric setting as to how languages satisfy the onset principle. There are also languages that violate the onset principle such as the Kunjen and Barra Gaelic cited above.

In brief, the syllable-building rule is blind to the overall structure of the syllable and more interested in the ordered rules in the phonological process. This can lead to illicit syllable structure particularly in languages with epenthetic vowels such as CK. A template-based algorithm, with its interest in the output by first maximising the syllable structure, correctly predicts the insertion site of epenthetic vowels and integrates it into the prosodic structure — regard syllables as a constituent within the prosodic categories. Therefore, this thesis adopts the template-based algorithm, preferring it over the syllable building rules. The next section looks at the syllable as a constituent in CK, investigating both conceptual and empirical evidence that support the argument of constituency of syllables.

3.2.2 The Syllable as a Constituent

To assess the constituency status of an element, conceptual and empirical evidence can be employed. Conceptually, two properties are usually represented for constituency; Kayne (1994[9]) and Oostendorp (2013) use the following criteria:

(1)

a. Constituency: two independent elements act as a unit for certain processes or constraints.

b. Headedness: the elements within the constituent are in an asymmetrical relation, one is a 'head', the other(s) are 'dependents'.

Typically, for most syllables, two or more distinct elements—segments in this case—play the role as one unit when they are grouped together to form a syllable. In the context of syllable structure, headedness means that the vowels act as the head while the margin consonants are the dependents. Vowels are heads because they often determine the quantity and the quality of the tauto-syllabic consonants. Further, the vowels are visible for stress assignment and other supra-segmental properties. In constituency-based models, there is only one node that other nodes depend on and centre around which is assumed to be the most sonorous segment in a syllable. What is generally agreed in the literature on syllable, as Goldsmith (2011) explains, is the fact that the notion of inherent non-relational feature of a nucleus is ill-suited for representing the nucleus. That is, whether a vocoid surface as a vowel (hence a nucleus) or a corresponding glide lies in relation between the segments and the context in which it appears.

Empirically, the syllable can be regarded as a constituent as there are phonological processes and constraints which take the syllable as their domain of application. Syllable structure is probably the most important conditioning environment for

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[9] Kayne's criteria of constituency are mainly meant and used for syntax. This should not be understood that constituency in phonology and syntax are exactly the same. Recursion, for example, a common feature of syntactic constituents, is not attested in phonological constituents at the bottom of prosodic category, at least on syllable level.

segmental rules such as aspiration, assimilation, flapping and so on. As the present study tests the prosodic theory against the data of a poorly studied language, it is inclined towards the empirical bases that establish syllable as the domain of the application of phonological processes.

For the syllable to be a constituent within the prosodic structure in CK, it should adhere to the general principles of prosody. Through parameters that govern epenthesis in CK, it will be shown that the syllable as a prosodic constituent meets the requirement by defining the insertion site, the directionality and maximality of epenthesis. Prosodic Theory assumes the following principles and parameters (Prince 1985; Itô 1989; Hayes 1984 and 1995 among others).

(2)

a. Maximality
b. Directionality
c. Prosodic Licensing
d. Extra-prosodicity

3.2.2.1 Maximality

According to this principle, ‘units are of maximal size, within the other constraints on their form’ (Prince 1985). In other words, syllables have maximum size unless other constraints restrict their maximality. Logically, this principle is taken for granted, i.e. its opposite is not possible. If units were supposed to be of minimal size, we would not know large structures. CK epenthesis demonstrates how maximality is maintained by inserting the minimum number of epenthetic vowels. In a string of segments, when syllable sizes are maximised, often the number of syllables are minimised in that string. Selkirk (1981) proposes a principle minimising syllable number per string by maximising syllable size whereby each epenthetic vowel rescues as many stray consonants as possible.

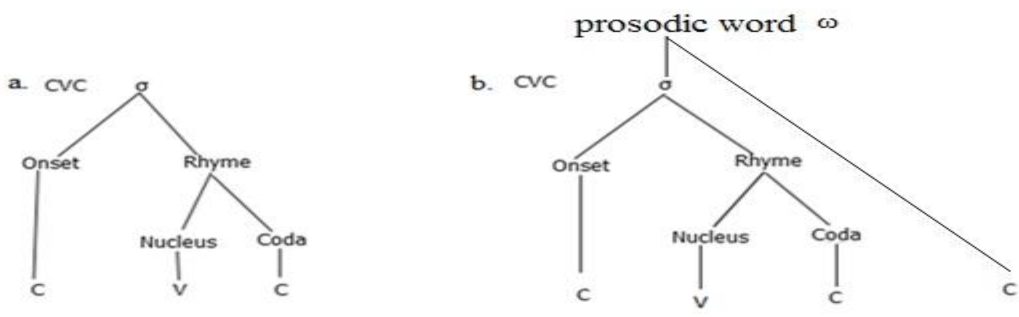
Take, for example, the CK word *frchk* ‘habit’, two epenthetic vowels are inserted to break the sequences into two syllables yielding /*fɨɾ.ʧɨk*/ in the output. However, the second consonant is not usually attached to the coda of the first syllable as the word *grft ‘problem’* shows. Here, the second consonant /ɾ/ forms the onset of the second syllable and the cluster /ft/ forms a complex coda of the second syllable as they do not violate sonority in CK producing /*gɨ.ɾɨft*/. If the first syllable of /*fɨɾ.ʧɨk*/ were open, we would end up with a tri-syllabic word **fɨ.ɾɨ.ʧɨk* but the maximality of the first syllable would be violated. In other words, /ɾ/ is in the coda of the first syllable in /*fɨɾ.ʧɨk*/ and in the onset of the second syllable in /*gɨ.ɾɨft*/ to guarantee that the minimum number of epenthetic vowels rescues the maximum number of stray consonants.

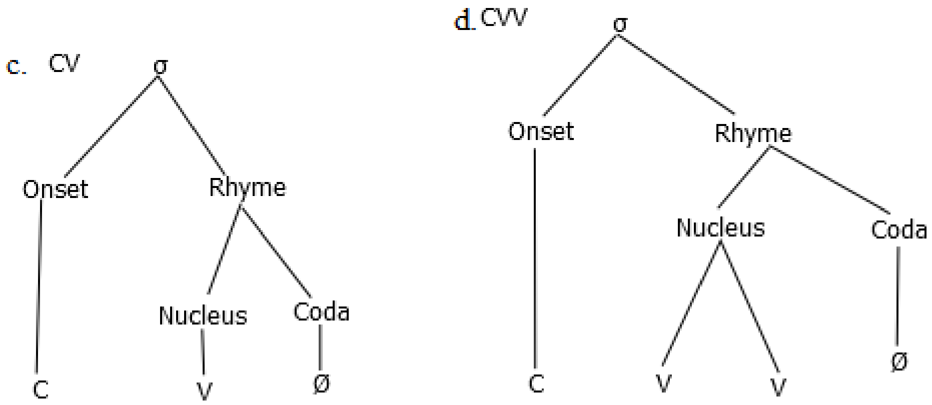
3.2.2.2 Directionality and Prosodic Licencing

The directionality parameter is widely used in prosodic phonology and morphology to analyse phenomena such as stress assignment and reduplication (McCarthy 1979; Hayes 1980). Directionality can also play an important role in syllabification as well. For example, it is used to account for syllabifying intervocalic consonants which parse the consonant sequences into simple coda + simple onset, then, instead of rule ordering, a directionality parameter (left-to-right or right-to-left syllabification) is employed (Steriade 1982). However, the directionality parameter can yet play a bigger role as it can correctly predict the insertion site of an epenthetic vowel. Broselow (1982), for example, explains that the contrasting epenthesis strategies account for different insertion sites of epenthesis in Cairene and Iraqi Arabic. For the most part, within template and well-formedness condition which regards syllable as a prosodic constituent of the prosodic categories, directionality can correctly predict the insertion site of epenthetic vowel.

To explain how directionality works in CK, lets first look at the structure of syllable in CK which has four syllable types depicted below in (3) (see also §3.3.1).

(3)





Now consider the underlying form *ʧɬmn*a ‘s/he is mucous’, syllable template requirement along with prosodic licensing and sonority principle, impose a different output for the input *ʧɬmn*a. The consonant sequence /*ʧɬm/* violates the CK syllable template which rules out the sonority threshold of the nucleus to be less sonorous than a vowel. It also violates the constraint that ban complex onset and sonority distance between a lateral and a nasal. The relevant question here is how to deal with segments that do not fit syllable template and cannot be syllabified. Here prosodic licencing calls for action to syllabify the three consonants /*ʧɬm/.*

According to (Selkirk 1981 [1978]; Itô 1986; 1989; Nespor and Vogel 1986), Prosodic Licencing requires that all phonological units belong to higher prosodic structure: segments to syllables, syllables to metrical feet, and metrical feet to phonological words and phrases. Languages choose mainly two different procedures to deal with stray consonants: some languages choose Stray Erasure while others choose Syllabification by epenthesising (ibid). Invoking two different mechanisms to tackle stray consonants results from Selkirk’s (1982) exhaustive syllabification where syllables resulted from epenthesis have crucial consequences on higher prosodic constituents especially on the weight of epenthetic syllables (see §2.7) and on parsing them within the foot structure.

Thus, the first three segments in the form *ʧɬmn*a, should be either syllabified according to CK syllable templates or be deleted through Stray Erasure. CK prefers epenthesis which is enforced by rules of syllabification and syllable template. The question is where to put the epenthesis? Following Selkirk (1981;1982; Broselow 1982 and Itô 1989), the directionality parameter leaves us with two options: right-to-left or left-to-right syllabification as shown in (4).

(4)

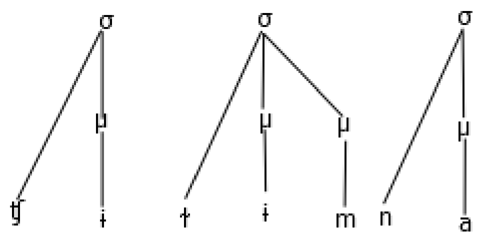
a. ʧɫmna ⟶ *ʧɨ.ɫɨm.na (right- to- left syllabification)

b. ʧɫmna ⟶ ʧɨɫ.mɨ.na (left –to-right syllabification)

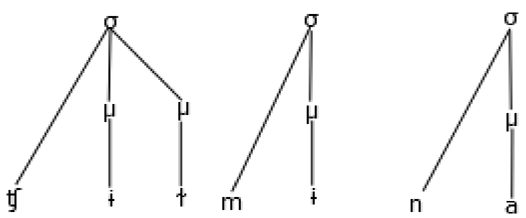
Schematically, right-to-left syllabification yields the ungrammatical form (5a) while left-to–right syllabification gives the grammatical form as in (5b). Both outputs (5a and 5b) have the same syllable types and the same number of moras, what is different is the directionality of syllabification.

(5)

a. The ungrammatical right-to-left syllabification



b. The grammatical left-to-right syllabification



Directionality tends to play central role in how adjacent unparsed consonants are syllabified. It not only identifies the insertion site of the epenthesis but also determines the number of syllables in a string of consonants. What is common in the CK is the fact that underlyingly, more than one unsyllabified consonant are found adjacent in the same form. The consonant string *xɾpn* ‘chubby’ would become a tri-syllabic word if syllabification and hence epenthesis insertion were from right-to-left, while it becomes bi-syllabic word when it syllabified rightward.

(6)

a. χɾpn ⟶ *χɨ.ɾɨ.pɨn (right-to-left syllabification: three syllables)

b. χɾpn ⟶ χɨɾ.pɨn (left-to-right syllabification: two syllables)

The attested case of left to right syllabification (6b) in CK also ensures the principle of syllable number minimisation whereby each epenthetic vowel rescues as many unsyllabified consonants as possible. Another consequence of rightward syllabification in CK is the fact that consonant clusters at the right edge of syllable are allowed while complex onsets are disallowed. In CK, bi-consonantal coda clusters of falling sonority are allowed at the right edge of prosodic words while complex onsets are not allowed in any form. Cross-linguistically, the correlation between directionality and edge-related consonant clustering has been reported in the literature. As Itô (1989) observes, languages with leftward syllabification allow clustering consonants at the left edge (complex onset). Iraqi Arabic is an example of such languages. Languages with rightward syllabification, on the other hand, tend to prefer clustering consonants at the right edge; Cairene Arabic is an example.

3.2.2.3 Extra-prosodicity

The notion of extra-prosodicity has been of prime importance in metrical phonology; it explains thorny issues that otherwise would remain unaccounted for (c.f. Liberman and Prince 1977; Hayes 1982, 1995). Extra-prosodic linguistic material (typically a peripheral segment or syllable) is invisible to certain phonological processes. Hayes (1982) explains that a syllable is extrametrical if it is ignored by the stress rules. More specifically, the role of extra-prosodicity in syllable level (known as extra-syllabicity which is the focus of this subsection), first brought into prominence by Clements and Keyser (1983) when they explained coda clusters in Klamath. Considering CVC as a light syllable word finally and as heavy word medially in Cairene Arabic would not be explained if the coda consonant were not extra-syllabic word finally (McCarthy 1979). Later scholars developed the notion of extra-syllabicity (Itô 1986, 1989; Zec 2007).

Extra-syllabicity in CK is not straightforward, i.e., phonological processes do not refer to it explicitly. Stress assignment, for example, is insensitive to syllable weight and no piece of evidence is found in prosodic phonology to call for the role of the final segment as extra-syllabic. However, there are segment distributions that cannot integrate into syllable structure and can only be explained in terms of extra-syllabicity. As will become clear in (§3.3.1), bi-consonantal codas can only be found word finally. In other words, the appendix (extra-syllabic segment) should always be final while only a single consonant is permitted in the coda of a non-final syllable. Thus, extra-syllabicity captures the unitary nature of CVC syllables in CK and accounts for the relatively few words with CVCC.

There are some processes that can shed more light on the exact nature of the extra-syllabic consonant (appendix) in bi-consonantal codas. First, word-final clusters consist of a segment with least sonorous consonants (usually obstruents) preceded by a relatively more sonorous segment as in (7a). Consonant clusters are usually broken up by an epenthetic vowel in clusters with rising sonority (as in 7 b).

(7)

a. (i) qurs ‘heavy’ (ii) haʃt ‘eight’ (iii) kułk ‘hair’

(iv) barχ ‘lamb’ (v) gɨrʒ ‘tension’ (vi) hast ‘feeling’

b. (i) ʃɑ.ʒɨn ‘queen’ (ii) nus.tɨn ‘sleep’ (iii) ʧɑ.dɨr ‘tent ’

(iv) ka.pɨr ‘cottage’ (v) qa.bɨr ‘grave’ (vi) ku.łɨm ‘cheek’

Moreover, when through morphological processes (compounding, suffixation), the complex coda becomes medial; the second consonant leaves the complex coda by re-syllabifying to the onset of the next syllable as in (8a, b). It has to be noted that re-syllabification of the second consonant word medially is not triggered by onset maximisation (as may be suggested by the examples in 8a, b) as even when a suffix with a consonant initial is added to the complex coda with a rising sonority, the complex coda is broken up by an epenthetic vowel as shown in (8c, d).

(8)

a. kurt ‘short’ vs kur. ta ‘it is short’

b. dost ‘friend’ vs dos.ti ‘friendship’

c. qurs ‘heavy’ vs qu.rɨs.tɨr ‘heavier’

d. barz ‘high’ vs ba.rɨz.tɨr ‘higher’

Moreover, the appendix is often deleted when its distribution is relocated to prosodic word medial as in (9).

(9)

a. dast ‘hand’ + mɑł $\longrightarrow$ das.mɑł ‘scarf’

b. bɨ.neʃt ‘gum’ + ʤʉ.win $\longrightarrow$ bɨ.neʃ ʤʉ.win ‘chewing gum’

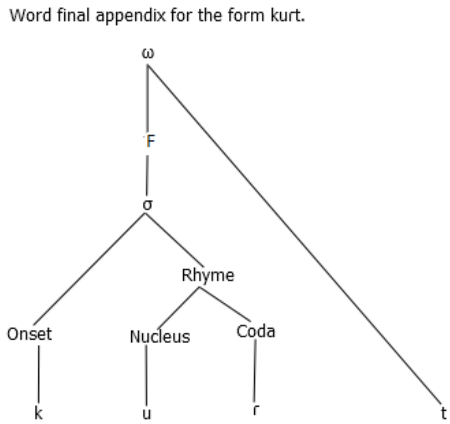
c. dast'hand' + pek ⟶ das.pek 'preface'

d. dast 'hand' + ʃoɾ ⟶ das.ʃoɾ 'basin'

What is understood from (8 and 9) is the ban on complex coda word internally and its occurrence at the right margin of the word. The fact that falling sonority clusters are kept while rising sonority clusters are broken up by epenthesis shows that sonority exceeds the syllable structure.

If the appendix is ruled out as a second segment of a coda, the question is, then, how to incorporate it into the prosodic hierarchy, i.e. which prosodic constituent should it belong to? Kiparsky (2003) and Vaux (2004) contend that an appendix or extra-prosodic element is attached directly to a higher level prosodic node usually the Prosodic Word as shown below.

(10)



The fact that the appendix segment in (10) is parsed as a non-moraic stray consonant rather than being given a moraic (semi-syllabic) status stems from its phonological behaviour. As Kiparsky (2003: 161) assumes for some Arabic vernaculars, the second consonant at the edge of word is either the least sonorant segment or undergoes de-sonorisation processes such as devoicing and glottalisation. This is based on the observation that moraic segments are known to be the more sonorous ones (Zec 1995). The appendix consonant in CK is characteristically either a voiceless obstruent or undergoes devoicing (see §5.2.2). Moreover, Kiparsky argues that moraic stray consonants that form semi-syllables are usually unstressed, toneless, or reduced tonal contrasts. The extra-syllabic consonant in (10) above, however, forms a unified stressed monosyllable with the rest of the word.

The appendix consonant also ignores the foot level to attach to the prosodic word. There are two explanations as to why the appendix is not attached to the foot. First, Kiparsky (2003) argues that the extra-syllabic segment passes over the foot to adjunct to the prosodic word as unsyllabified moras could not occur between two syllables that form a foot. However, this argumentation is ruled out here as the moraic status of the unsyllabified syllable is not established. Further, the unsyllabified segment does not occur between two syllables; there is only one syllable in the word. The second argumentation comes from the basic principle of Prosodic Structure which argues that constituents lower than prosodic word cannot be recursive (Itô and Mester 2009; Kabak and Revithiadou 2009). The motivation for recursion in phonology is assumed to mirror the recursion in morphosyntactic level. As the syllable and the foot do not interface with such structures, their recursive structure is not allowed. Therefore, I assume the non-recursivity of syllable and foot disallow attaching the extra-syllabic consonant to them.

In OT terms, syllable and foot well-formedness constraints NONREC (σ) and NONREC (F) outrank the constraint that calls for every segment to be affiliated with a syllable or foot PARSESEG and PARSEσ (Selkirk 1996). Hence, the constraint which requires a segment to be affiliated with a syllable is not active and is ranked low as SLH is violable in CK. Tableau (11) shows the competing constraints on the extra-prosodic segment for the input *kuɾt:* Note that the dot indicate syllable boundary; Parentheses indicate foot boundary, and the square brackets indicate prosodic word.

(11)

kuɾt	NONREC(σ)	NONREC (F)	PARSESEG	PARSEσ
☞a.[(kuɾ*.)t]*			*	*
b.[(kuɾ*.)t)]*		*!	*	
c.[(kuɾ*.tσ)]*	*!			

So, the extra-syllabic consonant abides by the rules of exhaustive parsing which requires every syllable to be parsed to a higher level prosodic constituent but violates SLH which requires parsing to be to the immediate higher level. The winning candidate in (11a) shows that a segment can bypass syllable and foot level as constraints on syllable and foot well-formedness NONREC(σ) and NONREC (F) are inviolable (11b and c).

3.2.2.4 Sub-Syllabic Constituency

While there is rather a consensus on the role of syllable as a constituent, the existence and nature of constituents within the syllable (sub-syllabic constituency) is more controversial. The views on sub-syllabic constituency can be summarised to the following. 1. the syllable has no immediate constituency but the segments are linked directly to the syllable node (Kahn, D. 1976; Clements and Keyser 1983). 2. The syllable is divided into three sub-constituents: onset, nucleus and coda (Davis 1988). 3. The syllable has bipartite divisions: onset and rhyme (Selkirk 1982; Blevins 1995). 4. Syllable has mono-moraic versus bi-moraic structure (McCarthy and Prince 1996 [1986]; Hayes1989). While I am not examining these approaches in detail, I will briefly explain why I adopt the third approach (for a detailed review see Blevins 1995; Davis 2006 and Goldsmith 2011).

The argument for sub-constituency of onset, and rhyme is based on phonotactics and allophonic distribution of segments. In CK, consonant clusters in a potential onset are broken up by an epenthetic vowel regardless of sonority while in the coda; bi-consonantal clusters are allowed provided sonority is not violated. On the other hand, allophonic rules have distinct domains of application. Devoicing, for example, is limited to coda position while aspiration occurs only after voiceless stops in the onset. As for the moraic approach, I take it as a theory of representing weight and find it irrelevant to syllable internal constituency as it cannot explain the sub-constituent-sensitive allophonic distribution. It cannot also account for constraints holding over co-occurrence for consonants in onset in contrast to coda. Thus, adopting bipartite syllabic constituency is made on the premise that it accounts for allophonic variations while adopting moraic theory is based on its insightful explanation for weight measurement.

What groups nucleus and coda into one constituent (rhyme) is its ability to express syllable weight. In many languages including CK, the nucleus and the coda carry the weight of the syllable in contrast to the weightless onset. Compensatory lengthening of deleted coda and non-compensatory of the onset deletion (see §2.6.3) supports the onset/rhyme argument. Moreover, in some templates of reduplication in CK, the rhyme of the base is repeated while the onset is shifted to the bilabial nasal /m/ as in *kur* 'boy' ~ *kur u m**ur***. 'boy and similar things'. *ʃaχ* 'mountain' ~ *ʃaχ* u m***aχ*** 'mountain and similar things'.

Thus, the syllable in CK complies with the basic principles of constituents within the prosodic hierarchy. Similar to other constituents, syllables are maximal up to well-formedness. That is, syllables are as big as possible within the constraints of syllable structure. Another property of constituency is that lower units should be licenced by higher constituents of the prosodic hierarchy. Directionality of syllabification, along with syllable templates, conspire to licence segments, otherwise, the segments will be considered extra-syllabic. Constituency of syllable, however, is usually established by phonological processes that use the syllable as the domain of their application. The next section, then, will be about phonological processes that are triggered to render a well-formed syllable.

3.3 Syllable-Based Phonological Processes

Syllable templates, like the types in (12), along with the sonority principle govern limitations on the distribution on sound sequences. Yet, there may be fewer or more segments in the underlying representation than the syllable patterns of a language can accommodate. In that case, phonological processes resolve the unmatched template by deleting or inserting segments. Languages differ in how to deal with such segments.

3.3.1 The Syllable as a Domain of Phonotactics

The role of syllable as a unit of organising permissible segment sequences has been emphasised in the literature (Fudge 1969; Kahn, D. 1976; Selkirk 1982). The alternative view within the generative paradigm, is that of Chomsky and Halle (1968) who claim that constraints on segment sequencing can be accounted for within morphemes. This view, not only fails to capture generalisations of medial clusters, it also fails to admit phonological constituents such as prosodic categories into grammar. Later, cross-linguistic studies established the role of syllable as a constituent to explain the restriction on segment distribution.

The grammars of languages are varied in their tolerated segment sequencing. In other words, different languages have different basic syllable shapes. The parametric variation of syllable types is best expressed by making reference to syllabic constituents. The phonotactic constraints are usually manifested in the two syllable margins: onset and coda. While every syllable should have a nucleus, onset and coda are subject to language particular variation. Inventories of syllable shapes in specific languages may vary widely: some of the subparts can be obligatory. For example, onset and nucleus are required in many languages but the coda is optional. As Zec (2007) notes, there are no dependencies between syllable subparts. If a language has an onset, that has no connection with whether it bans or require coda and vice versa. The fact that many languages allow various numbers of segments in onset and coda increase the number of syllable types.

As far as syllable types in CK are concerned, the onset is required to be filled by only one consonant, i.e. no consonant cluster is allowed in the onset. The coda, on the other hand, is optional. As explained in (§1.5), almost all consonants can combine freely with the vowel nuclei in both margins. Most of the closed syllables are closed with one consonant; however, bi-consonantal coda consonants can be found at the right edge of words. The basic syllable shapes in CK comply with the universal preference of syllable type inventories as onsets are highly desirable whereas codas are not favoured. This statement is supported by the cross-linguistic representation that every language allows syllable with onset; no language has only onsetless syllables. The basic CK syllable shapes are listed in (12).

(12)

a. CV

b. CV(V)

c. CV(C)

The role of phonotactics in CK is somewhat limited owing to the lack of consonant clusters in syllable margins. Moreover, the vowel nucleus combines freely with almost all consonants in onset and coda. Nevertheless, there can be constraints on the co-occurrence restriction within the syllable that cross the onset/rhyme divide (cf. Clements and Keyser 1983; Davis 1988). The phonotactic constraint enforces different syllabification for the medial cluster in (13a) and (13b). A constraint on the combination of nasal in onset followed by epenthesis syllabifies the lateral and the nasal into the second syllable (13a) but see how the lateral is syllabified to the coda of the first syllable in (13b). There is also another constraint on grouping the anterior nasal and the obstruents in the same coda. They are often disfavoured to be in the coda of the same syllable although they do not violate sonority. When such a combination falls out, it will be ruled out by strategies such as syllabification (13a, b), deletion (13c) or coalescence as in (13 d).

(13)

a.	bɑɫnda	⟶	bɑ. ɫɨ**n.d**a	‘bird’
b.	bɑɫgɾa	⟶	bɑ**ɫ.g**ɨ.ɾa	‘with wings’
c.	dawɫama**nd**	⟶	da**w. ɫ**a.man	‘rich’
d.	mɑ**ng**	⟶	mɑŋ	‘moon’

In (13 b), when a bi-consonantal medial cluster consists of a velarized lateral /ɫ/ followed by a stop /g/, the cluster is separated through syllabification as /ɫ/ becomes the coda of the first syllable and /g/ becomes the onset of the second syllable. In (13a), on the other hand, /ɫ/ is in the onset of the second syllable to attach the nasal to its coda (of the second syllable). The syllabification and insertion site of the epenthesis in (13a) ensures that an epenthesis does not break /n/ and /d/. The restriction on the combination of tauto-syllabic nasal and plosives can be resolved in other ways. (13c) is usually realised with the final obstruent deleted to avoid the /nd/ cluster. In (13d), /ng/ is coalesced into a velarised nasal.

Another constraint on the co-occurrence of segments in CK seems to be the combination of the guttural class of consonants (uvular /q, χ/, pharyngeal /ħ, ʕ/ and glottal /ʔ, h/) with another consonant. Guttural consonants have defective distribution in CK; they mostly occur in loan words from Arabic. Their occurrence is mostly in the onset rather than the coda although their coda occurrence is not totally banned. They never co-occur with another consonant in the coda. In fact, the distribution of gutturals in syllable coda and their absence in right edge of prosodic word as the second segment can be used as an argument for the syllable as a domain for the occurrence of these consonants. Gutturals also tend to disfavour being followed by high vowels in CK. Cross-linguistically, the constraint on the combination of gutturals with another consonant in the same syllabic constituent or with high vowels is common (Montoya 2014). The constraint on high vowel blocks epenthetic vowel in gutturals followed by more sonorous vowels in words such as */ʃahɾ/* ‘city’ triggering CL to resolve the illicit consonant combination yielding *ʃaɾ* rather than *ʃahɨɾ*.

Since this thesis takes the position that syllabification is based on templates and well-formedness conditions which represents the general shift of emphasis from rules to representation (Itô 1989), it is best explained in terms of constraint based approach (Prince and Smolensky 2004 [1993]). A constraint-based framework, moreover, because of its representational nature, will characterise syllables more adequately. Another advantage of OT over competing approaches is its ability to account for crucial questions like why different languages choose to have different syllable templates. Such questions have remained unanswered within rule-based and auto-segmental approach of generative phonology. For instance, OT has the privilege of raising and answering questions such as: why do different languages choose to have different templates? What is universal and what is language-specific among languages? Is there any relation between universal and particular? Moreover, OT has contributed to the understanding of the role of the syllable since its inception. OT can also account for how different processes strive for a common purpose which is not found in other approaches within generative phonology (Kisseberth's (1970) conspiracies). The fact that different rules strive for a common output was first observed by Kisseberth (1970). For instance, different phonological processes in CK strive to preserve the desired syllable template. However, as McCarthy (2008: 12) states, it should not be understood that OT commits to any particular theory of syllable structure.

For a simple (without complex margins) syllable in CK as *ʃa* 'king', the following markedness constraints (Prince and Smolensky 2004[1993]) are enough to capture the basic syllable shapes.

(14)

a.	*Parse-seg*	*Segments must belong to syllables.*
b.	*Ons*	*syllables must have onsets.*
c.	**Cod*	*syllables may not have coda.*

While the two constraints Ons and *Parse-seg* are never violated in CK, *Cod is violable as evidenced by syllable types. The markedness constraints interact, by definition, with faithfulness constraints which penalise any change of the input in the output.

(15)

a. *Max* *An input segment has a correspondence in the output. (no deletion).*

b. *Dep* *An output segment has a correspondence in the input. (no epenthesis)*

It is the interaction between markedness and faithfulness constraints and different rankings of the constraints that yield the range of syllable inventories in languages. Markedness constraints alone conspire to make all syllables in all languages to CV, whereas faithfulness constraints try to preserve the input segments without adding or deleting any segment to the sequence. The tableau in (16) shows how the ranking of the constraints yield the ultimate output.

(16)

/ʃɑ/	ONS	MAX	DEP	*COD
a.☞ʃɑ				
b.ʃɑɾ			*!	*
c.ɑɾ	*!	*	*	*

The main interaction in (16) is between ONS >> *COD, which results in an output with onset and without coda. The ultimate output in this instance is also faithful to the input. So, in principle, the faithful constraints are not involved in choosing the ultimate candidate. Needless to say, not all syllables in CK are as simple as */ʃa/*. There are syllables with complex margins which are usually regulated by the markedness constraints stated below in (17).

(17)
a. **COMPLEXONS* *syllables must not have more than one onset segment.*
b. **COMPLEXCODA* *syllables must not have more than one coda segment.*

With the mono-syllable word with a complex coda *kurt* ‘short’, the tableau in (18) shows how constraints on complex margins interact with the other constraints. Note that ONS and *COMPLEX*ONS* with the faithfulness constraints are equally ranked as there is no evidence that one of them outranks the other. Input is the phonological representations from Lexicon and morphological elements such as affixes before the application of any phonological processes. It is from the input that GEN produces the candidate forms that are evaluated by the constraint component, called EVAL, which constructs a set of candidate output forms that deviate from the input in various ways and selects a member of this set to be the actual output of the grammar.

(18)

/kurt/	ONS	*COMPLEXONS	MAX	DEP	*COD	*COMPLEXCODA
a.urt	*!		*		*	*
b.kur			*!		*	
c.klurt		*!		*	*	*
d.ku			*!*			
☞d. kurt					*	*

Likewise, MAX and DEP are equally ranked for this input. As it will become clear later, MAX outranks DEP and this different ranking has crucial consequences in the CK syllable types. The fact that DEP takes priority over *COD and **COMPLEXCODA* reflects the fact that vowel epenthesis is not available as a general strategy to avoid coda and complex coda. So far, the two winning candidates in tableaux (16 and 18) were identical to the input. But as it may be expected, this is not always the case. The departure of the output from the input through an epenthetic vowel is very common in CK. A form is determined as input when it has a licit form in the surface as the examples in (12) or it is a loan word.

The epenthetic vowel /ɨ/ offers valuable insights in to the syllable as a prosodic constituent and into general principles of prosodic phonology. As the vowel epenthesis is often motivated by the need to fit consonants into certain syllable templates. So, epenthesis can be regarded as a syllable-based phenomenon which is closely related to language specific phonotactics.

3.3.2 Epenthesis

Kurdish tends to apply a zero tolerance policy for consonant strings at syllable edges. Kahn, M. (1976) regards the phenomenon of low tolerance of consonant clusters which leads to the breakup of clusters as the most noticeable aspect of syllable structures in

Kurdish[10]. Another prominent feature of CK syllables is that there are strings of consonants without underlying vowels; the constraints imposed by sonority and the syllable template trigger epenthesis to result in the well-formed syllable types in (12).

The strings of underlying consonants can be forms of two, three, and four consonants as in (19). For how and why the underlying forms are regarded as vowelless, see (§1.6.2).

(19) Vowel Epenthesis for forms without any underlying vowels

a. mn → mɨn 'I'
b. ktʃ → kɨtʃ 'girl'
c. mʃk → mɨʃk 'mouse'
d. klk → kɨlk 'tail'
e. mɾdn → mɨɾdɨn 'death'
f. tʃɫkn → tʃɨɫkɨn 'filthy'

The analysis of epenthetic /ɨ/ within the OT framework in relation to the basic principles of prosodic theory offers the insight into understanding syllabification and syllable structure in CK. It also establishes the role of the syllable in CK as a prosodic constituent. In OT terms, markedness constraints of syllable shape requirements interact with faithfulness constraints; MAX and DEP. Languages use different constraint rankings in coercing strings of segments to comply with language specific syllable templates. If MAX outranks DEP the repair strategy will be epenthesis; if DEP outranks MAX, the repair strategy will be segment deletion. Thus, one of the faithfulness constraints needs to be violated to satisfy the highly-ranked markedness constraints. The markedness constraints that are crucially involved for repairing vowelless string of consonants in CK are the constraints in (14), (15) and (17). As the data in (19) show, epenthesis is used to repair the strings which, if translated into OT, means MAX outranks DEP. The overall ranking for the constraints of the item in (19a) is shown in (20)

(20) *PARSE-SEG, ONS, *COMPLEXONS* **,** *MAX>> DEP ,*COD*

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[10] Kahn investigated the phonology of northern Kurdish, but it seems to strongly resemble Central Kurdish in terms of syllable structure.

The rankings of the constraints for the form /mn/ is shown in the tableau in (21)

(21)

/mn/	PARSE-SEG	ONS	*COMPLEXONS	MAX	DEP	*COD
☞a. mɨn					*	*
b.mn	*!					*
c.ɨn		*!		*		*
d.mɨ				*!	*	
e.mnɨ			*!		*	

Note that as there is no nucleus in candidate (21b), the consonant segments seem not to be syllabified and, in turn, the syllable constituents: onset and coda are not identified. However, I assume the two consonants to serve as onset and coda. If the segments are not syllabified yet, still ONS is satisfied and *COD is violated vacuously. Another point to be noticed here is that candidate (21e) also violates the alignment constraint ALIGN-R (not included in the tableau) which requires aligning the right edge of the stem with the right edge of the prosodic word. It can be argued that the string also violates the constraint *Cunsyll which states that unsyllabified consonants are prohibited (McCarthy 2008).

None of the segments can form the nucleus since the sonority threshold on syllabicity requires the syllable peak in CK to be not less sonorous than a vowel. Sonority plays a vital yet limited role in the epenthesis of consonant sequences in CK. The limited role of sonority in CK stems from the fact that sonority has no role to play in the onset as onset clusters are ruled out by syllable templates; there is no consonant cluster to be regulated by sonority in the left edge of the syllable. This syllable template is enforced by the high ranking constraint *COMPLEXONS as shown in tableau (21) above. The crucial role of sonority relates to the right margin of the syllable. Bi-consonantal coda clusters at the right edge of prosodic word that do not violate sonority preserve the cluster in the output without breaking the cluster by any phonological processes. In other words, if sonority is falling from the nucleus towards the right edge of the syllable, the cluster forms the coda of the consonant without being broken by epenthesis. The fact that sonority principle is observed between a coda consonant and extra-syllabic segment shows that sonority principle is observed within categories higher than the syllable. That is, in a bi-consonantal cluster between a coda and the following appendix, sonority is not violated. This goes in line with de Lacy's (2007:281) finding that sonority interacts with all levels of prosodic structure from below the syllable up to the utterance.

Languages differ in permitting Minimal Sonority Distance imposed on a pair of segments within the same syllable sub-constituent. Sonority distance states that the interval between different types of phonemes with the same sonority is (0) while the distance between a segment and an immediately less or more sonorous distance is (1) and so on. The constraint on sonority distance in CK coda with the following consonant requires it should be equal or bigger than one. Clusters of zero sonority interval (22) or rising sonority in coda (23) are usually broken by an epenthesis.

(22)

a.	kułm 'cheek'	⟶	ku.łɨm
b.	ga.nm 'wheat'	⟶	ga.nɨm

(23)

a.	ʧa.tɾ 'umbrella'	⟶	ʧatɨɾ
b.	ko.tɾ 'pigeon'	⟶	ko.tɨɾ

Clusters of falling sonority with the following extra-syllabic consonant are not broken by epenthesis as shown in the examples of in (24).

(24)

a. baɾz 'high'

b. dost 'friend'

c. gɨ.ɾɨft 'problem'

d. nawt 'oil'

e. baɾd 'stone'

f. kałk 'benefit

g. dɑjk 'mother'

The generalisation that languages avoid the final clusters of rising sonority is stated as a markedness constraint by (Kager 1999) as in (25).

(25) *SON-SEQ*[11]

Complex onsets rise in sonority, and complex codas fall in sonority.

The SON-SEQ constraint which is highly ranked in CK militates against complex codas with rising sonority (as shown in tableau 26 for the form /ko.tɾ/) while it allows complex coda with falling sonority as in tableau 34 below). Incurring violation on SON-SEQ is fatal, so using the epenthesis strategy avoids the fatal violation. In a nutshell, sonority is the playmaker in using or not using epenthesis with complex codas in the right edge of words. Hence, SON-SEQ, *COMPLEXCODA, MAX and DEP are at play. In complex codas that do not violate sonority, vowel epenthesis is not available to avoid *COMPLEXCODA, but available to avoid *COMPLEXONSET or any consonant clusters that violate sonority. To put it differently, faithfulness outranks avoidance of no complex coda and no coda.

In sum, the faithfulness constraints are sandwiched between two syllabic structural well-formedness (markedness) constraints as ranked below for the tableau in (26).

(26) SON-SEQ, MAX>> DEP >>*COMPLEXCODA ,*COD

/kotɾ/	SON-SEQ	MAX	DEP	*COMPLEXCODA	*COD
☞ a. ko.tɨɾ			*		*
b. kotɾ	*!			*	
c. koɾ		*!			*

Another possibility for the optimal output in (26) is to have another epenthetic vowel at the right edge of the word yielding the suboptimal *kot.ɾɨ which does not violate the two high ranking constraints: SON-SEQ and MAX. Neither structural well-formedness constraints (markedness) nor faithfulness constraints explain why *ko.tɨɾ* takes priority over **kot.ɾɨ*. So, what causes the ill-formedness of the suboptimal form?

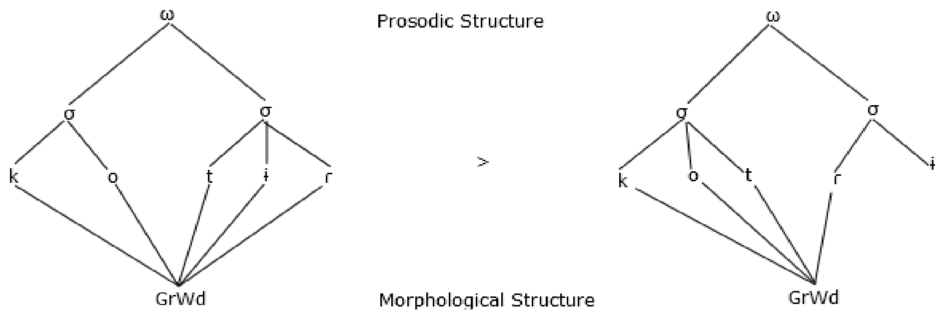
[11] This constraint is more complex than it looks. For example, it is not clear how it interacts with sonority distance principles that differ among languages. As Kager 1999 points out, it is also problematic for a language such as Dutch, (but not CK) that allows sonority violation for some segments and not others.

(27) ko.tɨɾ > *kot.ɾɨ

As the suboptimal candidate misaligns with the morphological word from the prosodic word, we can look for the influence of the morphological structure on the epenthesis. Blevins (1995) observes that epenthesis insertion maximally preserves morphological constituents[12]. Later, within OT framework, Kager (1999) elaborates on the idea within the framework of OT. Kager states that epenthesis seems to take into consideration the edges of morphemes by making the edges of a morpheme coincide with the edges of a syllable. Alignment constraints are not limited for some phonological and morphological constituents. They may serve to match the edges of most phonological constituents (syllable, foot, prosodic word) with other morphological constituents (for example, stem, root or affix). This diverse function of alignment constraints entails that alignment constraints manifest themselves in different types based on the categories and the edges to which they refer.

The brief account of alignment in the previous paragraph is introduced to gauge the ungrammaticality of the dominated candidate in (27). The final epenthesis misaligns the right edges of the prosodic word with the grammatical word. This is shown in the form of hierarchical representation in (28) where the optimal form which satisfies the right edge alignment is compared with the suboptimal output which violates the right edge alignment.

(28) a. /ko.tɨɾ/ b. *kot.ɾɨ



While in the right hand edge of (28a) the prosodic word aligns with the grammatical word, in (28

[12] The notion of aligning morphological and prosodic constituents originated first from Selkirk (1986), whereas McCarthy and Prince (1999) first restate alignment as a correspondence constraint ANCHORING stating that input segments at the edge should be at the edge in the output.

b), the epenthesis causes misalignment of the right hand edge of the prosodic word with the grammatical word. The constraint that is responsible for aligning the right edge of prosodic word with the grammatical word is called ALIGN-R (after McCarthy and Prince 1993a).

(29) ALIGN-RIGHT[13]

The right edge of a grammatical word coincides with the right edge of a syllable.

As vowel epenthesis in CK is inserted word internally (between consonant clusters) rather than at the edges, it can be argued that ALIGN-RIGHT is undominated. Tableau (30) demonstrates how ALIGN-RIGHT fares against other related constraints.

(30)

/kotɾ/	ALIGN-RIGHT	SON-SEQ	MAX	DEP	*COMPLEXCODA
☞ a. ko.tɨɾ				*	
b. kotɾ		*!			*
c. koɾ			*!		
d. kot.ɾɨ	*!			*	

Tableau (30) shows that the undominated ALIGN-RIGHT rules out candidate (30d), otherwise it would fare equally as the winning candidate (30a). While (30) explains the undominated status of ALIGN-RIGHT in CK, it is not logically possible to measure the left edge alignment of prosodic structure with grammatical structure as ONS and *COMPLEXONSET is undominated in CK. Any violation of ALIGN-LEFT by an epenthetic vowel would be a violation of ONS as well. Lack of initial epenthesis which would violate ALIGN-LEFT, can be attributed to the violation of ONS as shown in (31).

(31) Lack of initial epenthesis in CK

a. /tɾe/ [tɨ.ɾe] > *[ɨt.ɾe] 'grape'

---

[13] McCarthy (2008) interprets the same constraint to align right hand edge of a stem with the right hand edge of a syllable.

b. /kɾɑs/ [kɨ.ɾɑs] > *[ɨk.ɾɑs] 'shirt'

The dominated candidates (*ɨt.ɾe and *ɨk.ɾɑs) would misalign with the left edge of the grammatical word, but the undominated constraint ONS can also rule out the same candidates. In fact, cross-linguistically, initial epenthesis is rare. The rarity of initial epenthesis can be attributed to the fact that epenthesis results in increase in structural markedness. As Zec (2007) points out, phonological processes relevant to syllable shapes may conspire to supply a nucleus or an onset, but never a coda. An epenthesis that turns /tɨ/ into /ɨt/ in CK would do the opposite thing. One way to avoid the overlapping of ONS and ALIGN-LEFT is to look for initial consonant epenthesis, but such epenthesis does not exist in CK as far as I know[14].

It is of relevance here to ask why epenthesis is inserted minimally and how OT deals with it. As mentioned above, minimum epenthesis may strive to save maximum number of unsyllabified consonants. Prince and Smolensky (2004[1993]) also refer to the *economical* use of epenthesis by *doing only when necessary*. The necessity of epenthesis originates from a high ranking well-formedness constraint. However, when the insertion of one and/or two epenthesis satisfies the well-formedness, the less faithful candidate would be disfavoured as it violates the DEP constraint.

A form that serves well to gauge economical use of epenthesis against excessive use of epenthesis is /drk/ 'thorn'. Note that the undominated constraints in CK *Cunsyll and NUC outrank DEP. Now, two options are available to satisfy *Cunsyll and NUC as shown in (32) for two forms.

(32)

a. /drk/ [dɨrk] > * [dɨrɨk] 'thorn'

b. /gɾft/ [gɨ.ɾɨft] > *[gɨ.ɾɨfɨt] 'problem'

As mentioned above, no complex onset (in any form) and no complex coda that violates sonority occur in CK. We can observe from the undominated candidates in (32) that DEP

[14] Phonological acquisition can give insight to this point. Onsetless loan words from English which are epenthesised with a glottal stop in CK can serve this purpose but it is not clear whether the loan word with or without the consonantal epenthesis serves as the input (i.e. Grammatical word). This issue is outside the scope of this study; therefore, it will be left for further study.

is violated minimally, only to ensure the safety of high ranking well-formedness constraints. Satisfying all the well-formedness constraints (including the low ranked ones) would be at the expense of violating faithfulness constraints. A second epenthesis (double violation of DEP) satisfies *COMPLEXCODA, but it seems that minimum use of epenthesis is enough and DEP outranks *COMPLEXCODA:

(33) DEP > *COMPLEXCODA

Double violation of DEP rules out a candidate as shown in the following tableau.

(34)

/drk /	ALIGN-RIGHT	SON-SEQ	MAX	DEP	*COMPLEXCODA
☞a. dɨrk				*	*
b. dɨ.rɨk				*!*	
c. dɨr	*!		*		
d. dɨr.kɨ	*!			**	

(34b) is the only candidate that satisfies all constraints except DEP. However, it is ruled out due to double violation of DEP. This explains the importance of economical use of epenthesisation. (34c) which violates MAX hints that ALIGN-RIGHT can be violated through deletion as well. ALIGN-RIGHT is violated when assuming the underlying form to be the grammatical word; it misaligns with the right edge of the syllable when epenthesis is inserted in the right edge as in (34d).

3.4 Syllable as a Domain of Segmental Rules

3.4.1 Allophonic Variation

Syllable and its constituents (onset and rhyme) can account for segmental rules in terms of the domain of application. In other words, the realisation of particular allophones depends to a large extent on the position of those segments within the syllable. It should be noted that along with syllable sensitivity, segmental contexts play crucial role in triggering allophonic variation. Voicing assimilation, for example, is triggered in syllable border when the adjacent segment is voiced. Segmental rules such as voicing assimilation, aspiration and palatalization occur within the domain of syllable either in the edges of prosodic word or internal to it.

3.4.1.1 Voicing Assimilation

The occurrence of two adjacent obstruent segments of distinct voice is banned in CK. This ban stems mostly from the absence of complex sub-syllable constituents such as complex onset and coda even when a coda is followed by an extra-syllabic segment with a distinct voice; the voicing distinction is usually lost through final devoicing. The domain of final devoicing is typically the right edge of prosodic word (see §5.2.2).

However, through morphological processes such as affixation and compounding, when two obstruent segments with distinct voicing become adjacent in neighbouring syllables, the first segment (in the coda of the first syllable) assimilates to the second segment (in the onset of the second syllable). The assimilation attested in CK is mainly regressive as shown below:

(35)

a. ħaft + da ⟶ ħav.da ‘seventeen’
   seven + ten

b. haʃt + da ⟶ haʒ.da ‘eighteen’
   eight + ten

c. dast + ga ⟶ daz.ga ‘institution’
   hand + place

d. dast + giɾɑn ⟶ daz. giɾɑn ‘fiancé’
   hand + hold

e. pɨʃt + daɾ ⟶ pɨʒ.daɾ ‘place name’
   back + suffix

f. baʃ + dɑɾ ⟶ baʒ.dɑɾ ‘participant’
   part + SUF

Note that in the first five examples, the second coda of the first syllable is first omitted and then voicing assimilation occurs to the remaining coda. The examples above show that voicing distinction disappears between neighbouring segments of two different syllables. The generalisation captured from (35) is that coda and onset of two adjacent syllables is the domain of voicing assimilation in CK.

3.4.1.2 Aspiration

Another phonological process that uses syllable as a domain of its application is aspiration. The realisation of aspirated segments depends on the position of those segments within the syllable. In CK, voiceless stops /p,t,k,/ and to a lesser degree the voiceless uvular /q/ are aspirated in certain contexts. The voiceless stops are aspirated in syllable initial when they are followed by lexical vowels. The domain of aspiration in CK includes syllable onset in word initially, medially and finally as shown in (36). However, aspiration in voiceless stops seems to be stronger word finally compared to other places. The rather strong perception of syllable final aspiration can be attributed to the prominence of final syllable, i.e. the final syllable is stressed.

(36)

a. kʰɑ.łak ‘melon’
b. ja.kʰɑ.na ‘swine’
c. ʧɑw.ʃɑɾ.kʰe ‘hide and seek’
d. tʰuɾt ‘thick’
e. kʰa.tʰi.ɾa ‘glue’
f. za.łɑ.tʰa ‘salad’
g. pʰa.łɨp ‘excuse’
h. pʰa.pʰu.la ‘butterfly’
i. hał.pʰa ‘greedy’

The domain of aspiration of voiceless stops in the examples above can be easily explained if we assume that voiceless stops in syllable onset are aspirated. Moreover, the assumption can also explain why the voiceless stops at the coda of the second syllables in (36a and36g) are not aspirated.

3.4.1.3 Palatalisation

In palatalisation, non-palatal sounds are palatalised in certain domains and within certain segmental contexts; it typically happens when velar consonants are followed by front vowels. In CK, the velar stops /k/ and /g/ is palatalised when followed by front vowels /i/ and /e/. What is at issue here is the role of syllable in the realisation of palatalisation allophone. Velar stops are palatalised in the onset of syllables when followed by front vowels as shown below.

(37)

a.	[gʲisk]	'goat'
b.	[gʲiɾ.fɑn]	'pocket'
c.	[gʲel]	'fool'
d.	[kʲis]	'bag'
e.	[kʲe]	'who'
f.	[kʲeʃ]	'weight'
g.	[ʃɑ.kʲiʒ]	'princess'
h.	[ja.kʲe.ti]	'union'
i.	[pɨʒ.gʲi.ɾi]	'support'

The syllable-based generalisation that can be captured from the palatalisation examples in (37) is that velar stops in the onset of syllables are palatalised when followed by front vowels. Word initial cannot be the domain of palatalisation as it can occur word medially as the examples in (37g,h,i) show.

3.4.2 Syllable-Related Glide Formation

In addition to phonological processes that use the syllable as the domain of their application, there are other phonological constraints that affect certain phonemes at the edges of a syllable. One may argue that syllable edges correspond with word/utterance edges and there is no need to refer to syllable edge as the locus for these constraints. However, as Blevins (1995) points out, referring to the word/utterance boundary as the locus of applying phonological processes are problematic for the simple reason that boundary symbols and consonants do not form a natural class.

3.4.2.1 Alternating Glides

Glides pattern with consonants in a variety of phonological processes but they have phonetic features that are similar to high vowels. Cross-linguistically, glides tend to differ from their underlying representations. An underlying high vowel can surface as a syllabic and/or non-syllabic parse. It is also possible for an underlying glide to surface as another glide or as a vowel as in IT Berber (Guerssel 1986). So, glides can be derived from an underlying vowel or an underlying glide. Levi (2004) states that for glides to have distinct underlying representations, they should contrast with the high vowels. She also suggests that underlying glides are epenthesised when they are in a cluster that includes a glide and can have a reverse sonority sequence. Another property of underlying glides is that they can participate in consonant harmony and have syllabification similar to the consonants.

Based on Levi's (2004) typology, glides in CK fit the typology of derived glides from underlying high vowels, i.e. they do not have distinct underlying representations. This conclusion is drawn as CK glides do not contrast with high vowels, i.e. no minimal pair is found between glides and high vowels. Moreover, glides are not usually found adjacent to epenthesis and lack any other properties of glides with underlying representation reported above. In general, underlying high vowels in their surface realisation alternate between glides and high vowels. Hyman (1985) notes that languages that ban /ji/ and /wu/ by Obligatory Contour Principle suggest that in these languages the glides are [-consonantal][15]. So, the non-adjacency of two [-consonantal] features is not violated. I assume here that it is the [-syllabic] rather than the [+consonantal] feature that licence the glides in the onset of the syllable. The [Syllabic] feature is not used here in Chomsky and Halle's (1968) terms as a binary feature to distinguish segments that occupy nucleus from segments in the margins. The generalisation above implies that [syllabic] feature is not a binary intrinsic feature of segments. Rather, it is a contextual feature employed to make a distinction between glides and high vowels.

The relevant question here is what triggers the change from underlying vowels to surface as glides? To answer this question, we should ask where (in what phonotactic context) high vowels are realised as the homorganic glides. As the high vowels in CK

[15] Obligatory Contour Principle is a tendency in some languages towards the avoidance of adjacent sequences of similar elements.

are also realised in surface form, the phonological process of glide formation could be understood as a segment-based process that is triggered by the prosodic structure.

In CK, high vowels are realised as their homorganic glides for various syllable-related reasons. In stems (non-derived words), for instance, high vowels surface as glides through suffixation to avoid onsetless syllables (see §1.6 and 38a). This shows that it is the syllable template requirement such as the necessity of the onset and the avoidance of diphthongs that drive underlying vowels to surface as glides. By diphthongs, here, I mean two vocalic elements which function as a nucleus of the same syllable. Similarly, when the high vowels occur in the onset of syllables, they are realised as glides to avoid syllables without onset (38b). In morphologically complex words, on the other hand, through affixation, hiatus may be formed. The resultant hiatus of complex word violates onsetless and syllable typology of CK. Again, through glide formation, the high vowel is realised as a glide. Hence, the requirement of the basic syllable type of CK is met as in (38c).

(38)

a. (i) ʔɑu 'water' ⟶ ʔɑ.wa.ka 'the water'

(ii) kau 'partridge' ⟶ ka.wa.ka 'the partridge'

(iii) keu 'mountain' ⟶ ke.wa.ka 'the mountain'

(iv) ziu 'silver' ⟶ zi.wa.ka 'the silver'

b. (i) iɑɫ 'hill' ⟶ jɑɫ

(ii) iak 'one' ⟶ jak

(iii) bo.ia'paint' ⟶ boja

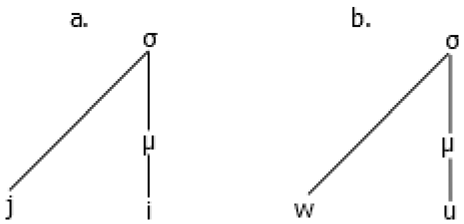
(iv) pa.iɑm 'message' ⟶ pa.jɑm

c. (i) ʃɑ + i + ʤi.hɑn ⟶ ʃɑj. ʤi.hɑn 'king of world'
king EZ world

(ii) bɑ + i + ba.hez ⟶ bɑj. ba.hez 'strong wind'
wind EZ strong

The constraints imposed by the CK syllable types on the underlying forms in (38) trigger the change of underlying vowels into glides. The difference between the high vowels [i] and [u] and the glides [j] and [w] is attributed to syllable affiliation in hierarchical representation of the syllable (Clements and Keyser 1983). In moraic structure, as Hayes (1989) points out, high vowels are moraic while their counterpart homorganic glides are not as shown in (39). Apparently, the underlying vowel, moraic by definition, loses its mora in surface form when realised as a glide sitting in an onset. Hayes also suggests that if the distribution of glides and high vowels are predictable in a language, then, the language does not need to include moras in the underlying representation. My suggestion here is that moraic status of underlying phonemes depends mostly on the phonological process rather than the language under study. CK data supports the argument that the weight of a syllable is process-specific rather than language-specific (c.f. stress assignment, minimal word, CL).

(39)



In OT terms, the structural well-formedness of the syllable types takes priority over the faithfulness to the underlying features. The competing constraints needed for the analysis of alternating glides are general syllable structure well-formedness such as ONSET, *DIPHTHONG and faithfulness constraints that compare features of input and output segments. Addition of segments is not in action here as they are not involved in the ranking of the constraints in any way. The constraints are from McCarthy and Prince (1999).

(40)
a. IDENT(F): *Correspondent segments are identical in feature F.*
b. ONSET: *Syllables must have onsets.*
c. *DIPHTHONG[16]: *No diphthongs are allowed.*

If we take into consideration the input /ʔɑu/ 'water', the ultimate output [ʔɑw] ranks *DIPHTHONG higher than IDENT(F). The changing feature in IDENT(F) is [syllabic] in CK while in the languages in which glides and high vowels contrast, the feature that

[16] This constraint is from Rosenthall (1997) and McCarthy (2008).

changes from input to output is IDENT(μ). In the input the segment is [+syllabic] which turns into a [-syllabic] feature in the output. So, IDENT(SYLLABIC) is outranked by *DIPHTHONG. Another way to satisfy *DIPHTHONG is to delete the glide, hence, violating MAX. However, the anti-deletion constraint is ranked higher than IDENT(SYLLABIC) as well. In this particular case, the two high ranking constraints cannot be ranked against each other as there is no evidence to support ranking one of them above the other.

(41) *DIPHTHONG, MAX-IO>> IDENT(SYLLABIC)

/ʔɑu/	*DIPHTHONG	MAX	IDENT(SYLLABIC)
☞a. ʔɑw			*
b. ʔɑu	*!		
c.ʔɑ		*!	

As mentioned above, the winning candidate satisfies the markedness constraint but incurs minimum violation to the input by being unfaithful to only one feature of the input rather than obliterating it completely. In the tableau (41), *DIPHTHONG causes feature changing.

However, observing the data in (38) reminds us of other markedness constraints involved in the alternating glides. For the input *iak* ‘one’, it not only violates *DIPHTHONG, but also violates ONS which is a non-violable constraint in CK under any circumstances. For this input, epenthesis and deletion cannot yield a well-formed output. Changing the [syllabic] feature of the underlying vowel /i/ into its homorganic glide satisfies both high ranking constraints ONS and *DIPHTHONG.

(42) ONS, NO-DIPHTHONG >> IDENT(SYLLABIC)

/iak/	ONS	*DIPHTHONG	MAX	IDENT(SYLLABIC)
☞a. jak				*
b. iak	*!	*		
c. ak	*!		*	

The first three equally ranked constraints overlap each other in terms of satisfaction and violation—satisfying one satisfies another as well. Similarly, violating one of them violates another. In (42a), for example, violation of the low ranking constraint IDENT(SYLLABIC) satisfies both ONS and *DIPHTHONG. In (42c), on the other hand, violation of MAX is not enough to satisfy ONS.

This section, through the data in (38) and the tableaux in (41 and 42) has explained that underlying vowels surface as alternating glides to satisfy syllable-related constraints such as the necessity to have onset and rule out diphthongs. In the next section, other syllable-related constraints that include glides will be explained; specifically, where by epenthesising a glide, diphthongs are avoided.

3.4.2.2 Glide Insertion

Apart from feature changing, CK uses other strategies to avoid diphthongs and onsetless syllables. Unlike the tableau in (42) where violation of IDENT(SYLLABIC) is enough to satisfy high ranking constraints ONS and *DIPHTHONG, some forms in CK tend to require other constraints. In morphologically complex constructions, when the copula verb /a/ is added to an open syllable, it results in a diphthong and/or an onsetless syllable as the data in (43a) show. On the other hand, when the definite marker suffix is added to a noun with an open syllable, it creates a potential diphthong and/or onsetless syllable as in (43b). In both cases, a homorganic glide is epenthesised to avoid violation of high ranking constraints.

(43)

a.

(i) zu + a /zu.**w**a/ >> */zwa/, */zua/, */zu.a/, */za/ 'it is early'
Early + COP

(ii) sɨ.pi + a / sɨ.pi.ja/ >> */ sɨ.pja/, /sɨ.pia/, */ sɨ.pi.a/, */sɨ.pa/ 'it is white'
white COP

But no glide epenthesis is inserted when ONS and NO-DIPHTHONG are not violated.

(iii) kuɾt + a /kuɾ.ta/ 'it is short'
short COP

b.

(i) mɑ.si+aka/mɑ.si.ja.ka/>>*/mɑ.sja.ka/,*/mɑ.sia.ka/,*/mɑ.si.a.ka/,/mɑ.sa.ka/'the fish'

fish + DEF

(ii) tu.ti + aka /tu.ti.ja.ka/>> */tu.tja.ka/, */tu.tia.ka/, */tu.ti.a.ka/,*/tu.ta.ka/ 'the parrot'

parrot + DEF

But no glide epenthesis is inserted when ONS and NO-DIPHTHONG are not violated.

c.

(i) guł + aka /gu.ła.ka/ 'the flower'

flower + DEF

(ii) ʧɑk + a / ʧɑ.ka/ 'It is good'

good + COP

For the input /zua/, The faithfulness constraints that are at play are MAX, DEP and IDENT(SYLLABIC), while ONS and *DIPHTHONG are also involved relative to the input intableau (44). *COMPLEXONS is another high ranking constraint which compels the violation of IDENT(SYLLABIC) not to be the winning candidate. In fact, it is *COMPLEXONS that triggers glide epenthesis as it is ranked above DEP.

(44) *COMPLEXONS ,ONS , NO-DIPHTHONG, MAX >> DEP, IDENT(SYLLABIC)

/zua/	*COMPLEXONS	ONS	*DIPHTHONG	MAX	DEP	IDENT(SYLLABIC)
zwa	*!					*
zu.a		*!				
zua			*!			
za				*!		
☞e. zu.**w**a					*	

The three high ranking constraints are equally ranked as they are not competing. Yet, DEP is ranked higher than IDENT(SYLLABIC) as epenthesis never applies to avoid IDENT(SYLLABIC) but whenever IDENT(SYLLABIC) yields a well-formed output, it applies to avoid DEP.

In brief, processes involving glides—glide alternation and glide insertion—are triggered by satisfying a well-formed syllable template that match syllable types of CK. The well-formedness requirement, here, is to have a syllable with onset and avoiding a syllable with diphthong or complex onset.

3.5 The Syllable as a Domain of Stress

The role of the syllable with regard to stress has been emphasised in both linear and non-linear versions of generative phonology. Chomsky and Halle (1968) did not admit any entities larger than the segment to the phonological grammar and they even tried to account for phonotactics with regard to morphological constituents alone. Yet, they refer explicitly to syllable when they accounted for the distribution of stress in polysyllabic words. In metrical theory, the role of the syllable as stress bearing unit has been confirmed. Liberman and Prince (1977), along with the observation that stress is not to be referred to as properties of segments or syllables but rather a hierarchical rhythmic structure that organise utterances; they emphasise the role of the syllable in relation to relative prominence and linguistic rhythm. They convincingly argue that the syllable, in contrast to morphological structure, is adequate for metrical labelling.

The insertion site of epenthesis and different degrees of stress (primary and secondary) are determined in relation to the stress on other syllables. For example, in quantity insensitive languages, the number of syllables, with the exception of degenerate and extra-metrical elements, determines the rhythm. In quantity sensitive languages, on the other hand, rhythm is determined by the internal structure of the syllables. The first step in defining the prosodic structure of an utterance, as Hammond (1995) explains, starts with identifying syllabic constituency as shown below in (45) for the CK word [kɨ.ˌteb.χɑ.ˈna] ‘library’:

(45)					
				x	line 2 (Prosodic Word-level)
		x		x	line 1 (Foot- level)
	(x	x)	(x	x)	line 0 (syllable- level)
	kɨ.	ˌteb.	χɑ.	ˈna	

Line (0) indicates syllable level where each (x) represents a syllable, line (1) represents any degree of stress (primary or secondary), while the (x) in line (2) is the prosodic word level stress. What would happen to metrical structure without reference to the syllable? Can an arbitrary string of segments explain the well-formed rhythmic patterns where strong and weak syllables are spaced apart at regular intervals?

Despite its popularity, the notion of the syllable as a stress bearing domain has been challenged. Steriade (2012), which has recently been supported by (Hirsch 2014), proposes a non-syllable-based approach to stress which takes the rhythmic unit to be the total vowel-to-vowel interval. Intervals do not have internal constituency, so the entire interval is the weight domain. The Interval Theory, as it claims to account for weight computation, may be more relevant to stress assignment in quantity sensitive languages. Nevertheless, in the following I examine its unsuitability to CK, a quantity insensitive language as far as stress is concerned.

The 'interval' is defined as a nucleus with the string of consonants following it to the following nucleus but not including it. However, proponents of interval theory do not make it clear what the nucleus is the nucleus of. Is it the nucleus of an already denied syllable or the interval itself? Second, and perhaps more relevant to our discussion here is what kind of segment can be a nucleus? The minimum sonority threshold on syllable peak varies cross-linguistically; the nucleus can be a vowel, a vowel and sonorant consonants or every segment including obstruents (Zec 1995). Crucially, the true identity of underlying vowels in CK, as has been argued above in (§3.4.2), is determined by the syllable structure rather than the intrinsic identity of vocoid phonemes. Below we use the CK word *bɨɾajati* 'brotherhood' to arbitrate between interval and syllable account for stress assignment (* notates interval division).

(46)

a.	<b>*ɨɾ*ɑ*ˌi*at*ˈi*	Interval division
b.	bɨ. ˌɾɑ.ja. ˈti	Syllable division

According to the definition of interval above, the /b/does not belong to any interval as it is not after any vowel while each two stars indicate an interval. So, * ɨɾ* is an interval and so on. As it can be seen from (46a), interval division cannot account for the regular iterative stress pattern of the word; neither can explain the vowel epenthesisation after the first consonant nor glide alternation of the penultimate syllable. As for the stressed syllables, it is on the syllables /ˈti/ and /ˌɾɑ/ which bear prominence (primary and secondary stress respectively) compared to other syllables. The interval theory, on the other hand, makes the wrong prediction when assign stress to *ˈi* and *ˌi*. Syllable division, on the other hand, can correctly predict the epenthesis and its insertion site along with the regular stress patterning of the word. Moreover, Syllable theory accounts for the motivation and insertion site of alternating glides. However, interval theory cannot explain why and where epenthesis and glides emerge.

Thus, the stress pattern of the word can function as further empirical evidence in support of syllable theory as a domain for stress in contrast to interval theory. In this chapter, it has been shown that the syllable, as Selkirk (1982) assumes, can function as the domain for segmental, supra-segmental and phonotactic rules. The syllable and its weight have also a basic role in the rhythmic structure of a language. The next chapter will address grouping of syllables into the higher prosodic constituent (foot) and the role foot can play in the prosodic structure of CK.

Chapter Four Foot Structure in CK

In this chapter, the discussion will point to grouping of stressed and unstressed syllables into constituents. Section two addresses the distribution of stress in simple, complex and compound words and also gives an account of stressability of function words. Different ways of representing stress (arboreal, pure grid and constituentised grid) and which one best explain the CK data is explained in section three. In section four, it is argued that foot type in CK is a departure from the cross-linguistically asymmetric parameters while section five portrays the issue of foot type in OT terms. Morphological processes that use the foot as a template are given as confirmatory evidence for the role of foot as a constituent in section six.

4.1 Introduction

This chapter considers the foot, as another category of the hierarchical prosodic structure and the integral role it plays in the phonology of natural languages. With data from CK, I establish the position of CK among the available parameters of metrical structure. Most of the arguments in favour of the foot in metrical theory have been based on distribution of stress —the distribution of stress is fundamental in determining the type of foot. However, there are also other phonological processes that can be applied in relation to the foot. Languages differ in the kind of rules that use the foot as a domain of their application. Cross linguistically, the foot has been used as a domain of segmental rules (Nespor and Vogel 1986), and of phonotactics and prosodic morphology (Bennet 2012). In this chapter, I identify foot structure in CK by determining its basic parameters. Rhythmic distribution of stress and morphological processes are used to argue for the foot as a constituent in the prosodic structure of CK.

4.2 Stress in CK

4.2.1 The distribution of stress in CK

CK is a stress language as in a prosodic word one syllable is more prominent than others, moreover there is secondary stress on every other syllable. CK, as is characteristic to stress languages, shows a preference for well-formed rhythmic patterns, where strong and weak syllables are spaced apart at regular intervals. Primary stress is final regardless to the weight of the syllable and determines the placement of secondary stress. It is usually two syllables away from primary stress (McCarus 1958, 1997; Abdulla and McCarus 1967; Ahmad 1986 and M. Khan 1976 for Northern Kurdish). According to an extensive survey (a total of 262 languages) by Gordon (2002), there are three basic groups of quantity insensitive languages: Languages with fixed stress, languages with binary alternating stress and those with ternary stress. Among the sort of stress patterns in quantity insensitive languages, CK has a binary alternating stress with primary stress assigned to the final syllable and secondary syllable on every other syllable starting from right to left. This patterning of stress includes morphologically simple and complex words. Note that the examples include nouns, past tense verbs[17], adjectives and adverbs.

4.2.1.1 Stress on Simple Words

The following examples in (1) show that stress in simple words, i.e. stems consisting of single stems, is on the final syllable regardless of the number of the syllables: mono-syllables as in (1a), di-syllables as in (1b), tri-syllables as in (1c) and quadri-syllables as in (1d).

1.

a. <u>One syllable</u>
ˈguł ‘flower’
ˈdam ‘mouth’
ˈhɑt ‘s/he came’
ˈroʃt ‘s/he went’
ˈbɑʃ ‘good’

b. <u>Two syllables</u>
ta.ˈła ‘trap’
χan.ˈʤaɾ ‘dagger’
gaw.ˈɾa ‘big’

[17] Present tense verbs usually conjugate for aspect, negation and preverbal prefixes to form phonological phrase. Thus, present tense verb stress is excluded from this chapter as it has a different status.

bis.ˈti ‘s/he heard’

ʔɑ.ˈzɑ ‘brave’

c. Three syllables

ta.mɑ.ˈta ‘tomatoe’

ˌqɑ. ɾa. ˈmɑn ‘champion’

ʧɑ.ˌwar.wɑ.ˈni ‘waiting’

ˌpan.ʤa.ˈɾa ‘window’

ba.ʧɑ.ˈki ‘well’

ba.baɾ.ˈzi ‘highly’

d. Four syllables

ʧɑ.ˌpa.ma.ˈni ‘publication’

ʃɑ.ˌɾa.wɑ.ˈni ‘municipality’

ʔɑ.ˌzɑ.jɑ.ˈna ‘bravely’

baχ.ˌta.wa.ˈɾi ‘happiness’

From the examples above, we can draw the conclusion that stress in simple words is on the rightmost syllable regardless of both the number of the syllables in the word (one syllable ˈ*guł* or four syllables *ʔɑ.ˌzɑ.jɑ.ˈn*a) and of the internal structure of the stressed syllables (open syllables ta.mɑ.ˈta or closed syllables χan.ˈʤaɾ).

4.2.1.2 Stress on Complex (derived) words

As for the position of primary stress in derived words, it tends to depend on the nature of the affix attached to the stem hosts, i.e. whether the affix is stressable or unstressable, and on their linear order where more than one affix is available. Similar to syntactic properties of function words which exhibit syntactic features different from lexical words, prosodic properties of function words are significantly different from those of lexical words. Typically, a sequence of lexical words in surface structure of morphosyntactic representation represents a sequence of prosodic words. The prosodisation of a morphosyntactic structure with function words, by contrast, is varied: The function words can form independent prosodic words or serve as a prosodic clitic (Selkirk 1996).

The classification of function words is mostly based on their relation with stress. Lexical words can have stress and serve as the host for the function words. Following Itô and Mester (2009), function words are assumed to be syllable-sized while content words can be basically of any size, provided they meet the minimality requirement. Accordingly, a semantically poly-syllabic function word is regarded as lexical word as far as prosody is concerned. So, the prosodically inert (stressless) function words are limited to just function words consisting of a single syllable; poly-syllabic function words are prosodised as lexical words and can form a prosodic word of their own.

As for syllable-sized function words, they are classified in different ways. Booij (1983) classifies function words according to their relation with stress: *cohering affixes* attract stress and thereby fuse with their host in forming the prosodic word. *Non-cohering affixes*, on the other hand, are stress neutral and hence cannot be part of the prosodic word. However, Booij's classification does not give any insight to the prosodic status of function words, i.e. it is not clear how stressable and unstressable function words are attached to prosodic word. Selkirk (1996), on the other hand, classifies function words according to the manner they are organised into prosodic word. The function word can be a free clitic, internal clitic or affixal clitic. In CK, an obvious bifurcation is noticed between internal clitics and affixal clitics. Most inflected and derivative morphemes are stressable and hence can be internal clitics. Personal pronouns, possessive pronominal endings and some other unstressable markers are affixal clitics (see §5.6.1 as to why affixes are classified in this way). When a derived word contains a stressable suffix (internal clitic), the suffix attracts the stress onto itself. Most derivational and inflectional suffixes attract stress to themselves and hence keep the stress pattern of the word as in (2).

2.

a.	ta. ɬa + ka	ta. ɬa.ˈka
	trap + DEF	'the trap'
b.	gaw. ɾa + tɨr	gaw. ɾa . ˈtɨr
	big + COMP	'bigger'
c.	χan. ʤaɾ + aka + ɑn	χan. ˌʤa.ɾa. ˈkɑn
	dagger + DEF + PL	'the daggers'
d.	qɑ. ɾa. mɑn + aka + ɑn	qɑ. ɾa. mɑ. na.ˈkɑn
	champion + DEF + PL	'the champions'

As (2a, b) show, the stressable suffixes attract stress to themselves when they are attached to the stem. When more than one suffix is attached to the stem, stress is regularly attached to the rightmost stressable suffix (2c,d).

Affixal clitics, on the other hand, are prosodically deficient as they do not bear an independent stress but lean on an adjacent stem (Anderson 2011). Clitics can be on the right of their host (enclitic) or on the left of their host (proclitic). The most frequent enclitics in CK include:

Pronominal subject markers: -ɨm, -it, -et, -in,-ɨn

Pronominal object markers in present: -ɨm, -it, -et, -in,-ɨn.

In the past: -ɨm, -it, -i, -man, -jan, -tan

Ezafe marker [18]/-i/

Conjunction /u/

Additive particle meaning ‘also’ /-iʃ/.

Indefinite marker /-ek/

These unstressable clitics (affixal clitics) neither attract stress nor repel it from the final syllable of the stem, they are stress neutral (3a, b). When a string of suffixes (stressable and unstressable) are attached to the stem, the unstressable suffixes are usually rightmost (3c, d). It is also not rare in CK to encounter cases of two successive clitics attached to the same host (3e, f). See (5.6.1) for a schematic representation of the affixes. Anderson (2011) claims that in such cases the right most syllable can be stressed and thus resulting in exhaustive parsing. Anderson argues that it is the rhythm of the language rather than the internal structure of the clitics that attract stress. However, it is not clear why inherently stressless morpheme such as clitics should attract stress based

[18] Ezafe construction is a characteristic of Iranian languages which is an inflection on modified categories in the noun phrase, corresponding to English (of) in some of its uses but not others (Holmberg and Odden 2005).

on their morphological context (see §4.5 below and constraint 38 on how to deal with clitic cluster).

3.

a.	χan.ˈʤaɾ + ɨm	χ an.ˈʤa.ɾɨm
	dagger + 1SG	‘my dagger’
b.	qɑ. ɾa.ˈmɑn + ek	qɑ. ɾa. ˈmɑ.nek
	Champion + DEF	‘a champion’
c.	mɑ.mos.'tɑ +ɑn + ek	mɑ.mos. tɑ. 'jɑ.<nek>
	teacher + PL + INDEF	‘a group of teachers’
d.	qɑ.ɾa.ˈmɑn + aka +ɑn + ɨt	ˌqɑ. ɾa. ˌmɑ.na. ˈkɑ.<nɨt>
	champion + DEF + PL + 2PL	‘your champions’
e.	bɑwk + ɨt + mɑn + bini	ˈbɑw.kɨt. mɑn vs bɑwk. <mɑn>
	father + 2SG + 1PL + see-PAST	‘we saw your father vs our father’
f.	bɨɾd + ɨn + mɑn	ˈbɨɾ.dɨn. mɑn vs bɨɾd <mɑn>
	took + 3PL + 1PL	‘we took them’

Similarly, the proclitics, in the left of their host, do not attract stress. The frequent proclitics include the prefixes be ‘without’, na ‘no’. nɑ ‘un’ and the monosyllable prepositions such as la ‘in’, bo ‘to’, tɑ ‘until’. The stress in cliticised words with proclitics is ordinarily on the rightmost syllable as in (4). It should be noted that poly-syllabic prepositions are prosodically regarded as lexical words. The poly-syllabic prepositions include *la.nɨˈ.zik* ‘near’, *l*a.ˈ*sar* ‘on’, *l*a.ˈ*ʒeɾ* ‘under’, *l*a.ˈ*naw* ‘inside’.

4.

i.	be + hez	be.ˈhez
	without + power	‘weak’
ii.	la + zɑn.ko	la.zɑn.ˈko
	in + university	‘in university’

The combination of hosts with clitics sheds light on prosodic structure particularly concerning the prosodic word since the host-clitic combinations restrict the alignment of units of prosodic structure with the units of morphosyntactic structure.

4.2.1.3 Stress in Compounds

There are two basic types of compounds in CK as far as the prosodic structure of the composite is concerned: compounds formed with two words without any linkers and compounds formed with two words joined by a vowel. The compound can be two nouns, (5a), a noun and a particle (5b); a noun and a verb stem (5c) or a noun and an adjective (5d).

5.

a.	zɨr + bɨ.ɾɑ	zɨr.bɨ.ˈɾɑ
	step + brother	step brother
b.	gɨ.jɑn + la.baɾ	gɨ.jɑn.la.ˈbaɾ
	soul + wearer	animal
c.	roʒ.nɑ.ma + nus	roʒ.nɑ.ma.ˈnus
	newspaper + writer	journalist
d.	dɨɫ + taŋ	dɨɫ.ˈtaŋ
	heart + tight	sad

As for the coordinated compounds where two words are joined by a vowel, stress is on the final syllable of the resultant compound. The coordinated compounds can be two nouns (6a), two adjectives (6b), two verb stems (6c) or an adjective and a noun (6d).

6.

a.	buk + a + ʃuʃa	bu.ka. ʃuˈʃa
	bride + a + glass	‘doll’
b.	rɑst + u + ʧap	rɑs.tu.ˈʧap
	right + u + left	‘whereabouts’
c.	hɑt + u + ʧo	hɑ.tu.ˈʧo
	come + u + go	‘traffic’
d.	tar + a + pɨ.jɑz	ta.ra.pɨˈ.jɑz
	wet + a + onion	‘spring onion’

Thus, it can be deduced from the previous data that stress in CK is on the final syllable on simple, complex (except clitics) and compound words.

4.2.2 Properties of Stress in CK

There is no uniform phonetic property corresponding to stress, but cross-linguistically, it is common for stressed syllables to have higher pitch levels, longer durations and greater loudness than stressless syllables. Tones tend to be assigned to stressed-syllables (Kager 2007). In the literature (McCarus 1958, 1997; Ahmad 1986; Fattah 1997; Mahwi 2009) loudness and length are considered to be the primary phonetic cues for stress in CK. No pitch level difference is reported between stressed syllables and their unstressed peers. Nor is any relation reported between stressed syllables and tones in CK. Nevertheless, all the above studies are based on auditory perception of stress rather than on a more accurate acoustic one. To fully address this question, an acoustic study is recommended to find more about phonetic cues of stress in CK. However, as the distribution of stress, which is crucial to this study, is clear, uncontroversial, and universally recognised by speakers of CK, phonetic study of CK stress is left for further research.

It is the distribution of stress that identifies the foot structure in CK among the basic parameters within metrical theory, viz, to which one of these binary basic parameters the Kurdish language belong: left to right or right to left parsing, left headed or right headed foot (iamb or trochee), bounded or unbounded foot. It also identifies whether the language allows extra-metricality and degenerate foot.

As explained in (§4.2.1) and cited in the literature (cf. McCarus 1958, 1997; Ahmad 1986; Fattah 1997; Mahwi 2009), stress in CK is final. Nevertheless, as far as I am aware, nobody in the literature has referred to stress in relation to prosodic structure, they claim stress to be on the final syllable of the grammatical word. As will be explained in detail in the next chapter, stress in CK is on the last syllable of the prosodic word regardless to the weight of the syllable(s) in the word. CK is neither a fixed nor a free stress language. It is a language with a limited freedom of stress. It shows traits of fixed stress, as stress is predictable on the basis of phonological factors such as edge. At the same time, it shows traits of free systems as some morphemes whose locations are not predictable are lexically marked for stress (see 1–4 above). However, once the morphemes are strung together to form a word, stress assignment rules take over.

Stress systems can also be divided into what Hayes (1995:31) calls rhythmic and morphological varieties. In rhythmic systems, phonological factors such as syllable weight, edge of a prosodic domains or spaces between primary and other degrees of stress determine the location and distribution of stress. In morphological varieties, on the other hand, stress serves to identify the morphological structure of derived words. In such languages, a certain syllable of a stem bears the main stress while affixes are either stressless or bear non-primary stress. In CK, stress tends to be a rhythmic system in contrast to the morphological system as phonological factors such as word boundary and distance between stressed syllables dictate stress placement. Thus, the stem *ʔan.daz.ˈjaɾ* 'engineer' has stress on the last syllable, but when the definite marker /aka/ is suffixed to the stem, its second syllable ends up being the final syllable of the construction and attracts stress as in *ʔan.daz.ja.ɾa.ˈka* 'the engineer' Further, when the plural marker suffix /*an/* attaches to the derived combination, it attracts stress *ʔandazjaɾ+* a *+ˈkan* 'the engineers'. However, as Hayes indicates, there is no pure rhythmic or morphological stress system. Thus, CK also manifests features of a morphological system with its rhythmic structure. Clitics are usually stressless in contrast to other suffixes. This division of suffixes based on stress is a feature of a morphological system of stress.

Cross-linguistically, the phonological properties of stress are often assumed to be culminative, with a demarcative function, and a preference for creating well-formed rhythmic patterns. Stress also tends to be (in)sensitive to the quantity of syllable weight (Kager 2007 inter alia). The examples above in (1) and (2) illustrate the universal phonological properties of stress as found in CK. First, stress in CK is culminative in the sense that there is only one maximally prominent peak (primary stress) within a stress domain. As for the demarcative function of stress, it usually means signalling an edge of a prosodic category. In the case of CK, it signals the end (right edge) of a prosodic word.

CK, similar to most stress languages, shows a preference for rhythmic stress patterns in the sense that stressed syllables are separated by a single unstressed syllable (see the examples in 1d). The rhythm in CK is pure binary stress where stressed and unstressed syllables are spaced apart at regular intervals. The rhythmic alternation is not perfect: lapse (two adjacent stressless syllables) can be found at the left edge (see 22). As Liberman and Prince (1977) state, non-primary degrees of stress—secondary and tertiary—are usually defined in terms of primary stress. This also implies that stress is hierarchical, in the sense that most stress languages have multiple degrees of stress. Finally, stress has a quantity (in)sensitive property. In many languages, stress has a preference to lodge on certain syllables having a certain degree of intrinsic prominence. Yet, there are many other languages whose stress assignment is not relevant to syllable weight. In CK, stress assignment is not determined by the intrinsic quantity of syllables. This can be explained in the sense that it is not the case that every parameter has a setting in every language. So, the principle is that every language has metrical structure while languages vary with regard to the parameters of metrical structure.

4.3 The Representation of Metrical Structure

The rhythmic structure can be formally represented in at least three different ways. First, the metrical tree (arboreal grid) in which Liberman and Prince (1977) propose to represent prominence in a supra-segmental hierarchy in terms of (strong/weak) nodes to represent stressed and unstressed syllables. Second, pure grid (non-constituent grid) variants of metrical theory as proposed by Prince (1983) and adopted by Selkirk (1984) and Gordon (2002). In the pure grid approach, a succession of columns of grid elements of different height is formed; the higher the column, the more prominent the syllable. The horizontal arrangement of grid elements represents rhythm without being grouped into constituents. Finally, there is the constituentised grid or bracketed grid (Halle and Vergnaud 1987; Hayes 1995) which combines the metrical grid with constituency.

This paper adopts a constituentised grid as it makes reference to the prominence relations between constituents (which the pure grid cannot) in hierarchical structure and makes reference to stress shift, in contrast to metrical trees. The constituent-based approach to stress can also account for the rhythmic distribution of stress. Further, foot-based analysis of the distribution of stress, in contrast to a pure grid analysis, can capture the connection between stress patterns and word minima. This approach has the privilege of doing away with redundancies of representing stress in three different ways found in arboreal representation.

The notations used to represent foot structure have had bearings on the theory itself. In fact, it is rejecting the arboreal representation of stress (which adopts constituency) that led to adopting non-constituency in pure grid (Hulst 1995). Moreover, the bracketed grid, adopted here, can handle some aspects of the theory which are otherwise deemed unexplainable. For example, it has the unified effect on marking and representing exceptions such as extra-metricality. It also has explanatory power about the grouping of syllables into foot, about marking the head of the foot and about the levels of prominence of the syllables.

Thus, as Halle and Idsardi (1995) explain, the formal representation of stress requires three devices: an element that is capable of bearing stress, a means for delimiting the grouping of the elements, and a marker to distinguish in each grouping or constituent the prominent head element from the rest. In the first step, the interface between the metrical grid and the strings of segments are captured by a mechanism called projection. The syllable heads, as the stress bearing units, are projected onto the first line (usually represented by line (0) of the metrical plane by means of (7).

(7) Line 0 mark projection

Project a line 0 element for each syllable head.

The syllable heads of a four syllable word *tʃa.ˌpa. ma.ˈni* 'publication' can be represented as in (8).

(8)

```
 x   x   x   x     line 0
tʃa. pa. ma. ni
```

The next step is to mark the head location parameter in each metrical constituent. In this stage, the head of each foot is identified but no difference between primary and secondary stress is indicated, this is called head location parameter (9).

(9) Head Location Parameter

Project the right/left most element of each constituent onto the next line.

Line 1 element is projected to build the next layer of the grid. CK sets head right as the interface between lines 0 and 1 giving (10).

(10)

```
     x         x     line 1
x    x    x    x     line 0
tʃɑ. pa. ma. ni
```

While (10) correctly represents some degrees of stress and the head of each foot, it fails to identify the primary stress. Assigning feet to words and phrases will capture systems of stressed and unstressed syllables but it cannot account for systems with secondary stress to distinguish it from primary stress. To capture systems with secondary stress such as CK, higher order structures are built over feet. Prince (1983) proposes *The End Rule* which selects a peripheral foot for main stress and all other feet have secondary stress. This representation can be algorithmically depicted in terms of line (0) for syllabic constituency, any degree of stress on line 1 and the result of End Rule is marked on line (2) which indicates the grid's culminating peak or prosodic word level. Halle and Idsardi (1995) uses another notation for End Rule called *The Edge Marking Parameter*. The Edge- Marking Parameter will place a parenthesis at one edge of a sequence of marks.

(11) Edge Marking Parameter

Place a right/left parenthesis to the right/ left of the right/left-most element.

Thus, CK marks the right boundary of the right most elements. The grid in (12), which includes the prosodic word level, is the result of the application of the line (0) parameter for syllable head projection, and the universal principles: Head Location in line (1) and Edge-marking in line (2).

(12)

```
                  x   Line (2) PrWd Level
      x           x   Line (1) Foot Level
x     x    x      x   Line (0) Syllable Level
tʃɑ. ˌpa. ma. ˈni
```

So, line (0) represents the potential stress bearing units, viz. the syllables. Line (1) represents the heads of the feet or the secondary stresses while line (2) represents the prosodic word stress level or primary stress. In other words, the height of the columns represents the relative prominence of the syllables while the horizontal alternations of the grids represent rhythm.

Another notational device for the bracketed grid is a rather flatter representation where the syllable and the foot level are merged into one level. In this representation, proposed by Hayes (1995), the head is represented by an asterisk and the non-head by a dot within each constituent. The notation of (13) is demonstrated by the flatter notation below.

(13)

```
(           *)  PrWd Level
( .   * )( .  *)  Syllable and Foot Level
ʧɑ.ˌpa. ma.ˈni
```

The foot can also be represented in a completely level surface. Kager (2007) gets rid of the grids by using a superscript for primary stress and a subscript for secondary stress. He also uses brackets for the feet and square brackets for prosodic word representation as shown below.

(14)

[(ʧɑ.ˌpa). (ma.ˈni)]

The notations above (12), (13), and (14), in contrast to tree or pure grid representation, all acknowledge the relational property of stress and represent it by prominence relations between constituents. So, as notational variants the choice of any of them is purely aesthetic and not related to the content of the theory. This thesis adopts the notation in (13) as, in contrast to other notations, making clearer distinction between syllable and foot levels and showing exceptions such as extra-metricality and mono-syllabic feet. This notation is of particular relevance to CK since an extra-metrical syllable can be easily distinguished from parsed syllables by being placed outside the foot brackets.

4.4 Foot Typology in CK

The distribution of stress in an utterance does not rely solely on individual syllables as may be understood from the account given in the previous section. Rather, it hinges primarily on possible structures for metrical constituents in the sense that stress placement is the result of parsing an utterance into feet. In other words, stress is assigned by the rhythm of the language and this is the crux of metrical theory. In turn, as Halle and Idsardi (1995) explain, the distribution of stress in a string of segments can explain three phenomena: the grouping of the segments into constituents, the head of the constituents and the different degrees of prominence of the elements in the string.

The status of the foot in phonology has sparked controversy among linguists. The introduction of metrical stress into phonological theory started with Liberman and Prince (1977) who explained that after stress assignment, the syllabified string of segments are fed into an algorithm that parses them into constituent structures. Later, the metrical theory of stress was transformed (from English) into a parametric theory of stress systems. Halle and Vergnaud (1978) explain that Liberman and Prince's account of metrical foot is one member of a family of algorithms. Other members can involve feet with a switch between binary options such as left/right, yes/no, on/off. Hayes (1980, 1995) examines many languages in relation to the available parameters of foot typology and comes up with a restrictive theory.

Establishing the foot structure in CK seems daunting for a number of reasons: first, Metrical Theory as such and foot structure in particular tends to be a very abstract and a divided issue. While the founders of the theory and many subsequent developers argue for parsing strings of stressed and unstressed syllables into constituent structure, some leading phonologists see no explicit notion of metrical grouping (Prince 1983; Selkirk 1984; Walker 1996; Gordon 2002). Second, stress patterning, which plots the foot structure, is the most phonetically elusive phonological feature. As first expressed by Liberman (1975) and echoed by Halle and Idsardi (1995), stress is not a simple phonetic feature as had been assumed by most phoneticians. On the contrary, it is a phonetic means for marking various kinds of groupings of linguistic elements; stress has no invariant phonetic cues. Thirdly, and of great relevance to this thesis, to the best of my knowledge, there exists no previous work on CK metrical constituency.

Nevertheless, apart from (morpho)phonological processes that make reference to the foot, a strong piece of evidence for the foot comes from the theory of prosodic phonology. As Selkirk (1996) demonstrates, an inviolable principle in prosodic hierarchy is headedness, according to which every prosodic category directly dominates at least another category no more than one level below it in the hierarchy. For example, a prosodic word must dominate at least one foot. Selkirk also argues that headedness, together with layeredness, hold universally in all phonological representations except for the terminal constituent in the hierarchy—syllable. Further, given the uncontroversial locus of stress, identifying CK foot structure is not impossible. The finality of primary stress in the prosodic word makes the right-headedness of foot type in CK inevitable. The independence of stress assignment to syllable weight, on the other hand, gives the quantity insensitive identity to the language. These two basic parameters (stress finality and quantity insensitivity) can be used to discover other parameters of the metrical foot in CK. Ruling out the foot would result in the loss of generalisations provided by a valid constituent in phonology.

The basic principles of parameterising metrical stress theory is to have a well-defined theory which is very restrictive and can describe the stress system of the world's languages. So, Hayes (1995:71) reduces foot types of the languages he studied into three basic types listed in (15). However, as will be explained below, the metrical structure of CK demonstrates that the three basic foot types cannot be representative of all languages.

(15)

a. Syllabic trochee: two syllables of equal length with stress on the left hand syllable (ˈσσ).

b. Moraic trochee: two light syllables with stress on the left hand size (ˈL L) or a single heavy syllable (ˈH).

c. Iamb: two light syllables (LˈL) or a light and a heavy syllable (LˈH) with stress on the right syllable or a single heavy syllable (ˈH).

The data from CK in (1–6) and the notation in (13) suggest that metrical theory is not as restrictive as it suggests. The foot type in CK is iambic with two equal weight syllables which I call a *Syllabic Iamb*. The foot is *Syllabic* in the sense that the foot template normally counts syllables without making reference to the internal structure of the syllables and it is an *Iamb* in the sense that stress is on the right hand syllable in every foot. This is a departure from Hayes' (1995) asymmetrical typology where it is argued that iambic systems exclusively depend on syllable weight. It also implies that Metrical Theory is not as restrictive as expressed in (15) above. Crucially, the asymmetrical gap of iambic systems with syllable weight insensitivity is filled by CK.

Hayes (1995:73) advocates an asymmetrical foot typology by ruling out iambic foot in quantity insensitive systems known as *Even Iamb*. Based on the rarity of such languages (four out of sixty-five languages in his data), Hayes argues that a strong theory should be maintained at the expense of excluding even iamb languages and hence the syllabic trochee is the only mechanism for quantity insensitive alternation. However, investigating a larger data set demonstrates that even iamb languages are not very rare. Gordon (2002), for example, shows that out of 38 quantity insensitive systems with binary stress, five of them have stress on odd numbered syllable counting from the right. Gordon's finding—though it appeals to grid-based rather than foot-based representation to stress—can be interpreted as even iamb in foot-based terms. Moreover, the data from CK in this thesis and from Persian (Amini 1997) are two more additions to the even iamb systems.

As the empirical observation does not verify a restrictive theory for foot typology, my proposal is that *Syllabic Iamb* should be added to the theory and it is the adopted foot type for CK. The attestation of all logically possible foot types suggests a greater degree of symmetry in binary stress systems that are allowed for by (15). As for the relative rarity of even iamb languages, as Jacobs (1990) suggests, the mirror image of the syllabic trochee languages should be adopted and it should be marked. He attributes the markedness of Syllabic Iambs, however, to violation of the Iambic/Trochaic Law rather than to the nature of the languages. According to the Iambic/Trochaic Law, elements with initial prominence contrast in intensity and hence forming the trochees while elements with final prominence contrast in length (Hayes 1995). CK appears to violate *Iambic/Trochaic Law* as stressed and stressless syllables contrast in both intensity and length while prominence is final. Therefore, there is no a priori reason to categorise Syllabic Iamb foot types as a marked case.

Moreover, a different kind of foot can be found in words with odd-numbered syllables. If parsing of syllables is to be exhaustive, and if the foot templates are to be maximally restrictive, how should single syllables at the left edge of words with an odd number of syllables be parsed? In CK, all syllables with potentially long vowels /ɑ,u,i,e,o/ (open and closed) and short vowels at closed syllables in the left of odd length syllables tend to form a proper foot (rather than a degenerate one) for three reasons. First, the long vowels on the leftmost syllables are stressed and realised longer (16) compared to stressless short vowels in identical positions (17). The long vowel (bi-moraic) syllables are promoted to foot based on the fact that they are stressed and realised with similar prominence to similar syllables in stressed position. The closed syllables with the only short vowel /a/ and epenthetic vowel /ɨ/ are also stressed (18).

A caveat is in order here. The vowels of stressless syllables are not reduced and hence the unstressed vowels are not neutralised to a weak vowel. So, the distinction between stressed and unstressed is based on lengthening stressed vowels.

(16)

a.	ˌʃɑː.ɾa.ˈzɑ	‘expert’
b.	ˌkuː.la.ˈka	‘courgette’
c.	ˌpeː.ʃa.ˈwɑ	‘leader’
d.	ˌsiː.na.ˈmɑ	‘cinema’
e.	ˌʧoː.la.ˈka	‘sparrow’
f.	ʔɑ;.ʃa.ˈwɑn	‘miller’

(17)

a.	ta.nu.ˈɾa	‘skirt’
b.	za.ɫɑ.ˈta	‘salad’
c.	χa.ʤɑ.ˈɫat	‘embarrassed’
d.	ʃɨ.qɑɾ.ˈta	‘matches’
e.	sɨ.kɑ.ˈɫɑ	‘complain’
f.	dɨ. ɾe. ˈʒi	‘length’

(18)

a.	ˌbaɾ.da.ˈwɑm	‘continuous’
b.	ˌpɨɾ.ta.ˈqɑɫ	‘orange’
c.	ˌsaɾ.ba.ˈχo	‘independent’
d.	ˌkɨɾ.da.ˈwa	‘action’
e.	ˌfaɾ.mɑn.ˈga	‘office’
f.	pɨʃ.ti.ˈwɑn	‘support’

The syllables with secondary stress in the left most syllables can be promoted to foot status according to the Faithfulness Condition (Hammond 1984; Halle and Vergnaud

1987 and Hayes 1995) which states that grid marks must be in one to one relation with the domains that contain them. For a notational illustration, we take the first example [ˌʃɑ.ɾa.ˈzɑ*]*. First, Project a line (0) element for each syllable head.

(19)

```
x    x    x  Line (0) syllable Level
ʃɑ   ɾa   zɑ
```

The next level, which is the head location parameter, the right element of each constituent is projected into the next line. In other words, stressed syllables are projected to the next line.

(20)

```
( x ) (      x)  Line (1) Foot Level
  x     x    x   Line (0) syllable Level
 ʃɑ    ɾa   zɑ
```

To meet the requirement of the Faithfulness Condition, the line (1) grids should be in one to one relation with the brackets which represents the foot as a constituent. Thus, proper foot is allowed for heavy syllables which are dominated by a grid mark.

The second argument concerning parsing of single heavy syllables into foot in CK can be independently verified through the notion of *Minimal Word*. One of the basic assumptions of prosodic structure is that every prosodic word should at least contain one foot expressed through the headedness principle of SLH. The fact that there are monosyllable-size words in CK (see §2.6.2); there can be monosyllable foot sizes like those leftmost syllables assumed in (16 and 18). The prosodic word should, by definition, contain at least one foot. The fact CK has prosodic words with open monosyllables with potentially long vowels /ɑ,u,e,o,i/ and closed monosyllables with short vowels presuppose foot of at least the same size.

Finally, according to the general principle of prosodic structure which assumes that parsing is exhaustive and prosodic structure is created maximally (Prince 1980; Itô 1989 and §3.2.2.1 of this thesis), the leftmost syllables should be parsed into the higher constituent rather than being left unparsed. Thus, by maximality of foot construction, the foot in CK is (σˈσ) wherever possible otherwise (ˈ$\sigma_{\mu\mu}$). Following Hayes (1995:102) who for reasons of concreteness classifies moraic and syllabic trochee languages as equivalent, I classify the foot in CK as a syllabic iamb including monosyllabic feet. So, the syllabic iamb allows for a monosyllabic foot consisting of a single heavy syllable. The difference of syllabic iamb to Hayes' iamb is mainly in the insensitivity of sress-assignment to the weight of syllables. Hayes argues that iambic foot in quantity insensitive systems are unattested. However, as shown above, an iambic system with stress assignment based on syllable weight cannot account for CK data.

The CK foot pattern seems to be the mirror image of a similar foot pattern in several other languages. Hayes uses the term *Generalized Trochee* for those syllabic trochee languages where a word final heavy syllable is promoted to a foot. He also (1995:103) demonstrates that several syllabic trochee languages attest to the promotion of a heavy syllable to a foot. Kager (1992), on the other hand, provides evidence similar to Hayes' generalized trochee by showing that syllabic trochee systems manifest a syllable weight contrast. Accordingly, CK accounts for the asymmetry of foot typology in two different ways: First, quantity insensitivity is not restricted to trochaic systems; iambic systems can be insensitive as well. Second, the promotion of single heavy syllables to foot is not limited to syllabic trochee systems; iambic systems can promote a single heavy syllable to a foot.

As shown above, only single heavy syllables (but not single light syllables), if they are leftmost, are allowed as a foot. The question now is this: what are the leftmost stressless light syllables in (17)? In the literature, Prince (1980) and McCarthy & Prince (1996[1986]) argue for forming a metrical foot from a single syllable called degenerate foot. This single syllable, which is logically the smallest possible foot, consists of a single light syllable in quantity sensitive languages and a single syllable in quantity insensitive languages. However, the fact that the short vowel /a/ and the epenthetic vowel in open leftmost syllables in words composed of odd number of syllables (as in 17) are not lengthened or realised differently suggests that the leftmost syllables with short vowels cannot be promoted to foot. Besides, to capture the contrast between potentially long vowels and short vowels in similar contexts, such syllables could not form even a degenerate foot.

Nevertheless, the exhaustivity of parsing should not be overgeneralised to parse every element to higher categories, nor it should be understood that parsing is limited to the immediate higher constituent. The essential discipline for parsable elements is the requirement that the theory imposes on the categories; the requirements may include the size of the categories along with the supporting evidence that substantiate their existence such as a syllable being stressed. Thus, there remain phonological entities that may not meet the parsing requirement into a certain constituent. These phonological entities that cannot meet the criteria of parsing into higher constituents are known as extra-metrical and in turn deemed invisible to the metrical structure. According to Hayes (1995:57) 'an extra-metrical rule designates a particular prosodic constituent as invisible for purposes of rule application: the rules analyse the form as if the extra-metrical entity were not there'. This can be understood as the phonological elements are parsed into higher prosodic categories to the exclusion of the extra-metrical constituents.

As explained in (§2.7), open epenthetic syllables conspire to avoid stress in CK. Intriguingly, the distribution of such syllables in the head of foot is limited to the left edge of the prosodic word. When such weightless syllables occur in the dependent position (non-head position of foot) of a well-formed iamb, they can be parsed similar to canonical syllables as shown below.

(21)

a. (ʃɨ.ˌɾo).(va.ˈkɑɾ) 'analyst'

b. (ʃɨ.ˌla).(ma.ˈni) 'liquid'

c. (bɨ.ˈɾɑ) 'brother'

d. (ʃɨ.ˈmak) 'thing'

However, when the epenthetic weightless syllables occur in a stress bearing distribution, i.e. in the left of odd length syllables, they are not parsed into foot and thereby become extra-metrical as shown below. Extrametricality of the left hand syllables rather than promoting them to degenerate feet is based on the prosodic behaviour of the syllables; the weightless epenthetic vowel cannot be promoted to degenerate foot.

(22)

a. <ʤɨ>(ga.ˈɾa) 'cigarette'

b. <sɨ>(kɑ.ˈɫɑ) 'complaint'

c. <bɨ>(ɾɨn.ˈdɑɾ) 'injured'

d. <ʃɨ>(qɑɾ.ˈta) 'matches'

Similarly, unstressable clitics (see 3) at the right edge of the word cannot be parsed into the foot structure and in turn should be extrametrical. So, the derived word [qɑ. ɾa. ˈmɑ.na. ˈkɑn] ‘champion’ with the clitic /*ɨt/* ‘your’ has the following parsing.

(23)

```
(              *    ) Word Construction
( *)(.   *)( . *)     Foot Construction
 qɑ. ɾa.mɑ.na.kɑ.nɨt
```

Thus, (22 and 23) show that, in CK, an unparsed foot—from open epenthetic /ɨ/ or short /a/ vowel can occur at either edge. According to Hayes (1995:57), for a phonological entity to be deemed extrametrical, it should meet certain criteria: constituency, peripherality, non-exhaustivity and edge-markedness. The extrametrical syllables in (22 and 23) meet all the criteria. One departure from the criteria is having unparsed syllables at both edges in CK. Hayes proposes the unmarked edge for extra-metricality to be the right edge but that does not rule out having extrametrical constituents at the left edge or both edges.

So far, it has been assumed that the directionality of stress assignment in CK is leftward. Given that primary stress is final and secondary stress is on every other syllable, rightward directionality of even-numbered syllables may still give the same result. To establish the directionality of footing we need to parse a word with an odd number of syllables, three for example. In that case, when we take parsing from both edges, the single syllable outside the foot determines directionality of parsing. This involves a lot of complications in quantity sensitive languages specifically with iambs and moraic trochees where a bi-moraic syllable can form a foot. In strictly quantity insensitive languages, however, the case is different as it makes no sense to classify syllables into light and heavy syllables. In CK, even though the rhythm is mostly independent of syllable weight, signs of dependency on syllable weight can be traced. For example, five of the six lexical vowels of CK are potentially long and hence can be bi-moraic to form a foot on their own when they occur at the opposite edge to where parsing begins in odd-numbered syllable words.

When the potentially long vowels or closed syllables are at the left edge of a word with odd-numbered syllables, leftward and rightward parsing would give the same stress pattern. In that case, leftward parsing gives the correct result of a syllabic iamb foot with a bi-moraic iamb as in (24a and 24c). Similarly, rightward parsing would give the same stress pattern but with a different foot structure as in (24b and 24d). The brackets represent foot.

(24)

a. ˌʃɑ.ɾa.ˈzɑ ‘expert’ ⟶ (ˌʃɑ) (ɾa.ˈzɑ) leftward parsing

b. ˌʃɑ.ɾa.ˈzɑ ‘expert’ ⟶ *(ˌʃɑ ɾa) (ˈzɑ) rightward parsing

c. ˌpan.ʤa.ˈɾa ‘window’ ⟶ (ˌpan) (ʤa.ˈɾa) leftward parsing

d. ˌpan.ʤa.ˈɾa ‘window’ ⟶ *(ˌpan.ʤa) (ˈɾa[19]) rightward parsing

Thus, potentially long vowels at the left edge of odd-numbered syllables are not insightful in identifying the directionality of parsing in CK. So, to find the directionality of parsing, the example should be an open syllable with the short vowel, viz. /a/.

If parsing is leftward, as the example in (25a) shows, we get the correct stress where only the rightmost syllable is stressed. Rightward parsing, on the other hand, results in an unacceptable metrical structure. (25b).

(25)

a. pa.tɑ.ˈta ‘potato’ ⟶ <pa> (tɑ.ˈta) leftward parsing

b. pa.tɑ.ˈta ‘potato’ ⟶ *(pa.ˈtɑ) <ta> rightward parsing

The pattern of leftward parsing in quantity insensitive iamb languages is cross-linguistically rare (5 in 262 studied languages, see Gordon 2002). CK appears to be an addition to these languages. The location of head and directionality, as Halle and Verngaud (1987) postulate, determine the metrical parsing of the phonemic string especially at the syllable level. As shown in the data in (1 and 2), regardless of the number of the syllable(s) the item may have, primary stress falls on the final syllable of isolated items. This final head position induces a right headed foot with leftward parsing. In metrical theory, the patterns in (1 and 2) are described in terms of feet. These feet are metrified in a right to left fashion and position stress on odd numbered syllables

[19] As this syllable (ɾa) is an open syllable with a short vowel, it cannot form a foot and the parsing in (24d) is given for the sake of the argument.

counting from the right edge of the word. Each foot is metrified into a headed constituent. Thus, the parameters of foot structure in CK can be determined as follows.

(26) Parameters of Foot in CK

a. The Foot is maximally binary on a syllable level (σˈσ) otherwise binary on a moraic level ($ˈσ_{μμ}$).
b. Heavy syllables may occur in weak positions of a foot.
c. The Foot has final prominence.
d. Foot construction is iterative.
e. Create new layer for stressed syllables. Once the foot is in place, create a word layer construction marking the right most element.
f. Parsing is leftward.

The above parameters yield the three different observed patterns (σˈσ ; $ˈσ_{μμ}$; $<σ_{μ}>$) based on the number of the syllables and then on the internal structure of the leftmost syllable in words with odd-numbered syllables. Moreover, the statements made in (26) above demonstrates that foot in CK should consist of at least one syllable and optional syllables to the left of the stressed syllable that forms the head of the foot. Crucial to the hypothesis of this thesis, this shows that prosodic structure between foot and syllable is hierarchical in nature.

4.5 Metrification in OT

As Kager (1999: 142) observes, stress patterns are a domain of potentially conflicting forces: for the choice of each parameter, there is a competition among different alternatives. In rhythm, for instance, there is conflict between perfect well-formed rhythmic patterns with irregular intervals of stress. By its parallelism, OT is naturally equipped to capture interactions of conflicting forces and to establish interactions between prosodic levels. That is, the ranking of constraints matches the choice of parameters within the metrical phonology. Further, different rankings of the constraints in different languages can capture the interactions of cross-linguistic variation between metrical systems. Accordingly, there is abundance of research on metrical phonology within the framework of OT.

The constraints that govern metrical phonology stem from the nature of the theory. The constraints that call for foot binarity FT-BIN and PARSE-SYL (McCarthy and Prince 1993:160), for instance, are proposed on the basis of the cross-linguistically common pattern of grouping rhythmic units into stressed and unstressed syllables. So, it is a basic requirement of foot to be binary.

(27) **FT-BIN**

Feet are binary under moraic or syllabic analysis.

(28) **PARSE-SYL**

Syllables are parsed by feet.

For a word composed of an even number of syllables, such as (29), the two constraints in (27) and (28) can exhaustively parse the syllables without conflict as in (30).

(29) ʧɑ.pa.ma.ni ‘publication’

(30)

ʧɑ.pa.ma.ni	**FT-BIN**	**PARSE-SYL**
☞(a) (ʧɑ.ˌpa) (ma.ˈni)		
(b) (ˌʧɑ)(ˌpa) (ma.ˈni)	*!	
(c) (ˌʧɑ)(pa.ˈma)ni		*!

As the two constraints in (30) are equally ranked, violation of either of them results in ruling out the candidates (30 b and c). As it becomes clear in tableau (36), FT-BIN is an inviolable constraint in CK in contrast to PARSE-SYL.

Similarly, an odd number of syllables with a heavy leftmost syllable such as (31) can faithfully and exhaustively be parsed into feet without violating any of the constraints. This assumes that the initial syllable is bi-moraic which satisfies FT-BIN.

(31) ˌqɑ. ɾa. ˈmɑn ‘champion’

The bi-moraicity of the long vowel in the leftmost syllable satisfies concurrently both constraints as shown below.

(32)

qɑ. ɾa. mɑn	Ft-Bin	Parse-Syl	Iamb
☞ (a) (ˌqɑ) (ɾa. ˈmɑn)			
(b) (qɑ. ɾa. ˈmɑn)	*!		
(c) (ˌqɑ. ɾa) (ˈmɑn)			*!
(d) qɑ (ɾa. ˈmɑn)		*!	

Candidate (32b) violates the binarity of foot while (32d) violates exhaustive parsing, viz. Parse-Syl. (32c) shows an interesting feature of syllable parsing into foot in CK as it satisfies both constraints yet it is ruled out to be the optimal candidate as it demonstrates that parsing in CK gives priority to foot binarity on the basis of syllable (σˈσ). In other words, it is the Foot-Type=Iamb (see 39) that chooses the optimal candidate rather than the two other constraints. As in the winning candidate, feet are allowed to be monosyllable only under duress.

Although the tableaux in (30 and 32) and the constraints therein can account for the examples, a closer look at the data from CK necessitates a different ranking of the constraints. As explained in the examples cited above in (17) and repeated in (33), the short vowels in words with odd number of syllables cannot form a foot. Further, it shows that the directionality of parsing determines which syllable is left behind in words composed of odd-numbered syllables.

(33) <ba>(ha.ˌra).(ma.ˈki) ‘randomly’

As the vowel in the leftmost syllable is a short vowel, that syllable cannot form a bi-moraic foot. Therefore, either foot binarity or parsing of that syllable should be violated. If parsing was rightward in CK, every syllable would be parsed and foot bi-narity would be satisfied, but the constraint which is responsible for directionality of parsing ensures from which edge parsing should begin. The constraints for direction of metrification are two alignment constraints ALL-FT-LEFT and ALL-FT-RIGHT (McCarthy and Prince 1993:48).

(34) **ALL-FT-LEFT**

Every foot stands at the left edge of the ω.

(35) **ALL-FT-RIGHT**

Every foot stands at the right edge of the ω.

These constraints calculate the distance gradiently between the left-edge foot (for ALL-FT-LEFT) with every syllable to its right. That is, the number of violation marks equals the number of the syllables to the right of the left edge foot. ALL-FT-RIGHT is its mirror image. The tableau in (36) shows that ALL-FT-RIGHT outranks ALL-FT-LEFT as the light syllable in the left is left unparsed. It also shows that foot binarity outranks parsing every syllable.

(36)

ba.ha.ra.ma.ki	FT-BIN	PARSE-SYL	ALL-FT-RIGHT	ALL-FT-LEFT
☞(a)ba.(ha.ˌra)(ma.ˈki)		*	**	*,***
(b)(ˌba)(ha.ˌra)(ma.ˈki)	*!		**,****	*,***
(c) (ba.ha) ra (ma.ˈki)		*	***!	***
(d) ba. ha. ra. (ma.ˈki)		**!*		***
(e) (ba.ha) (ra.ˈma). ki		*	*,**!*	**

The candidates (36a and 36b) show that apart from FT-BIN, all other constraints are violable. Candidates (36c and e), on the other hand, demonstrate that the direction of metrification is leftward represented by outranking of ALL-FT-RIGHT over ALL-FT-LEFT. Note that the violation marks are incurred for every syllable occurring between the left/right edge of the foot and the left/right edge of the word; for each candidate, violation marks for each foot is summed. The commas separate the violation marks for each foot. What rules out candidate (34c) in contrast to candidate (34a) is the number of violation marks incurred on a high ranking candidate ALL-FT-RIGHT which is ranked higher than ALL-FT-LEFT.

However, unparsed syllables are not always leftmost. As explained above in (5), enclitics are stressless and hence remain unparsed.

(37) bɑ.pi.ɾɨt 'your grandfather'

In rule based phonology, it is not clear why some affixes attract stress while others do not. (cf. 2 with 3). In OT, however, a constraint explains why clitics cannot attract stress. Itô and Mester (2009) propose a constraint which militates against heads of prosodic categories to be contained in function words.

(38) **HEAD -TO-LEX**

Assign one violation mark for each prosodic head which is contained in a function word.

The constraint in (38) is violated if the head of the prosodic word is in the clitic. The head of a prosodic word is regularly the right most foot as far as it is not an enclitic. As clitics are not usually stressed in CK, this means HEAD-TO-LEX is not violated. Therefore, this constraint outranks PARSE-SYL and ALL-FT-RIGHT as tableau (38) demonstrates. Another way to satisfy HEAD –TO-LEX is to shift the enclitic from the head of the foot to the dependent position. However, this violates the high ranking foot form constraint IAMB.

(39) **IAMB**

Assign one violation mark for every foot which is not iambic (σˈσ) or (ˈH).

(40)

bɑ.pi.ɾɨt	HEAD -TO-LEX	IAMB	PARSE-SYL	ALL-FT-RIGHT
☞(a) (bɑ.ˈpi).ɾɨt			*	*
(b) (bɑ).(pi.ˈɾɨt)	*!			**
(c) bɑ.pi.ɾɨt			**!*	
(d) (ˌbɑ).(ˈpi.ɾɨt)		*!		**

Thus, HEAD-TO-LEX accounts for the unstressability of the enclitic as its violation rules out the candidate (40b). While leaving the word unparsed (40c) is a multiple violation of PARSE-SYL which renders the entire string of syllables invisible to the prosodic structure. Besides, it violates other non-violable constraints such as GrWd=PrWd.

4.6 Morphological Evidence for Foot structure

This section provides examples of morphological processes that make reference to prosodic categories, in particular foot. Morphological processes only apply to forms having certain prosodic templates. The prosodic templates include categories of various sorts of feet and syllables. The morphological process that depends on templates from prosodic categories is known as Prosodic Circumscription (McCarthy and Prince 1990). Reduplication and hypocoristic formation are two morphological processes that make reference to foot structure in CK.

4.6.1 Reduplication in Kurdish

According to McCarthy and Prince's Prosodic Morphology Hypothesis (1996[1986]; 1990), templates are defined in terms of the authentic units of prosody: mora μ, syllable σ, foot F, prosodic word ω. Another principle of the hypothesis is that satisfaction of templatic constraints is obligatory and is determined by the principles of prosody, both universal and language-specific. The set of CK reduplicative affixes can be regarded as foot templates similar to the metrical structure described above, i.e. syllabic Iamb.

(41)

a. pat 'rope'	ˌpat-**pa.ˈten** 'skipping'
b. ʃɑn 'shoulder'	ˌʃɑn-**ʃɑ.ˈnen** 'shoulder in'
c. pɑɫ 'push'	ˌpɑɫ- **pɑ.ˈɫen** ' pushing each other'
d. χat 'line'	ˌ χat-**xa.ˈten** 'hopscotch'

The reduplicative affixes consist of two syllables with the second syllable stressed and heavier than the first syllable. Through the phonological rule of re-syllabification, the reduplicative affixes copy the root word plus /en/. However, the root word does not remain intact in the reduplicative affix; rather CVC + /en/ are re-syllabified into CV + Cen. The common explanation of this process is onset maximization. Nevertheless, regardless of the rule that triggers the process, as a result a Syllabic Iamb foot is formed. So, through re-syllabification, a di-syllabic foot /σˈσ/ is formed which results in an iambic foot structure. CK reduplication has several other templates, all of which consist of foot template, but their detailed analysis is beyond the scope of this thesis. Consider, for example, another kind of reduplication with a different template which gives further evidence for the existence of foot structure in CK. In this kind of reduplication, adjectives are repeated to form adverb as shown in (42).

(42)

a.	kɨz ‘dim’	ˌkɨz-kɨ.ˈze ‘dimly’
b.	χɑw ‘slow’	ˌχɑw-χɑ.ˈwe ‘slowly’
c.	geʒ ‘foolish’	ˌgeʒ- ge.ˈʒe ‘foolishly’

Similar to the examples mentioned in (41), the reduplicative affixes in (42) consist of two syllables with stress on the second syllable. The reduplicative affixes copy the root words plus the mid-front vowel /e/. The root part of the reduplicative affix loses its coda to the onset of the second syllable of the reduplicative affix. So, CVC + /e/ is re-syllabified into CV + Ce. This re-syllabification process helps make a (σ ˈH) foot, that is, keep the iambic foot in conformity with the foot type of CK.

4.6.2 Hypocoristics

A hypocoristic is defined as a shortened or diminutive form of a word or a given name. It is used in more intimate situations as a nickname or term of endearment. It is also used as a pet name or calling name (Poser 1990). In CK, a hypocoristic is usually used as a nickname in more intimate situations. The basic property of CK hypocoristic formation is subject to the bi-syllabic requirement. In CK, there is no hypocoristic suffix; rather, the proper name (mostly borrowed Arabic proper names) are truncated to bi-syllabic if it is phonologically longer than two syllables as in (43).

(43)

a.	mu.ħam.məd →	ħa.ˈma
b.	musˠ.tˠa.fɑ →	mɨ.ˈʧa
c.	xa.di.ʤa →	χa.ˈʤe

Hypocoristics in CK do not always undergo truncation; another kind of hypocoristic is formed through vowel insertion. Monosyllabic Kurdish names are made bi-syllabic as shown in the examples in (44).

(44)

a. jɑd ⟶ jɑda

b. ʒiɾ ⟶ ʒiɾa

c. rɑz ⟶ rɑza

So, in both kinds of hypocoristics, foot structure triggers a bi-syllabic foot template through processes of truncation and vowel insertion. Thus, both processes (elision and insertion) conspire to yield a prosodic template —foot in this case.

To conclude, foot structure in CK consists of a syllabic iamb with stress assigned in the absence of sensitivity to syllable weight. Yet, syllable weight plays a role in assigning stray syllables (left most syllable in words composed of odd numbers of syllables) into bi-moraic foot for heavy syllable or left unparsed in light syllables. CK does not ignore syllable weight completely, but assigns more importance to other factors, such as binary rhythm, at the expense of stress on heavy syllables. Parsing is iterative and leftward. I use the existence of mono-syllabic content words as evidence of bi-moraic foot structures rather than degenerate foot or violation of word minimality. Morphological constituents also provide evidence for CK foot structure. Reduplicated affixes and hypocoristics support the iambic pattern of foot structure provided by phonological evidence. The foot is usually bi-syllabic with relative strength of the right hand syllable. This right hand prominence is enforced by lengthening an open syllable or re-syllabifying the template to strengthen the right hand syllable.

Part II Interface Category with Morphology

Chapter Five Prosodic Word

This chapter addresses issues related to prosodic word (ω) in CK. First, to establish ω as a prosodic category, its use as a domain of phonological processes has been investigated. Section two looks at the segmental processes that are sensitive to ω; this includes nasal assimilation (§5.2.1) and final devoicing (§5.2.2). Preserving weight through CL is another process that makes reference to ω in (§5.3). CK data demonstrates that ω serves as the domain of phonotactics and syllabification (§5.4) and the bearer of primary stress (§5.5). Second, the formation and mapping of ω onto morphological structure forms the second part of this chapter. (§5.6) examines how the domain of ω is identified and investigates its interface with morphological elements.

5.1 Introduction

This chapter has two main goals. First, to look for phonological processes that either make reference to ω or uses it as a domain of their application. Nespor and Vogel (1986:11) assume that the phonology of a given language must include all the prosodic units of the prosodic hierarchy whether phonological processes make reference to all the prosodic units found or not. Selkirk (1986) and Itô and Mester (2013), in contrast, hold the view that cases where all units are instantiated are never simultaneously realised within a single language or such languages are rare. In addition, Jun (2005) states that the prosodic categories above the foot are not universal. The relevant phonological processes to prosodic structure may be segmental or supra-segmental, or even can be phonotactic constraints on particular segments in edges of certain prosodic units. The phonological processes that may make reference to ω include: the processes that use that string as the domain of their application, the bearer of relative prominence relations among the elements of that string, and the domain of application of phonotactic constraints (Booij 1983; Nespor and Vogel 1986). Thus, segmental and supra-segmental processes in CK that use ω as their domain or make reference to it will be examined.

The second goal of this chapter, which depends entirely on the outcome of the first goal, is to establish the domain of the ω in CK, i.e. the size of ω in relation to morphosyntactic structure. The ω is the lowest constituent in the prosodic hierarchy to represent the interaction between the phonological and the morphosyntactic component of the grammar. That is, the mapping rules that relate phonological structure to morphological structure. So, it should make reference to certain aspects of morphology and be able to distinguish a number of different morphological units such as underived (simple) words from derived (complex and compound) words.

5.2 Prosodic Word-Conditioned Segmental Assimilation

In early generative phonology, surface morphosyntactic constituents were implicitly regarded as the domains of phonological processes (e.g. Chomsky and Halle 1968; Selkirk 1972). In a series of articles, Selkirk (1981[1978], 1980 and 1986) inaugurated prosodic hierarchy theory which was developed and extended by other phonologists, (Booij 1983, Nespor and Vogel 1986, Hyman 1985 inter alia). The main assumption of all the research in this framework shares two basic principles. First, the phonological representations are structured into hierarchically-composed prosodic units. Second, the prosodic constituents are stratified into distinct prosodic categories. It is the non-linear ordering of the categories that constitute the hierarchy. Each category is instantiated and defined by a (set of) phonological process(es).

Vogel (2009) explains that a number of phenomena should cluster together in establishing a particular string of elements as their domain. The rules that make reference to a prosodic unit may be segmental adjustments such as nasal assimilation, final devoicing, intervocalic voicing, or they may be supra-segmental processes such as prominence, tone-related alternations and processes that strengthen boundaries of prosodic units (see Kainada 2009 for the nature of prosodic boundaries). The segmental adjustments and prominence tend to be relevant for identifying the ω in CK, in particular final devoicing, nasal assimilation, weight preservation and stress assignment.

5.2.1 Nasal Assimilation

Nasal assimilation was assumed to have access to morphological structure. Chomsky and Halle (1968) consider nasal assimilation in English as applied across morpheme boundaries as in (1) but not across word boundaries as in (2).

(1)

a.	in + legal	⟶	illegal
b.	in + responsible	⟶	irresponsible

(2)

a.	un # lawful	⟶	*ullawful
b.	un #reliable	⟶	*urreliable

However, the assimilation does not rely entirely on boundaries and/or purely phonological issues alone. The examples in (3) show that nasal assimilation does not apply in the absence of morphological boundaries while the examples in (4) show that nasal assimilation does not also apply at all morphological boundaries.

(3)

a.	Only	⟶	*olly
b.	Stanley	⟶	*Stalley

(4)

a.	sudden + ly	⟶	*suddelly
b.	sun + less	⟶	*sulless

Allen (1979) tries to resolve this problem by invoking the Level Ordering Hypothesis in which (Class I) prefixes such as (*in*-) assimilate to the following consonant, while (Class II) prefixes such as (*un*-) do not. Later, morphophonological processes have been handled by lexical phonology. Yet, structural information does not seem to be adequate for all morphophonological processes. For instance, there are processes that apply only to specific lexical categories or in the presence of specific morphemes. So, the application of phonological rules cannot be captured in terms of morphological structure. It can be shown that nasal assimilation and other processes are applicable within the domain of ω.

In CK, for instance, the anterior nasal /n/ assimilates in informal language in point of articulation to the following labial obstruents within the domain of ω. The nasal assimilates in both underived words as in (5) and derived (compound and complex) words as in (6).

(5)

a.	qun.bala	[qum.bala]	'bomb'
b.	min.baɾ	[mim.baɾ]	'podium'
c.	ba.ɾɑn.bar	[ba.ɾɑm.baɾ]	'opposite'

(6)

a.	zɨmɑn + pis	[zɨ.mɑm.pis]	‘slanderer’
	tongue + dirty		
b.	ʃin + bɑw	[ʃim. bɑw]	‘bluish’
	blue + SUF		
c.	gɨyɑn + fidɑ	[gɨ.jɑŋ.fi.dɑ]	‘fighter’
	soul + provider		
d.	nɑn + bɨda	[nɑm.bɨ.da]	‘charitable’
	bread + giver		

The application of nasal assimilation is blocked for the compound word in example (6d) when it is used as a phrase in (7a). While the examples in (5) and (6) demonstrate optional application of nasal application in simple and compound words, the examples below in (7) show that the rule cannot be applied across word boundary in a phrase.

(7)

a.	nɑn + bɨda	[nɑn. bɨ.da]
	bread + give	‘give bread’
b.	fɨ.roʃ.tɨn + ba.ko	[fɨ. ɾoʃ.tɨn. ba.ko]
	sell + whole	‘wholesale’
c.	Hemɨn + bɑ.zi.da	[he.mɨn. bɑ.zi.dɑ]
	Proper name + jumped	‘Hemn jumped’
d.	bɨzɨn + ba. χewkɨrdɨn	[bɨ.zɨn. ba. χew.kɨɾ.dɨn]
	goat + raise	‘goat raising’

In OT terms, any change to the underlying form (input) to a surface form involves the violation of a faithfulness constraint. It is the type of the change of the output that identifies which faithful constraint is violated. The change to the input, and hence violation of the faithful constraint, is forced by a higher ranking markedness constraint which is satisfied by the surface form. For assimilation, the faithfulness constraint which regulates the features of surface and underlying form is IDENT(x) (McCarthy and Prince 1999).

(8) IDENT(x)

Corresponding input and output segments have the same value of the feature x.

In the case of assimilation, the faithfulness constraint in (8) is crucially outranked by a markedness constraint AGREE(x), which regulates agreement in terms of (*x*) between adjacent output segments (Lombardi 1999). This constraint requires that, in the surface form, distinct features in neighbouring segments of the same ω can become similar.

(9) AGREE(x)

Adjacent output segments have the same value of the feature x.

Note that (*x*) represents place feature in (8) and (9). The necessity of ranking AGREE(PLACE) above IDENT(PLACE) guarantees assimilation. These two constraints are not the only two constraints that are involved in choosing the optimal candidate. As Bakovic (2007) notes, the resulting output created by satisfaction of AGREE(PLACE) may violate another markedness constraint that are otherwise would be satisfied. Consider the place feature of the underlying anterior nasal in (5 and 6) that assimilates to the anterior bilabial. The assimilation incurs a violation of a markedness constraint against anterior nasals (referred to here as NOANTENAS) that it would not have incurred had the nasal surfaced faithfully. This is shown in the tableau below.

(10)

qunbala	AGREE(PLACE)	IDENT (PLACE)	NOANTENAS
☞ a. qum.bala		*	*
b. qun.bala	*!		
c. quŋ.bala	*!	*	

Satisfaction of AGREE(PLACE) is the crucial factor for candidate (a) to be the winner. As there is no indication for candidates (b and c) to compete in this tableau, they are ranked equally.

The examples given for the application of nasal assimilation demonstrate that a lexical word (5), a lexical word and a suffix (6c, d) and compound stem + stem (6a, b) belong to the same ω. Nevertheless, the examples are so impoverished that they do not give a clear picture of the domain where the process applies. For example, they do not provide examples for the application of the rule in (prefix +stem) or (compound + suffix) contexts. To be more precise, nasal assimilation applies within the domain of ω but it does not identify its domain in relation to morphosyntactic structure. Hence, more phonological processes are needed to accurately identify the domain of ω in CK.

5.2.2 Final Devoicing

Final Devoicing is quite common among the world's languages including German, Dutch, Polish, Turkish and Russian, among others (Brockhaus 1991). Earlier accounts of devoicing attributed it to fortition or strengthening, while most recent literature regards it as an instance of weakening (see Harris 2009, Crystal 2008). Iverson and Salmons (2007) use two reasons for regarding final devoicing as fortition: one is based on the observation that obstruent voicing commonly occurs inter-vocalically. If voicing is weakening, devoicing should be strengthening. The other argument takes the form of a claim that devoicing strengthens final obstruents in order to demarcate the right edge of words or syllables. Harris (2009) uses the same two reasons to argue against the claims that regard final devoicing as fortition in the sense that it becomes more consonantal and turns less sonorous than the underlying voiced consonants. I will not go into the details of what triggers final devoicing since what is at issue here is the domain of application of final devoicing.

Final devoicing is another segmental rule that makes reference to ω in CK. Languages vary with regard to syllable final or word final devoicing. While in Slavic, Romance, Germanic, Basque and many others only word-final obstruents are devoiced, in Thai, Vietnamese, Turkish, Malay and many others the syllable coda is devoiced (Myers 2012). CK is one of the languages that undergoes final devoicing in the right edge of the prosodic word. As the data in (11) show, voiced obstruents in CK undergo final devoicing. That is, they are realised and heard as the voiceless counterpart of the same phoneme [b] to ~ [p], [d] to ~ [t] and so on. As for devoicing in coda position in CK, it is clouded by assimilation: voiced codas are assimilated in voicing to the onset of the following syllable. Therefore, syllable coda (internal to prosodic word) is not regarded as the domain of devoicing (see 15).

(11)

a	b
[ʔɑ.zɑt] ‘free’	[ʔɑ.zɑ.di] ‘freedom’
[kɨ.tep] ‘book’	[kɨtebaka] ‘the book’
[sak] ‘dog’	[sagakat] ‘your dog’
[batʃ] ‘badge’	[badʒakam] ‘my badge’
[mɨ.ɾɒf] ‘human being’	[mɨ.ɾɒ.vi.ʒir] ‘wise human’
[ba.ɾas] ‘pig’	[ba.ɾa.za.kan] ‘the pigs’
[gɨɾʃ] ‘tension’	[gɨɾʒ i w ʔɑlozi] ‘tension and unstable’

(Note that the examples include all the voiced obstruents: plosives, affricates and fricatives (except [ʕ])

In the examples of (11a) the devoicing includes word final devoicing as (either the words are mono-syllables or the non-final syllables do not give evidence for syllable final devoicing). (11b) shows that the obstruents do not devoice when they are not final —followed by a vowel. It might be argued that the devoiced obstruents in (11a) are underlyingly voiceless segments and undergo voicing inter-vocalically in (11b) rather than devoicing of underlyingly voiced phonemes as in (11a). Hence, a competing analysis arises as a result of two competing constraints: the first one, voiced coda obstruents undergo devoicing, while according to the second analysis, underlying voiceless obstruents surface as their voiced counterpart inter-vocalically. As far as the list of words in (11) is concerned, both of them are possible. To resolve this question, when more than one analysis is possible for a set of data, it is one of the tasks of the phonologists to evaluate competing analysis and choose between them.

In this case, as Wolf (2008) states, there is no reason to think that any language would only allow voicing inter-vocalically and not elsewhere. Moreover, Looking a bit further for more evidence in CK, plenty of words like [to.pa.ka] ‘the ball’, [kɨ.ɾe.kɑɾ] ‘worker’ [mɑ.si] ‘fish’, [ka.ʧaɫ] ‘bald’ can be found. Words like these and multiple other examples can be used as a counterargument for the second analysis and at the same time they can be used as an admissible evidence to support position one, i.e. an underlying voiced obstruents are devoiced at the right edge of prosodic word. If position two were correct, these words would have to appear as *[tɒbaka], *[kɨ.ɾe.gɑɾ], *[mɑ.zi], *[ka.ʤaɫ], and there is no evidence that underlying voiceless segments are voiced inter-vocalically. Thus, the list of words in (11b) shows that the final segment of the word list in (11a) is underlyingly voiced.

Final devoicing is not limited to simple (underived) words in CK. The list of words in below shows that derived words; both complex: (stem + suffix) as in (12), (prefix + stem) as in (13) and compound words (stem + stem) as in (14) undergo final devoicing as well. The affixes in the list of words in (12 and 13) are derivational affixes. Thus, final devoicing shows that the simple (underived) words and the (derived) words—both complex and compound words—have the same status, which is the domain of application of final devoicing.

(12)

a.	nuk.ta + bɑz	[nu.kta.bɑs]
	joke + teller	'comedian'
b.	me + bɑz	[me.bɑs]
	female + dealer	'ogler'
c.	ko.tɨr + baz	[ko. tɨɾ. bɑs]
	Pigeon fonder	'pigeon fancier'

(13)

a.	be + hez	[be.hes]
	without + strength	'weak'
b.	ba + ʤaɾg	[ba.ʤaɾk]
	with + liver	'brave'
c.	bɨ + kuʒ	[bɨ.kuʃ]
	bɨ + kill	'killer'

(14)

a.	suɾ + pɨjɑz	[suɾ.pɨjɑs]
	red + onion	'wasp'
b.	sar + baɾz	[sar.baɾs]
	head + high	'proud'
c.	saɾ+bɑz	[saɾ + bɑs]
	head + provider	'soldier'

The devoicing of the final obstruent of the right stem in the compounds in (14) demonstrates compound composites are also the domain of final devoicing. The application of compounds and complex (stem + affix) as the domain of final devoicing in CK support Nespor and Vogel's (1986:142) prediction that if in a language ω includes both members of a compound, no affixes or sequences of affixes can form ω of their own.

As the examples in (15) show, final devoicing is exclusively sensitive to the right edge of ω in CK. Voiced obstruents do not undergo devoicing in syllable coda internal to the ω when they are followed by a voiced onset.

(15)

a.	ʔaʒ.di.hɑ	[ʔaʒ.di.hɑ]	'python'
b.	dɑd.gɑ	[dɑd.gɑ]	'court'
c.	bad.kɑɾ	[bat. kɑɾ]	'evil doer'
d.	ʔad.ham	[ʔat.ham]	'proper name'

Note that the voiced obstruents in the coda of the first syllables of the examples (15a and 15b) have an adjacent voiced consonant and thus blocking their devoicing may be attributed to a constraint of voicing assimilation that outranks final devoicing. The voiced coda in the examples of (15c and 15d), on the other hand, are devoiced as they are followed by a voiceless consonant. Therefore, it is voicing assimilation, rather than devoicing that determines the (de)voicing of obstruents in coda syllables internal to the prosodic word (see Hamid 2014 for a different account). Further, the blocking of devoicing is in consonance with what Selkirk (1986) conjectures for the application of rules in two different phrasal domains. She states that if two rules in a language refer to different phrasal domains, then the smaller domains must form sub-parts of the larger ones. This means, if a rule applies to syllable final, it applies to larger categories such as foot, ω and so on. However, the opposite is not true, final devoicing in ω does not require its application to syllables.

As a rule, it can be concluded from the data in (11–15); CK final devoicing is limited to the right edge of ω. It applies in (prefix + stem), (stem + stem) and (stem + suffix). Examples in CK are not found to show that a (compound + suffix) or a (stem + suffix + suffix) undergo final devoicing since the suffixes that end with voiced obstruent cannot be added to a derived word, i.e. there is no well-formed morphological construction in CK with the internal structure of (compound + a voiced obstruent ending suffix).

The decision of which constraints to be used and how they should be ranked in an analysis depends mostly on the input inferred from the data. The list of words and phrases of (11–14) is a good piece of evidence that the input should include a voiced segment at the right edge of ω. In other words, the right-most obstruent segment is underlyingly voiced, but devoiced on surface in the right edge of ω. In phonological alternations, it is inevitable that faithfulness constraints should conflict with markedness constraints. In this case, devoicing competes with feature preservation. It seems to be straightforward that no phonemes are deleted or epenthesised in these cases, but rather, a feature is changed and thus IDENT (F) is violated. Based on the descriptive generalisations in the previous section, a markedness constraint is needed to disallow voiced obstruents at the right edge of ω which is *VOICED-OBS (Lombardi 2001).

The basic tenet of OT requires a faithfulness constraint to interact with the markedness constraint about output forms. The second constraint should be a typical faithfulness constraint requiring the input value of the feature voice to be preserved in the output which is IDENT_IO(voice). However, *VOICED-OBS can be satisfied by other means such as deletion of the final voiced consonant or epenthesis insertion after the final consonant but why devoicing is only satisfied in CK by feature changing is beyond the scope of this thesis (see Lombardi 2001; Hamid 2014 for detailed discussion).

OT constraints, including the above constraints, are supposed to be universal while it is the rankings that are subject to language particulars. For example, in English, the faithfulness constraint IDENT-IO(voice) outranks *VOICED-OBS resulting in a word in which final voicing is pronounced yielding IDENT_IO(voice) »*VOICED-OBS. While in CK, the constraints are ranked in a reversed order; resulting in voice neutralisation in coda of right-most syllable of ω. Thus, *VOICED-OBS » IDENT_IO(voice).

To draw a tableau for this ranking, two candidates are needed and since ranking arguments are based on comparing candidates, we need a winner and a loser. The winner is [kɨ.tep] 'book' which satisfies *VOICED-CODA and derives from the input /kɨ.teb/. The loser, on the other hand, should do better than the winner on the

IDENT_IO(voice) and worse than the winner on *VOICED-OBS. A loser that meets both these criteria is */kɨ.teb /.

(16)

/kɨ.te**b**. /	*VOICED-OBS	IDENT (voice)
☞ kɨ.te**p**.		*
kɨ.te**b**	*!	

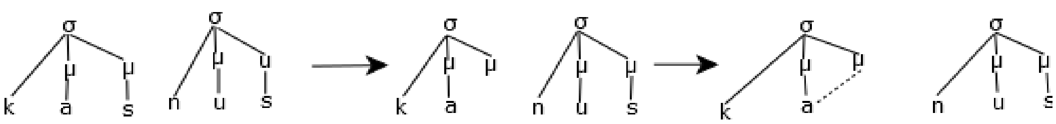
As candidate (a) satisfies the high ranking *VOICED-OBS, it is chosen as the winning candidate.

Thus, similar to nasal assimilation, in final devoicing, the domain of ω is equal to a stem plus any linearly adjacent string of affixes. It also includes the two stems of a compound but the exact size of ω is not yet determined by these two processes. However, rules from metrical phonology such as weight of the word and stress placement of Main Stress Rule tend to help identify whether derived word + suffix are within the domain of ω (see next section).

5.3 Weight of Prosodic Word

CL is one of the phonological processes that make direct reference to the weight of prosodic categories. Hayes (1989) attributes CL to a prosodic constraint as the deletion of a weight-bearing phoneme aimed at preserving the structure of the syllable by conserving the number of the moras. That is, segments are compensated for in the nearby segment or syllable —mostly left—if they occupy a particular position within the syllable. In other words, the number of segments changes within a prosodic category but the number of moras is conserved as shown for the Latin word (17a) in the schema in (17b).

(17)
a. kasnus ⟶ ka:nus ‘gray’
b.



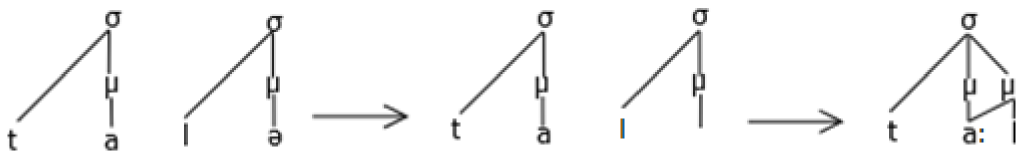
Although Hayes (ibid) demonstrates that CL is attributed to a prosodic frame, he limits the prosodic unit only to syllable. He holds that CL resulting from both consonant loss and vowel loss forms part of the syllabification principles of individual languages. To put it in other words, the way in which empty prosodic positions are provided with segmental content forms part of syllabification.

However, preserving the syllable weight cannot always be the reason of CL particularly when it results from vowel loss. In this section, I will show that preservation of the weight of prosodic word can trigger CL. An example of CL vowel loss is from Middle English where the loss of a vowel triggers lengthening the left side vowel and reduces the number of the syllables by one. The loss of the vowel implies the loss of the syllable structure; this process is called *parasitic delinking*[20] which leads to reducing the number of the syllables by one (Kavitskaya 2002). As shown in (18a), the vowel of the second syllable is lost which leads to the deletion of the entire syllable. Yet, the weight of the deleted vowel is preserved by attaching it to the first syllable resulting in a monosyllable word with a long vowel. The onset of the deleted syllable, on the other hand serves as the coda of the first syllable.

(18)

a. C1V1.C2V2 ⟶ C1V1:C2

b. Input vowel drop parasitic delinking



Contrary to what Hayes (1989) claims, CL triggered by vowel loss cannot be part of a re-syllabification process. As (18) shows, re-syllabification is inevitable but syllable cannot be the prosodic constituent within which CL occurs. In the input above, for instance, the second syllable is completely deleted while the structure of the first one changes from CV to CVVC.

20 Parasitic Delinking: Syllable structure is deleted when the syllable contains no overt nuclear segment (Hayes 1989:268).

Fox (2000:82), on the hand, states that retaining the weight of the foot is what triggers CL in vowel deletion examples like the one given in (18). He explains that maintenance of syllable weight clearly cannot be the motivation for the compensation, since the weight of one syllable is increased and that of another is deleted altogether. What is maintained in such cases is not the weight of the syllable but rather, I argue, the weight of the whole ω (see the examples in 19 and the discussion that follows). Since here the original form of the word consists phonologically of a di-syllabic sequence of stressed and unstressed syllables, the reduction of a di-syllabic word with open syllables into a mono-syllable word with a closed syllable changes the type of the foot. CK undergoes CL that results from loss of consonant (see §2.6.3 for CL resulting from a consonant loss). In the following, I argue that maintenance of ω is what triggers CL when a vowel is lost.

CL is more common among certain varieties of CK. These varieties are associated with the rural areas and parts that are not adjacent to Arab speaking region and not influenced by orthography. CK undergoes both types of CL triggered by both consonant and vowel deletion. CL associated with consonant deletion seems to be based on preserving the structure of the syllable. On the other hand, CL associated with vowel deletion seems to be based on preserving the weight of the ω. A vowel from one of the syllables is deleted which, in turn, leads to lengthening of the vowel in the left-side syllable. The deletion of the vowel results in the reduction of the syllables by one.

The loss of the syllable can be attributed to prosodic licencing. Itô (1986) holds that phonological material must be incorporated into the next higher level of prosodic structure; otherwise, it is deleted by *stray erasure*. In spite of this, the syllable is not deleted entirely; a number of complications are involved. First, the coda of the lost syllable becomes the coda of the syllable to its left[21]. Second, the onset of the lost syllable is also deleted with its nucleus (19a). The deletion of the onset can be attributed to prosodic licencing, i.e. results from a stray onset not linked to any syllable rather than being deleted with the vowel in one step. Cross-linguistically, no cases of CL has been

[21] I could not find a case where the left hand syllable is closed to see how the coda of the deleted syllable re-affiliates to the remaining closed syllable.

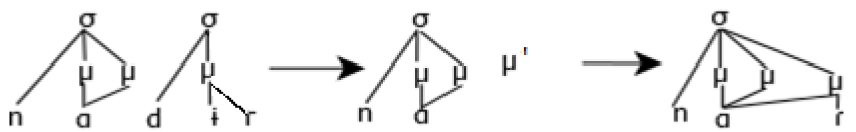
reported that is triggered by the deletion of the onset and nucleus (see Topintzi 2011 for a different view). I assume the loss of the onset will not be compensated for—does not trigger lengthening adjacent vowels—as onsets are non-moraic and this has been established in literature (Hayes 1989 inter alia). The list of words in (19) shows the lengthening process that compensate for the vowel loss.

(19)

a.	C1V1.C2V2C3	→	C1V1V2C3	
b.	nɑ.dɨɾ	→	nɑːɾ	‘proper name’
c.	bɑ.dam	→	bɑːm	‘almonds’
d.	χɑ.dim	→	χɑːm	‘servant’
e.	bɨn.jɑ.dam	→	bɨn.jɑːm	‘human being’

The data in (19 and the diagram below in 20) show that the segmentally unaffiliated mora is accounted for and, thus, the weight of the whole ω, rather than a syllable, is preserved. This cannot be a syllable-based process alone: the two syllables are merged into one and the open syllable becomes a closed one. The gist of the process is to keep the weight of ω, i.e. the number of moras in the word before and after deletion is the same as the diagram in (20) depicts.

(20)



[22]

The fact that the vowel that undergoes lengthening is already a long (bi-moraic) vowel before lengthening and another mora will be added to it after lengthening through CL makes the vowel and the syllable tri-moraic. The existence of tri-moraic vowels are supported by languages that have three-way vowel length distinction. Hayes (1989) states that, historically, tri-moraic vowels appear to have arisen via CL. CK, however, has two-way vowel length distinctions. Three-way vowel length distinctions in CK are found only in CL as the lengthened vowels in (19) are only observed in CL. The

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[22] μ' is a segmentally unaffiliated mora.

evidence for the extra-long vowels comes from the way they are pronounced; they are pronounced distinctively longer than underlyingly long vowel /ɑ/.

As explained in (§2.6.3), Stratal OT, in contrast to other versions of OT, can aptly handle opaque processes such as CL where both deletion and lengthening are happening at once. As Kiparsky (2011:37) explains, Stratal OT offers some insight for why the mora migrates and what triggers weight displacement. In conformity with the principle of the *richness of the base,* predictable structure including the moraic segments and other prosodic information are freely available in the lexical representation. This means, among other things, moraic codas cannot be guaranteed to be specified as moraic. However, at the word level, moras assigned at the stem level (via Weight by Position to codas) are indistinguishable from vowel moras. Then, the language's constraint system will, on the first pass through the stem-level constraint, dictate the predictable properties regardless of their lexical representation. The word level, in turn, receives a fully specified input conforming to the stem level and then the post-lexical level in turn receives as input a fully specified representation which is parallel to word level.

The constraints that are involved and compete in CL resulting from vowel loss mostly depend on what triggers the loss and lengthening process. For CL resulting from consonant loss, the constraint that bans glottal and pharyngeal phonemes in coda position triggers CL. Similarly, For CL resulting from a vowel loss, I assume the occurrence of gutturals in banned distribution of loan words in CK triggers CL. It should be noted that CK allows the guttural, i.e. employs a pharyngeal node, but they have limited distribution. However, when the gutturals occur word medially followed by a high vowel in loan words (mostly from Arabic), through a repair strategy, phonological materials are deleted and inserted to satisfy the violated constraint. This is in agreement with Paradis and LaCharité (2001) who explain that a language with a pharyngeal node usually repairs non-existent guttural segments instead of deleting them. Likewise, CK has guttural phonemes in limited distributions, but when the gutturals occur in a banned distribution or in a certain phonotactic constraint, they are repaired rather than being deleted. In the examples in (21), the deleted gutturals /h, ʕ, ħ/ in the onset of the second syllable are syncopated with the following epenthetic vowel. Given that the onset is weightless in CK, the compensation (adding one mora to the first syllable by lengthening the vowel) will be for the mora of the deleted vowel of the second syllable. This shows that the weight of the entire word rather than a syllable is preserved.

(21)

a. ʃa.hɨɾ ⟶ ʃɑɾ 'city'

b. qa.hɨɾ ⟶ qɑɾ 'wrath'

c. na. ʕɨl ⟶ nɑɫ 'slippers'

d. fa.hɨm ⟶ fɑm 'understanding'

e. qa. ħɨt ⟶ qɑt 'draught'

f. ba. ħɨs ⟶ bɑs 'research'

The constraint that bans the gutturals + epenthetic vowel word medially *[…Gut+ɨ]ω outranks Max. Likewise, the constraint that requires preserving the input moras in the output Max-μ outranks Max which includes the deletion of the onset and vowel of the second syllable. The vowel in the underlying form is epenthetic but since the surface form of the word serves as the input to CK speakers, I assume its deletion causes violation of Max. As the onset of the second syllable is deleted, the Onset constraint is also interacts with other constraints. So in the word ʃa.hɨɾ 'city', in the stem level, the constraint *[…Gut+ɨ]ω results in the deletion of the /h/.

(22) The stem level: the resolve of phonotactic constraint

ʃa.hɨɾ	*[…Gut+ɨ]ω	Max-μ	Onset	Max
☞a. ʃa.ɨɾ			*	*
b. ʃa.hɨɾ	*!			
c. ʃaɾ		*!		**

As Onset is an inviolable constraint in the grammar of CK, the two syllables merge into one in word level resulting in preserving the weight of the ω and resolving the onsetless syllable as shown below.

(23) The word Level: Preserving the weight of the ω

ʃaμ.μ ɨɾ (from stem level)	*[…GUT+ɨ]ω	MAX-μ	ONSET	MAX
a.☞ʃaμμɾ				*
b. ʃaμ.hɨμɾ	*!			
c.ʃaμɾ		*!		*
d.ʃaμ.ɨμɾ			*!	

To sum up, CL resulting from vowel deletion in CK aims at retaining the weight of the ω. This can be regarded as another phonological process that makes reference to the prosodic word. Nevertheless, it cannot give the exact domain of ω in relation to morphosyntactic structure as the words that undergo CL are simple (underived) words and makes no reference to the status of affixes with regard to the domain of ω.

5.4 Domain of Phonotactic Constraints and Syllabification

Together with the syllable and the foot, ω has been considered an important domain for phonotactic constraints. Booij (1983) argues that ω is not mere concatenation of well-formed syllables; rather words may have extra restrictions or extra combinatorial possibilities at their edges. On the other hand, Selkirk (1986) claims that ω and larger units can be a domain for applying phonological rules but they cannot be a motivation for phonotactic restriction. However, data from CK support the role of ω in phonotactic restrictions. As the examples in (24) and (25) show, edges of ω are restricted to certain segments. The glottal fricative /h/ cannot occur at the right edge of ω, while they are well-formed syllables in the coda of a syllable as in.

(24)

a. bah.ɾa ‘skill’

b. ʔah.ɾi.man ‘devil’

c. bah.man ‘proper name’

But *(…….h) ω

The distribution of the glottal stop /ʔ/ is even more restricted; it can occur only word and syllable initial (see §1.5.1). Tellingly, when through compounding, /ʔ/ occurs medial to ω, it will be deleted through re-syllabification as this phoneme is banned ω medially as shown below.

(25)

a. mɑst + ʔɑw ⟶ mɑs.tɑw 'milkshake'
   yogurt + water

b. sʉ.weɾ + ʔɑw ⟶ sʉ.we.ɾɑw 'brine
   salty + water

The data above not only demonstrates that /ʔ/ is banned ω medially, but also shows that the two stems of a compound act as one word and hence it can be said they form one ω.

Likewise, there is a constraint disallowing some consonants at the left edge of ω. The velaric lateral, the velaric nasal and the alveolar flap /ɫ, ŋ, ɾ/ cannot form well-formed ω word initially; however, they are allowed syllable initial as in.

(26)

a.	ka.ɾa	'butter'
b.	bɨ.ɾɑ	'brother'
c.	mɑ.ŋa	'cow'
d.	mɑ.ŋa.ʃaw	'full moon'
e.	qa. ɫɑ	'castle'
f.	ko. ɫɑn	'lane'

Syllabification in some languages is also taken to be a reliable diagnostic for establishing the ω domain. Nespor and Vogel (1986:137) state that the domain of syllabification is not a grammatical word; rather, it is a prosodic word. English compounds, for example, which are syntactically one word, can be shown to consist of two or more ωs. Thus, their syllabification pattern may violate the Maximal Onset Principle: *Pack ice* is syllabified to (pack)σ (ice)σ. Similarly, in Dutch, the domain of syllabification is limited to ω. Booij (1983) demonstrates that the sequence /dsp/ is syllabified in different ways. Although /sp/ makes a well-formed onset cluster in Dutch as shown in (27a), /s/ is blocked by ω to syllabify to /p/ in (27b) in violation of Maximal

Onset Principle, i.e. re-syllabification is blocked in (27b) as two stems of a compound are two separate domains of syllabification.

(27)

a. [[lood]σ]ω [[spet]σ]ω] 'drop of lead'

b. [[loods]σ]ω [[pet]σ]ω 'sea captain's cap'

Revithiadou (2011), on the other hand, states that (re)syllabification is not blocked by an intervening ω boundary in all languages. Nevertheless, in CK, syllabification tends to be a criterion in establishing the domain of ω. While syllabifications takes place across all the stems +affixes and compounds that constitute ω as in (28) and (25) above.

(28)

a. xɨzɨm + ɑ.ja.ti [xɨz.mɑ.ja.ti]'kinship'
relative + state

b. dɑɾ + stɑn [dɑ.ɾɨs.tɑn]'forest'
tree + place

c. raʃ + a + bɑ [ra.ʃa.bɑ] 'storm'
black + vowel + wind

The examples in (28) show that (re)syllabification occurs within the morphological elements constitute ω. It also passes to clitics that do form part of the maximal ω as in (29). (See §5.6.1 for the recursive ω as a domain of re-syllabification)

(29)

a. qa.ˈɫam + ek [qa.ˈɫa.mek]'a pen'
Pen + INDEF

b. ta.ˈmɑ. ta + ɨm [ta.mɑˈ.tam]'my tomato'
tomato + 1SG.POSS

Thus, the phonotactic constraints that make reference to ω such as (24) and (25) and the (re)syllabification rules (28) and (29) clearly make reference to ω but the domain of their application cannot be informative to the size of ω in the sense that they cannot pin down the exact size of ω.

5.5 Prosodic Word as Bearer of Prominence

Stress is widely regarded as a dependable diagnosis for establishing the domain of ω: the importance of stress to ω is not only uses it as a domain and refers to its existence, but also it is the phonetic/phonological ground that defines ω. As Nespor and Vogel (1986:112) explain, ‘the phonological word is equivalent within which stress is assigned.’ Namely, every ω has only one primary stress. In CK, a ω must bear only one primary stress consistently on its right edge. So, stress assignment can identify the exact size of ω. As a rule, regardless of the number of the syllables, stress in CK falls on the last syllable of the word as shown below (also see the data in §4.2.1).

(30)

a.	ta.ˈɬa	‘trap’
b.	χan.ˈʤaɾ	‘dagger’
c.	gaw.ˈɾa	‘big’
d.	ta.mɑ.ˈta	‘tomato’
e.	qa. ɬam.ˈdɑn	‘pencil sharpener’
f.	pan.ʤa.ˈɾa	‘window’
g.	ʧɑ.ˌpa.ma.ˈni	‘publication’
h.	ʧɑ.ˌwar.wɑ.ˈni	‘waiting’
i.	ʃɑ.ˌɾa.wɑ.ˈni	‘municipality’

As for derivational affixes (both prefixes and suffixes) which create complex words, still the final syllable of the composite is stressed as in (31a, b) for suffixes and (31c, d) for prefixes.

(31)

a.	dɨ.ˈɾeʒ + i long + SUF	⟶	dɨ. ɾe.ˈʒi ‘length’
b.	nuk.ˈta + bɑz joke + SUF	⟶	nuk.taˈbɑz ‘joker’
c.	nɑ.ˈχoʃ PREF + pleasant	⟶	‘unpleasant’
d.	be + ˈhes PREF + strength	⟶	be.ˈhes ‘weak’

Derivational affixes behave quite regularly as far as stress assignment is concerned. No irregularities are found or reported in the literature as to the placement of stress. Irrespective of the weight of the syllable, right edge derivational and inflectional[23] suffixes attract stress. CK nouns are inflected for definiteness, number and person. Similar to derivational suffixes, most inflectional suffixes take the word stress. Plural marker (*an*) and definite marker (*aka*) receive word stress.

(32)

a. ˈkur + ɑn ⟶ ku.ˈrɑn'boys'
   boy + PLU

b. qa.ˈłam + aka ⟶ qa.ła.maˈka 'the pen'
   pen + DEF

Adjectives may take the same suffixes as nouns, but they also take the comparative suffix (tɨɾ) 'more' and the superlative suffix (tɨ.ɾin) 'most' which take word stress.

(33)

a. ˈbaʃ + tɨɾ ⟶ baʃ.ˈtɨɾ 'better'
   good + SUF

b. ˈχe.ɾa + tɨ.ɾin ⟶ χe. ɾa. tɨ.ˈɾin 'fastest'
   fast + SUF

The generalization that can be made from stress assignment so far is that stem + affixes can be within the domain of ω. However, indefinite marker and agreement marker clitics, in contrast to other inflectional suffixes, are unstressable.

(34)

a. qa.ˈłam + m ⟶ qa.ˈła.mɨm 'my pen'
   pen + 1SG

b. qa.ˈłam + ek ⟶ qa.ˈła.mek 'a pen'
   pen + INDEF

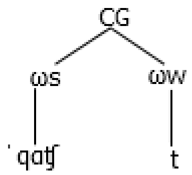
c. ˈqɑʧ + t ⟶ ˈqɑ.ʧɨt 'your leg'
   leg + 2SG

---

[23] As far as I know, Inflectional prefixes do not exist in CK.

As for clitic exception, it has been dealt with in two different ways: first, as Hayes (1989[1984]) suggests and Nespor and Vogel (1986:145) adopted the idea, it forms different ω. It is within a different prosodic constituent with their ω host, i.e. the Clitic Group (CG) as shown below.

(35)



Nespor and Vogel's account, here, tends to be against two of their basic principles they propose. First, given that ωs dominate foot and foot is usually a branching constituent, ωs should be minimally either bi-moraic or disyllabic, depending on whether they are composed of moraic or syllabic feet. The clitic in (35) cannot be bi-moraic or disyllabic and therefore violates SLH they advocate. Second, in Nespor and Vogel (1986), the domain of syllabification is ω not a clitic group whereas most clitics in CK induce obligatory re-syllabification and fuse with the adjacent ω.

Another approach to the exceptional behaviour of the clitics is through weakening of the SLH. Itô and Mester (2003[1992]) suggest prosodic parsing can be non-exhaustive. One of the examples they cite for non-exhaustivity[24] of parsing is the adjunction of sub minimal elements such as clitics to ω. This suggestion seems to work better than the clitic group for reasons mentioned above (see §5.6.1 for why it works better for CK).

Stress placement on compound words, similarly to simple (underived) words, is on the last syllable of the second component, i.e. stress is on the final syllable of the second stem. Therefore, stress assignments show homogeneity in all the main types of compounds (also see § 4.2.1.3 for more examples on stress on compounds).

24 The term 'Non-exhaustivity' later replaced by 'level skipping' by Ito and Mester 2009. A level skipping configuration constitutes a violation of the constraint 'Exhaustivity'.

In the first type of compounds, the components are linked without any linkers. The stress is on the last syllable of the modifier such as.

(36)

a. bɑ.ˈɫɑ + ˈbaɾz ⟶ bɑ.ɫɑˈbaɾz ‘tall’
   height + high
b. taχ.ˈta + ˈraʃ ⟶ taχ.ta.ˈraʃ ‘blackboard’
   board + black
c. ˈdɑɾ + χuɾ.ˈmɑ ⟶ dɑɾ. χuɾ.ˈmɑ ‘date palm’
   tree + palm
d. ʔɑ.zɑ.ˈdi + χʉ.ˈwɑz ⟶ ʔɑ.zɑ.di. χʉ.ˈwɑz ‘freedom fighter’
   freedom + seeker

In the second type of compounds, the components are linked with the vowel -a- where the modifier precedes the modified noun.

(37)

a. ˈpɑʃ + a + ˈroʒ ⟶ pɑ.ʃa.ˈroʒ ‘future’
   after + a + day
b. ˈraʃ + a + ˈbɑ ⟶ ra.ʃa.ˈbɑ ‘storm’
   black + a + wind

Finally, coordinate compounds are linked by the coordinator /u/ ‘and’ such as.

(38)

a. ˈdaŋ + u + ˈbɑs ⟶ da.ŋu.ˈbɑs ‘news’
   sound + CONJ + subject
b. ˈkɑɾ + u + ˈbɑɾ ⟶ kɑ.ɾu.ˈbɑɾ ‘business’
   work + CONJ + state

It should be noted that not all two stems in CK linked by a coordinator /u/ form a compound. The examples in (38) are lexicalised to compounds due to high frequency of collocation.

In a derived word where more than one affixes is attached to the stem, i.e. multi-morpheme words, the position of primary stress depends on the nature of the affixes. Primary stress is usually on the last stressable suffix. The linear order of suffixes attached to the stem in CK is in such a way as the suffixes attract stress to themselves are adjacent to the stem while unstressable suffixes (clitics) are more peripheral —they are at the right edge of the stressable suffixes.

(39)

a. sew + aka + ˈɑn + ɨm 'my apples'
   apple + DEF + PL + 1SG

b. qałam + aka + ˈɑn + ɨt 'your pens'
   pen + DEF + PL + 2SG

If all the attached suffixes to a stem are stressable, then, stress is attracted to the last stressable suffix (as in 40a and 40b). Stressable suffixes attached to compound words also attract stress (as in 40c).

(40)

a. be + hez + aka + ˈɑn 'the weak'
   PREF + strength + DEF + PL

b. dar + stɑn + aka + ˈɑn 'the forests'
   tree + SUF + DEF + PL

c. dɨł + ʃɨ.kɑw + aka + ˈɑn 'the heart-brokens'
   heart + broken + DEF + PL

The (36–40) examples demonstrate that the domain of ω comprises (prefix + stem + (stem) + suffixes) which are precisely equal to the terminal element of a syntactic tree. Thus far, the morphological structure that constitutes a ω corresponds to a terminal element of a syntactic tree, —head of a phrase. Although Nespor and Vogel (1986:110) do not exclude occasional isomorphism; they argue that the most compelling argument for the existence of prosodic hierarchy independent from the morphosyntactic structure is the non-isomorphism of the two structures. However, evidence for the existence of prosodic hierarchy in the grammar hinges upon the (morpho)phonological processes that refer to it not to its size vis-à-vis morphosyntactic hierarchy.

Another important inference that can be drawn from the set of examples cited above is the fact that ω consists of at least one foot. To be specific, regardless of the morphological component of the ω, there is at least one primary stress that forms the head of the ω along with optional feet to the left of the head. This complies with the two basic inviolable principles of prosodic hierarchy—layeredness and headedness. As for the other two violable principles of prosodic hierarchy, i.e. non-recursivity and exhaustivity, their violation hinges upon the morphological components of ω.

The phonological processes of nasal assimilation, final devoicing and phonotactics that make reference to ω are in consonance with the domain of ω determined by stress assignment. There are two indications that [prefix + stem + (stem) + suffixes] comprise single ω. First, in these morphological constructions, similar to single underived words, there is only one primary stress. Stress on the morphological elements that bear stress (before the formation of the composite) is demoted to the exclusion of the final syllable of the compound. Second, stress in the derived constructions fall on the final syllable of these complex constructions—they respect the same well-formedness condition on the position of stress.

5.6 Deriving Prosodic Word from Morphological Elements

The domain of prosodic units cannot be identified by the number of segments or syllables, neither by the number of rules that use the ω as the domain of their application. So, the best option to identify the size of prosodic units—after determining their edges— is to compare them to morphosyntactic categories. Selkirk (1978[1981]) states that one of the basic conditions for any prosodic unit is the syntactic domain within which these well-formedness conditions are met. That is, the size of prosodic units is measured by the morphosyntactic elements. This, in turn, developed to The Match Theory which states that each constituent in prosodic structure has a corresponding designated constituent in syntactic structure, and it is defined in relation to it. Match Theory argues that prosodic units are isomorphic to morphosyntactic units. Any instance of non-isomorphism between morphosyntactic and prosodic units is attributed to constraints on the size and well-formedness of prosodic units.

Ladd (2008:289), on the other hand, argues that syntax-prosody mapping is not a definition of prosodic structure. Rather, it is a hypothesis or prediction(s) about the correspondence of prosodic structure with the morphosyntactic structure which is an independently definable structure. He stresses the importance for each prosodic domain types to have phonetically explicit definitions suggesting that each category to be determined by their edges based on the phonetic behaviour of each edge.

However, it is the relation between morphosyntactic and prosodic structure that justifies an independent prosodic structure. Logically, grouping stretches of speech into independent prosodic structure is redundant if the morphosyntactic structure can serve as the domains of all the phonological processes whether these domains have phonetically explicit cues or not. Thus, the mapping of syntactic and prosodic structure justifies the prosodic structure and also explain the relation between them. Constituents can easily be measured by morphosyntactic materials once their edges are determined. As mentioned above, a constituent cannot be identified by the number of segments or syllables. The easiest way to identify a prosodic constituent is to compare it with morphosyntactic constituents. Moreover, the pauses and phonetic cues are usually observed at the edges of higher prosodic constituents (φ, ι). Since the biggest prosodic constituent addressed in this thesis is ω, apart from stress, no other phonetic cues are found to mark the edges of ω. CK has poor distribution of pitch accent, no pitch variation is also observed at the edges of ω.

In Nespor and Vogel's (1986) relation-based prosodic phonology, ω is equal or smaller than the terminal node of a syntactic tree. They argue that due to an assortment of morphological constituents (stems, affixes, compounds) that can be sensitive to mapping rules, there are several options available for the definition of ω. Their definition of the mapping possibilities include the options listed below.

(41) Domain of Prosodic Word

a. The domain of ω is terminal element of the syntactic tree (Q)[25], or

b. The domain of ω consists of:

i. a stem;

[25] Apart from the occasional exceptions where terminal element of a syntactic tree is phonologically null, for example, when it is a tense feature, the terminal element of a syntactic tree is a morphological word whose constituents must always occur together, in a fixed order and have conventionalised coherence and meaning (Revithiadou 2011).

ii. any element identified by specific phonological and or morphological criteria;
iii. Any element marked with the diactric [+ω].

c. Any unattached element within (Q) form part of the adjacent ω closest to the stem; if no such ω exists; they form a ω on their own.

The definition in (41) makes some predictions that work well for CK. For instance, no single stem can be mapped into more than one of ω. More importantly, as the examples in (40) show, the prediction that in a language in which ω includes both members of a compound, there will be no affixes or sequence of affixes that form independent ω.

However, the empirical facts from CK contradict two basic principles of Nespor and Vogel's definition of ω shown in (41). First, ω in CK is isomorphic to element of morpho-syntactic structure; in this case, it is equal to the terminal element of a syntactic tree, i.e. the head of a phrase XP. Since any lexical phrase head, whether a single stem or a compound, is the bearer of a primary stress which in turn corresponds to a single ω. Second, promoting unattached elements (clitics) to ω such as the examples in (39) has repercussions in CK. This structure encounters some problems including the promotion of an unstressed element to prosodic word (see next section for a detailed account of parsing function words).

Selkirk (1986), on the other hand, argues that the syntax-phonology mapping can be defined simply by reference to the edges of syntactic constituents. One of the arguments she uses to support *edge-based theory* is the fact that main word stress is always assigned by an *end rule* and the stress rule needs to know about ends of domains. Selkirk's proposal is that the edge of syntactic and prosodic constituents must be aligned. The co-occurrence of the left or right edges of syntactic and prosodic constituents is evaluated separately. There is parametric variation on whether left or right edges of syntactic and prosodic constituents align. Later, Selkirk (1996) puts edge-based theory into an OT analysis using violable alignment constraints. Edge-based theory only considers languages which provide a phonological diagnostic for one of the edges of the prosodic domain in question.

At first glance, edge-based theory seems to work properly for CK in various ways. In ω consisting of only stems whether single stem as simple words or double stems as in compounds, the right edge of ω matches the right edge of the morphological word.

Moreover, function words are not identified as content words and so do not count in the mapping with syntax. A careful examination, however, reveals that this algorithm is problematic as well. The problem lies in selecting only one of the edges of syntactic constituents by prosodic constituents of a particular language. Given the noun suffixes at the right edge of stems that encliticise to their host, we predict that the CK ω should align to the right edge of syntactic terminal nodes ω [Right Xº]. Based on the right edge parameter, prefixes are expected to encliticise to the preceding ω, but they do not. Prefixes also attach to the following phonological word and hence the left edges of syntactic and prosodic word align [Left Xº]. It seems the alignment of both edges should be satisfied as shown below.

(42)

a. be + hez + aka 'the weak'

PREF + STEM + DEF

b. ALIGN-L (X, ω) be + *ω(stem suffix)

c. ALIGN-R(X, ω) *ω(prefix stem) + suffix

As seen in (42 b and c), the choice of the alignment of one edge of the syntactic constituent with the prosodic unit over the other results in ungrammatical structure. Another departure from the edge-based mapping and Hayes (1989[1984]) and Nespor and Vogel's (1986) relation-based mapping as well, is violating or weakening of the SLH which is defined by (Selkirk 1984:26) as 'a category of level *i* in the hierarchy immediately dominates a (sequence of) categories of level i-1.' The basic assumption of SLH is non-recursivity and exhaustivity of prosodic categories (see next section).

Recently, Selkirk (2011) reviews two basic arguments for the departure from the previous relation between syntax and prosodic structure. First, the fact that standard prosodic theory reiterated SLH had the consequence of giving the properties of prosodic categories that are completely different from that of syntactic constituent structure. A second argument for a distinct prosodic category from syntax is based on the supposed generalisation assumed by the literature in the 1980s (Nespor and Vogel 1986 Selkirk 1986) on prosodic phonology that phonological domains are systematically non-isomorphic to syntactic constituents.

So far, the analysis of the morphosyntactic constituent that corresponds to ω in CK encounters two basic problems. First, what is the status of a clitic (*fnc*) that encliticizes to a ω. Second, while it is established that the terminal element of a syntactic tree corresponds to [ω], what is the status of complex constructions? Each one of these two questions can be approached in different ways that has typological and conceptual basis in the literature. As for the prosodic integration of functional elements to the lexical host, widespread similar problems are found cross-linguistically as in Danish, Dutch, English, French, and Japanese among others (Selkirk 1996; Itô and Mester 2009).

To sum up, departure from syntactic constituents, through both SLH and non-isomorphism to syntax, was a strong motivation for prosodic constituents in standard prosodic phonology. However, this view changed gradually by first weakening SLH (Itô and Mester 2003[1992]; Vogel 1999) then aligning edges of syntactic and prosodic constituents (Selkirk 1996) until it culminated in Selkirk's (2011) Match Theory which argues for keeping the syntactic constituency in prosodic structure. CK data shows that a ω matches the head of a syntactic phrase and hence support Match Theory. §5.6.2 investigates the syntax-prosody interface at the word level and shows how CK data behaves in relation to Match Theory. It explains how Match Theory accounts for the interface of complex constructions such as compound with prosody. But first, 5.6.1 reviews the literature on prosodisation of function words in the light of CK data.

5.6.1 The Status of Function words in Prosodic Words

Typically, a morphosyntactic phrase (S-structure) consisting only of lexical items is prosodised as a sequence of prosodic words in phonological representation (P-structure).

(43)

S-structure	[Lex Lex]
P-structure	((lex)ω (lex)ω)φ

The prosodisation of the clitics exhibits a different behaviour from that of the lexical items of the host element in terms of stress assignment; the incorporation of *fnc* into the prosodic structure exhibits variation. While each lexical ω carries stress, clitics, on the other hand, bear no signs of prominence nor do they trigger any stress change on their stem hosts. This section explains the prosodic position of the *fnc* which are outside the domain of ω.

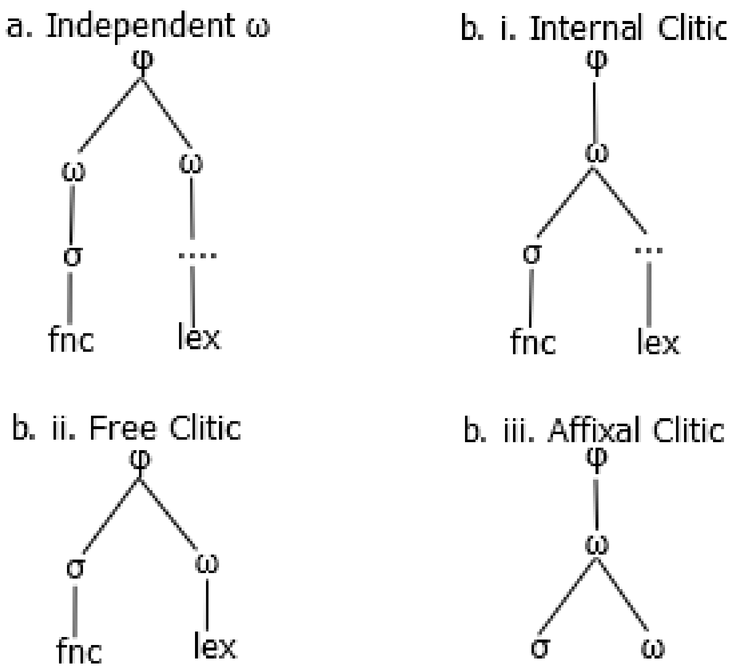
There has been much controversy in the literature on how to incorporate clitics into the prosodic structure. One approach to deal with *fnc* in prosody is to regard the [ω + *fnc*] as a separate independent category known as Clitic Group (CG) (Hayes 1989[1984]; Nespor and Vogel 1986; Vogel 1999; 2009).

Nespor and Vogel (1986:141), as stated in (41), argue for the promotion of clitics into independent ω. However, unstressability of clitics and violation of foot binarity soon rules out the prosodic wordhood of clitics. These strong arguments led Vogel (1999:258) to acknowledge that certain types of syllables cannot be parsed into ω and this poses major problem for SLH. She proposes modifying the SLH by abandoning the exhaustivity principle. Vogel argues that CG, as a prosodic constituent, dominates the monosyllabic clitics by skipping the intermediate levels of ω and Foot. She cites intervocalic /s/ voicing, a prosodic word level process in northern varieties of Italian which does not apply when intervocalic /s/ occurs between a light syllable prefix and a prosodic word. Vogel uses the absence of application of intervocalic /s/ voicing in prefixes with hosts as an argument for another prosodic constituent namely CG. Later, Vogel (2009:15) also states that excluding CG from the prosodic hierarchy will have a number of undesirable consequences such as the loss of flat structure that distinguishes phonological from morphosyntactic structure of grammar and the loss of a constituent as a linguistic string defined on the basis of particular properties. Her argument for CG is based on having a constituent in prosodic phonology that is different from other components of grammar rather than the requirement of prosodic or phonological rules of grammar.

Nevertheless, as Peperkamp (1996: 104) explains, categories in prosodic phonology are motivated by the fact that they consistently constitute the domain of application of phonological rules but clitics are not incorporated into prosodic constituent structure in a uniform manner. If a phonological process applies between proclitic and host but not between host and enclitic that means CG as a prosodic constituent is not available. In Vogel's (1999) case, for example, prefixes are outside the domain of ω while suffixes are inside it. Data from CK shows that *fnc* can form a prosodic clitic either internal or affixal based on their phonological behaviour (see 44 below).

As mentioned above, *fnc* adjacent to ω cannot form independent ω as the phonological processes that make reference to lexical ω cannot make reference to a putative *fnc*- ω. In addition, forming a ω from unattached clitics by overlooking the foot structure results in violating SLH and constraints on constituent well-formedness. On the other hand, Selkirk's (1996) Lexical Category Condition holds that 'Constraints relating syntactic and prosodic categories apply to lexical syntactic elements and their projections, but not to functional elements and their projections, or to empty syntactic elements and their projections'. So, the big question here is how to integrate *fnc* into the prosodic hierarchy? Selkirk (1996) proposes that *fnc* may be prosodised in four different ways: the *fnc* is an *independent ω* as in (44a) or it is a *prosodic clitic* that has one of these three forms: the *fnc* fully incorporates into the lexical word to form a [ω], i.e. is an *internal clitic* (44bi) or adjoining the *fnc* directly to the Phonological Phrase φ (overlooking the foot and [ω]), i.e. is a *free clitic* (44bii) or the *fnc* adjoins to the ω, i.e. is an *affixal clitic* (44b iii).

(44)



While the structures above obviate CG as a prosodic constituent, they assume the recursivity and non-exhaustivity of prosodic structure as in (44bii, 44biii). There is broad consensus amongst researchers (see Selkirk 1996, 2009, 2011; Itô and Mester 2009; Kabak and Revithiadou 2009) that the first two options discussed so far, i.e., promoting a *fnc* word to a ω or fully integrating it with ω is not well-formed. However, researchers disagree whether to adjoin the *fnc* word to the ω or the phonological phrase (44bii, 44biii). The attestation of recursivity and non-exhaustivity in some languages in contrast to the inviolable principles of headedness and layeredness shows that SLH is no longer a monolithic requirement but it is reduced to its more basic components. Selkirk (1996) loosens and compartmentalises the SLH of prosodic constituents from strict to weak. She states that the SLH of the prosodic categories of a language should not be taken as one unit; rather, they should be factored out into more primitive component constraints, each with an independent status in the grammar. While layeredness (smaller constituents cannot dominate bigger ones) and headedness (a constituent must dominate at least one immediately lower category) are universally inviolable, the non-recursivity (level repeating) and exhaustivity (level skipping) of the prosodic units should be subject to parametric variation of languages based on ranking the constraints.

A number of cross-linguistic studies are divided in choosing between free clitic and affixal clitic. Selkirk (1996) for English and Serbo-Croatian, Hall (1999) and Kabak and Schiering (2006) for German regard the *fnc* to be a free clitic attached to the phonological phrase as in (44bii). Selkirk (1996) opts for φ-attached structure for English proclitics based on the domain of aspiration. She argues that the left edge of ω is the domain of aspiration, yet prepositions with voiceless stops are not aspirated. Selkirk takes this to exclude prepositions to be part of ω and hence should be attached to phonological phrase. Here, Selkirk implicitly claims the left edge of ω in English to be the domain of aspiration. On the other hand, Peperkamp (1996) for Neopolitan (Italian dialect), Booij (1996) for Dutch and Kabak and Revithiadou (2009) present evidence for the affixal clitic status of the *fnc* —it adjoins to the ω. The fact that researchers' analyses of different languages resulted in bifurcation of choice between free clitic and affixal clitic gives the impression that parametric variation is the main decision maker.

Nevertheless, Itô and Mester (2009:164) argue for the universality of the affixal clitic status of *fnc*. They present counter evidence for the free clitic status of *fnc* in English by convincingly arguing that aspiration cannot be the litmus test for marking the left edge of ω as voiceless plosives at the left edge of some ωs such as *today, tonight* and *tomorrow* flap instead of being aspirated. Further, they argue that the strength of the boundary rather than category-specific speculations is responsible for aspiration. Instead, they show that the recursivity of ω results in a structure with two edges and each can serve as a domain of certain distinct processes. Thus, aspiration is not the hallmark for ω, but it could clearly mark the beginning of a structural unit with a crisp edge property (45a) while non-crisp edges can be the domain of flapping (45b). Crisp edge is used here to mean the strength of a boundary which allows or blocks some phonological processes in contrast to a non-crisp edge.

(45)

As for the recursivity and hence size of units within the prosodic phonology, ωs and larger prosodic units do not have intrinsically defined shapes. In OT terms, a No-recursivity constraint is violated when it interacts with higher ranking constraints such as syntax-prosody alignment constraints and constraints on the size of the prosodic units such as foot or word binarity.

Now the question is how *fnc* in CK fare with regard to the structures in (44). As explained in (§5.5), most inflectional and derivational morphemes can attract stress and hence can be internal to ω. As for unstressable clitics, their small size (violation of foot and word binarity) rules out promoting them to independent prosodic words as in (44a) which gives too much weight to the prosodically deficient *fnc* words[26]. Unstressability, in contrast to stressable affixes, rules out classifying clitics internal to prosodic words as in (44bi) which gives too little weight to the clitics. So, they can be prosodised as either free clitic (44bii) or affixal clitic (44biii) which allows recursivity of ω. The choice of either of them hinges upon the phonological processes and theory neatness.

Data from CK supports the recursivity of ω (adjunction of ω 46a), in contrast to φ-attachment (46b) which violates SLH principles of exhaustivity and non-recursivity. CK ωs can nest in another ω when a clitic is enclitisised to a host at one of its edges.

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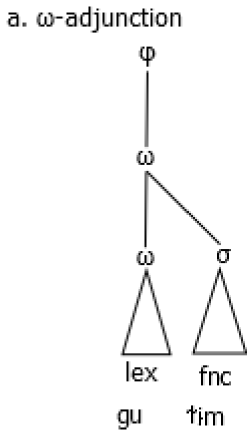
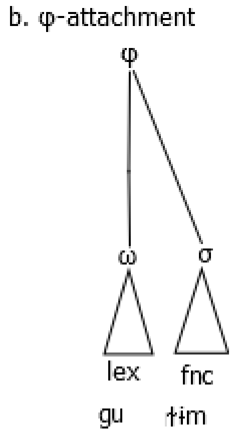
[26] The *fnc* in (46) does not violate foot and word binarity due to re-syllabifying the coda of the stem to the onset of the *fnc* and hence inserting an epenthesis to form a CVC syllable. However, in stems ending with vowels, the clitic is only a single stem as in *ʃa* + *m* ‘king + my’.

(46)





What are the determining factors in CK for preferring the (46a) structure over (46b)? Since there are two ωs in (46a) — the minimal one that immediately dominates only the lexical word and the maximal projection of ω that dominates both the lexical and the *fnc* — there should be phonological processes that refer to each of them. As phonological processes such as final devoicing, nasal assimilation, weight preservation and stress refer to minimal ω, there should be phonological processes that make reference to maximal ω. Syllabification is one process that makes reference to the maximal projection ω. As explained in (§5.4), syllabification occurs across domains larger than minimal ω such as that in (46b). In other words, if ω is the domain of syllabification, we should adopt (46a) as the stem+ clitic syllabifies within the higher ω. Otherwise, as shown in (46b), ω cannot be the domain of syllabification. Thus, ruling out a recursive prosodic word results in losing the generalisation of the domain of syllabification in CK. (46a), which maps to affixal clitic in (44b.iii), shows that a prosodic constituent of a certain type (ω in this case) dominates another constituent of the same type, that is, a recursive order of the constituent. It also shows that a constituent of one type is permitted to skip intermediate levels and dominate a constituent of more than one level lower in the prosodic hierarchy, —non-exhaustivity.

While the *fnc* above are to the right edge of the lexical words, the relation of the functional words to the lexical words, as Selkirk (1996) explains, can be from any edge. In the case of CK, *fnc* can be at either edge: clitics and suffixes internal to ω are to the right of the lexical word while prepositions are to the left. The edge variation of functional words lies in the interfaces of phonology-morphosyntax interface. Itô and

Mester (2009) formulate the following relevant interface constraint for the mapping between morphosyntactic constituents and [ω].

(47)
LEX-TO-ω (L/R): ALIGN (Lex, Left/Right, ω, Left, Right)

Every lexical word is left/right aligned with a prosodic word.

Other constraints also involve in choosing the optimal candidate. Based on Prince and Smolensky's (2004[1993]) constraint family of PARSE–element, Itô and Mester (2009) propose a constraint family of prosodic parsing PARSE-INTO-X which requires every element of the terminal string to be parsed at X level.

The function words that are not parsed violate PARSE-INTO-X. As far as clitics in CK is concerned, PARSE-INTO-F (insert a violation mark for every syllable not parsed into foot) competes with LEX-TO- ω (R) shown in (48).

(48)

/qa.ła.mɨt/ 'your pen'	LEX-TO- ω (R)	PARSE-INTO-F
☞ a. [(qa.ła)ω mɨt ω]		*
b. [(qa.ła.) (mɨt)ω]]	*!	

The inevitable consequence of ranking LEX-TO-ω(R) higher than PARSE-INTO-F is the violation of EXHAUSTIVITY. The tableau in (48) accounts for the status of CK clitics but does not show how the winning candidate is chosen in relation to the other options in (44). The first choice in (44), i.e. giving clitic the status of an independent ω violates the highly ranked constraint LEX-TO-ω(R) and as explained above, clitics in CK cannot be given the status of ω. The second option, namely, amalgamation of the clitic into ω is also unacceptable as stress is ω-final, while clitics are unstressed and beyond the domain of ω. In addition, fully incorporating clitics into ω violates LEX-TO- ω (L/R), as no prosodic edge marks the right edge of /*qa.ła.mɨ*t/.

While the tableau in (48) rules out clitics as independent prosodic words or internal clitics, it does not give insight between free clitic and affixal clitic. The stressless indefinite marker, however, clarifies the position. /ek/ is unstressed only if there is a ω to attach to (49a). What is interesting about the behaviour of indefinite marker is that when it attaches to a monosyllabic noun, it receives stress to form a disyllabic ω with the monosyllabic word attached to as in (49b).

(49)

a. qa.ˈɬa.<mek> ‘a pen’

b. /ʒɨ.ˈnek/ a woman

The indefinite marker makes a crucial distinction between monosyllabic and multisyllabic words. I take this to suggest that the indefinite marker needs a ω to use it as a host. If the host is not available[27], the function word fully incorporates with the lexical word by receiving stress. In OT terms, the case of the indefinite marker clitic shows that highly ranked constraints on alignment edges are violable if constraints on prosodic well-formedness are at stake. As the coda of /ʒɨn/ re-syllabifies to the onset of the following clitic /ek/, it results in a stressed function word /ʒɨ.ˈnek/. The light syllable /ʒɨ/ cannot form a foot and hence a ω. So, satisfying the high ranking ONSET triggers violation of the constraint that requires the lexical word to be right aligned with the ω. PARSE-INTO-F, on the other hand, requires both syllables to be parsed into the foot.

(50)

[ʒɨnek]	ONSET	FT-BIN	LEX-TO- ω(R)	PARSE-INTO-F
☞ a. [(ʒɨ.ˈnek)ω]			*	
b.[(ˈʒɨn)ω]ekω]	*!			*
c.[(ʒɨ) (nek)ω]		*!	*	
d. ʒɨ.nek				*!*

Candidate (50a) is optimal as it satisfies the high ranking constraints ONSET, FT-BIN (the foot and the prosodic word are bi-syllabic) and PARSE-INTO-F as all the syllables are

[27] Through re-syllabification, the coda of the lexical word re-syllabifies into the onset of the *fnc* leaving a light syllable behind for the [ω]. The left over lexical word cannot stand as [ω] for many reasons, violation of FT-BIN is one of the reasons.

parsed into foot. (50b) is ruled out as the second syllable lacks onset and not parsed into foot but attached to the maximal ω. In (50c), the light syllable violates foot binarity while (50d) vacuously satisfies the high ranking constraints as it is not prosodised, but it incurs multiple violation of PARSE-INTO-F and other constraints that require a grammatical word to be equal to a prosodic word. Comparing tableau (50) with the tableau (48) supports the argument that *fnc* in CK is an affixal clitic. In (50a) an unstressable *fnc* becomes an internal clitic to form a well-formed foot as it does not have a ω to lean on. While in (48), a ω is enough for the *fnc* to use it as a host in order not to become the internal clitic to the lexical word. What is obvious here is that the *fnc* does not become internal clitic if a ω is available and does not require a φ to be parsed.

It is time to revisit the central question asked in this thesis, do we need an independent prosodic structure in CK as far as ω is concerned? The domain of phonological processes in (§5.2–§5.6) cannot be any morphological constituent (stem, affix). As for the syntactic word (terminal element of a syntactic tree), it is less straightforward to identify what constitutes terminal element of a syntactic tree: for example whether projections of functional categories are regarded as syntactic word. Selkirk (1996) argues that only the projections of lexical categories are visible to syntax prosody mapping constraints. Elfner (2012:4), on the other hand, argues that what is relevant is the phonological overtness of the morphosyntactic elements rather than the lexical/functional distinction. The latter proposition seems to work for CK. Although they are functional categories, polysyllabic prepositions are phonologically visible (attract stress) and therefore visible to the syntax prosody mapping (see §4.2.1).

Assuming the invisibility of monosyllable functional categories to syntax-prosody mapping, ω is equal to a terminal node of a syntactic tree. Simple words (single stems) and compounds (two stems whether linked by a vowel or not) constitute the head of a phrase. The two components of compounds together form the terminal node of a syntactic tree.

So, it would be redundant to assume an independent prosodic structure if syntactic constituents can serve as the domains of all phonological processes. However, if there are phonological processes that cannot apply within the morphosyntactic domains, a distinct grammatical system is needed. These phonologically conditioned constraints, such as the size of a certain phonological constituent, define the relation between syntactic and prosodic structure.

The winning candidate in (50) answers the radical question of do we really need a structure for prosodic phonology independent from syntax? According to the (supra)segmental processes that use prosodic word as the domain of their application in (§5.2–§5.6), a prosodic word corresponds to a terminal element of a syntactic tree (morphological word). In other words, the prosodic constituent reflects morphosyntactic structure. The fact that the prosodic structure shows some similarity to syntactic structure (recursivity, branching, constituency) and morphosyntactic representation often matches the prosodic structure tempted some researchers (Odden 1995; Pak 2008; Samuels 2009) to argue that an independent prosodic structure is redundant. However, there are cases where morphosyntactic domains cannot match the domains of certain phonological rules. The prosodic word [(ʒɨ.ˈnek)ω] in (50) does not match any morphosyntactic constituent in CK. So, when the prosodic well-formedness is at stake, prosodic elements mismatch morphosyntactic representation. This justifies prosodic structure (independent from syntax) and shows its indirect relation with morphosyntactic structure.

The attachment of function words to the phonological phrase or their adjunction to a prosodic word is a central issue in determining the nature of prosodic structure. The adjunction of function words to ω reflects the recursive nature of the ω. Prosodic words and larger prosodic units do not have a defined shape that precludes their recursivity and they should be formed maximally; it is phonology-morphosyntax constraints that govern their size. The recursivity of a prosodic constituent depends, to a large extent, to ranking of the constraints especially NO-RECURSION in relation to constraints of phonology-morphosyntax interface. Selkirk (1996) puts forward a morphosyntactic view towards recursivity in prosody. She suggests that nested morphosyntactic structures, especially the structures that include a lexical with an adjacent functional word, are mirrored in phonology. This means, as Kabak and Revithiadou (2009) explain, that recursion is not an inherent property of phonology, but rather the by-product of its interface with morphosyntactic component of grammar.

Apart from NO-RECURSION, other constraints involve and compete in choosing the optimal candidate. In the case of a ω in CK which contains a clitic adjacent to the lexical word, the constraints that ban recursion are NO-RECURSION and LEX-TO-ω(R) which are ranked below the constraint that requires clitics to be stressless. The unstressability of clitics in CK can be attributed to a constraint proposed by Itô and Mester (2009:188) HEAD-TO-LEX which requires prosodic heads to be contained in lexical word. The constraints that require every segment in different levels to be parsed are ranked below. These constraints stem from EXHAUSTIVITY—no level to be skipped which is present in all the levels of the prosodic category. This can be divided into a set of constraints: the relevant constraints here are PARSE-INTO-F and PARSE-INTO-ω as shown in the tableau below.

(51)

[lex qała] [*fnc* mɨt]	HEAD-TO-LEX	LEX-TO-ω(R)	PARSE-INTO- ω	PARSE-INTO-F	NO-RECURSIO
a.[φ[ω(qa.ła)ω][ω (mɨt) ω] φ]	*!	*			
b.[φ [ω (qa.ła.) mɨt ω]		*!		*	
☞c.[φ[ω[ω(qa.ła)ω] mɨt ω]				*	*
d. [φ[ω(qa.ła) ω] mɨt φ]			*!	*	

The ranking in (52a) is not optimal due to violating the highly ranked constraint HEAD-TO-LEX, since the head of the second ω is contained in a function word. Fully incorporating the clitic to ω in (52b) violates LEX-TO- ω (L/R) as no prosodic edge marks the right LEX-edge of /*qa.ła.mɨt/*. Adjoining the clitic to the ω in (52c) violates two constraints of PARSE-INTO-F and NO-RECURSION, however, it is the optimal candidate as it incurs the least violation compared to competing candidates. PARSE-INTO-F is violated to satisfy a high ranking constraint, i.e. HEAD-TO-LEX, while violation of NO-RECURSION is not fatal as it is the lowest ranking constraint. Finally, attaching the functional word to the phonological phrase- skipping two levels- violates EXHAUSTIVITY which includes both PARSE-INTO-ω and PARSE-INTO-F. Thus, recursive ω is the optimal candidate.

In summary, data from CK show that the prosodisation of unstressable *fnc* can be explained by adjoining them to a recursive ω, i.e. affixal clitic in contrast to the alternative options such as promoting them to a ω in a Clitic Group constituent or attach them to the φ in the form of a free clitic. It was also shown that when the well-formedness of ω is at stake, it does not match the morphological word.

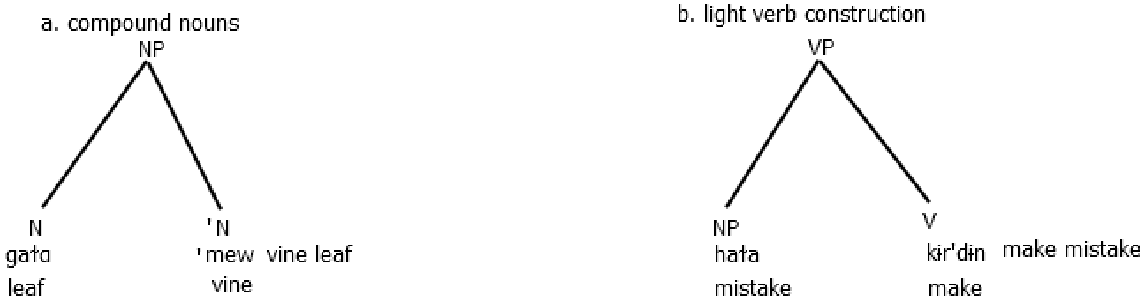
5.6.2 The Status of Complex Constructions

Some complex constructions in CK that correspond to single ω require special treatment to account for the mapping of phonology-morphosyntactic components. These complex constructions include compound nouns and light verb constructions which are complex predicates with a preverbal noun followed by a semantically empty lexical verb. The verb is the head of the construction. The complex constructions project an X° bearing the same category label as at least one of its sisters. What is common of these types of construction is recursivity of one of the elements as shown in (52a) for compound nouns and (52b) for light verb constructions. The construction in (52b) is an example of embedding two prosodic words within another prosodic word. This is because the stress on individual morphemes is retained in the complex constructions while the main stress is typically on the right edge. This construction cannot be taken as phonological phrase for two reasons. First, stress is on the right edge similar to other prosodic words. Second, the phonological phrase is left-headed in contrast to prosodic word which is right-headed. In contrast to the finality of stress on ω, stress in CK verb phrase is left-headed, i.e. on the first syllable of the verb phrase. Verbs in CK conjugate for tense and negation in the form of prefixes: *da* for present tense and *na* for negation. Tense and negation markers attract stress (52 a and 52 b). Further, when the same verb is conjugated for both tense and negation, the negation marker, which is left most, attracts stress (52 c). I assume CK verb phrase to correspond to a phonological phrase.

(52)

(a) ˈroʃt ‘he/she went’ ˈda.roʃt ‘he/she was going’
(b) ˈroʃt ‘he/she went’ ˈna. roʃt ‘he/she did not go’
(c) ˈroʃt ‘he/she went’ ˈna.da. roʃt ‘he/she was not going’

(53)



The kind of structure in (53) poses a problem for the domain and definition of ω and has been given different correspondence in the prosodic hierarchy. Some researchers propose two levels of ω. Vigário (2010), for example, argues for a prosodic domain located between ω and φ (the Prosodic Word Group-PWG) for compound-like expressions. However, the bifurcation of any prosodic category[28] into two other sub-categories has been refused for at least two reasons. First, it is against one of the basic principles of prosodic phonology known as Syntax-Prosody Mapping Hypothesis (SPMH). SPMH, according to Itô and Mester (2013), holds that 'each constituent in prosodic structure (above the rhythmically defined foot) has a corresponding designated constituent in syntactic structure, and is defined in relation to it.' Nevertheless, PWG and sub-prosodic constituents have no morphosyntactic correspondent like other categories. Second, the prosodic sub-categories are not instantiated and supported cross-linguistically. More importantly, the structures in (53) along with a ω that consists of only a lexical word or a lexical and a *fnc* are not the domain of different phonological rules from ω to be given different category names. In CK, they are all the domain of stress assignment.

Another way to deal with the kind of construction in (53) is Selkirk's (2009, 2011) *Match Theory*. The tendency of prosodic categories to recursivity has led Selkirk to think of having categories similar to syntax by proposing Match Theory. After re-analysing the nature of the relation between syntax and prosody in Xitsonga, a Bantu language, Selkirk has found that Xitsonga displays evidence that goes contrary to the

[28] Sub-categories of phonological phrases have also been reported in literature. Intermediate vs. accentual phrase in Japanese has been argued for by Pierrehumbert and Beckman, 1988, among others).

SLH, particularly recursivity and exhaustivity. She regards these properties as a result of a new theory of the syntactic-prosodic constituency relation that calls for a match between syntactic and prosodic constituent. This understanding leads to the Match Theory of syntactic-prosodic constituency correspondence.

One more piece of evidence for the groundedness of the prosodic structure in the syntax is the existence of distinct prosodic domain types corresponding to clause, phrase and word. Match Theory proposes a set of universal match constraints calling for the constituent structures of syntax and phonology to correspond. That is, *Match Clause* calls for matching between a syntactic clause with an intonational phrase, *Match Phrase* calls for equal correspondence between phonological phrase and a syntactic phrase. Finally, the *Match Word* constraint calls for morphological word (terminal element in the syntax tree) to be matched by a corresponding prosodic word. It should be noted here that the relation between the (supra)segmental rules of phonology and the syntactic constituents is indirect through the prosodic constituents.

Thus, instead of the co-occurrence of the right or left edges of syntactic and prosodic constituents, Match Theory proposes the co-occurrence of both edges of syntactic constituents with their prosodic correspondents. It proposes that the correspondence of syntactic and prosodic constituents is governed by violable family of syntax-prosody correspondence. These constraints, under the OT framework, call for one-to-one correspondence between syntactic constituents of certain types (word, phrase, clause) and prosodic constituents (ω, φ, ι).

(54)

a. Match Theory (Syntax to Prosody faithfulness)

MATCH(LEX, ω): The left and right edges of a constituent of type α in the input syntactic representation must correspond to the left and right edges of a constituent of type π in the output phonological representation.

b. Match Theory (Prosody to Syntax faithfulness)

MATCH(ω, LEX):The left and right edges of a constituent of type π in the output phonological representation must correspond to the left and right edges of a constituent of type α in the input syntactic representation.

At the same time, phonological markedness constraints on prosodic structure may lead to violations of *Match Constraints* and produce instances of non-isomorphism between syntactic constituency and phonological domain structure. Earlier, Nespor and Vogel (1986) and Ladd (1986) proposed isomorphism between syntactic clause and intonational phrase. Later, Itô and Mester (2003[1992]) call for weakening the layer hypothesis and in (2007); they argue that prosodic structure has formal properties more similar to syntactic structure than previously thought. But such a unified theory as Match Theory which includes all the domains (ω, φ, ι) and establishes correspondence between syntactic and prosodic constituents was not formally established until Selkirk (2011).

Selkirk (2009) argues that the grammar allows the fundamental syntactic distinction between clause, phrase and word to be reflected in, and retrieved from, the phonological representation. So, if the prosodic constituents (above the foot) are grounded in the syntactic structure, what is the motivation for the prosodic structure? Selkirk explains that phonological domains can be independent from syntactic structure if phonological markedness constraints on prosodic structure clash with and rank higher than constraints that call for match between syntactic and prosodic constituents. In the case of light verb constructions in (53b), although the two lexical items—a preverbal noun and a semantically empty verb—form an XP (= syntactic maximal projection), they represent a prosodic word in the prosodic structure. The two lexical items usually each parsed into a distinct ω but belong to the same prosodic word. This is the violation of the MATCH PHRASE constraint which requires each syntactic phrase (XP) must be matched by a phonological phrase φ. So, VP[(N) (V)]VP is realised as ω((ω) (ω))ω in the prosodic representation.

Some well-formedness and interface constraints compete with Match constraints to produce the optimal candidate. The constraint that requires sister nodes in prosodic structure belong to the same prosodic category is called EQUALSISTERS (Myrberg2013).

(55) EQUALSISTERS Sister nodes in prosodic structure are instantiations of the same prosodic category.

EQUALSISTERS, in turn, competes with MATCH (XP, φ) which requires the syntactic phrase in (53b) to correspond to a phonological phrase. However, as noted above, the syntactic phrase of light verb construction is a recursive prosodic word. As the syntactic constituent does not match its regular type in prosody, it is violated and should be ranked lower than EQUALSISTERS as shown in tableau (56).

(56) Ranking constraints for a light verb construction

[[ha.ła][kɨɾdɨn]]XP mistake make	EQUALSISTERS	MATCH(LEX, ω)	MATCH(ω, LEX)
☞a. ((ha.ła)ω (kɨɾdɨn)ω)ω		*	*
b. ((ha. ła)ω(kɨɾdɨn)ω)φ	*!		

Candidate (56a) shows that the markedness constraint EQUALSISTERS is ranked higher than the MATCH constraints that call for correspondence between syntactic and prosodic constituents. The tableaux (50 and 56) demonstrate that the prosodic word, although it often matches a syntactic word, it can have its well-formedness requirements and, hence, independent existence.

This chapter has demonstrated segmental and supra-segmental rules that clearly make reference to ω in CK. Nasal Assimilation, final devoicing, CL and Phonotactic rules are some of the segmental rules that apply within the domain of ω. More importantly, ω is the domain of prominence. It is stress that pinpoints the size of ω in relation to morpho-syntactic structure which is equal to the terminal node of a syntactic tree.

After assessing the common theories of prosodic phonology with respect to the prosodic word level in the light of CK data, it has been demonstrated that *fnc* will be attached to ω rather than being attached to phonological phrase or become independent ω. This result comes at the expense of loosening SLH by introducing RECURSIVITY and NON-EXHAUSTIVITY.

Chapter 6: Conclusions

This thesis has examined the small categories (ω and below) of CK prosodic structure. The central question addressed is that whether there are phonological representations that serve as the domain of application of phonological processes. Namely, are there prosodic constituents that serve as the domain of applying phonological processes? The relation between prosodic constituents —hierarchically organised or otherwise— is also tested. A logical development of answering the former questions in positive is what the nature of these constituents is and how they are formed? How the data generated in this thesis fares in relation to the sub-theories developed in the field? The thesis aims to give a precise description of CK prosody of categories below phonological phrase. In the light of CK data, the thesis also tests the arguments advanced in the area of prosodic phonology.

The data and analysis appear to suggest that phonological processes are sensitive to the prosodic constituents. They also show that the prosodic structure below phonological phrase is hierarchically ordered, i.e. non-terminal constituents consist of at least one lower constituent. This proves the hypothesis made in the introduction that prosodic constituents serve as the domain of phonological processes and are hierarchically arranged. In addition to establishing a phonemic inventory of the language under study, certain interesting findings have been made when it comes to details of the CK prosodic structure. It was shown that mora, though crucial to the phonology to CK as a weight measuring unit, it is not a prosodic constituent. Syllable weight divides rhythm and prosodic morphology into two different realms; CK data shows that sensitivity to syllable weight is process-specific rather than language-specific. In other words, syllable weight is insensitive to some phonological processes and sensitive to prosodic morphology. Syllable as a prosodic constituent, on the other hand, can serve as the domain of some segmental and supra-segmental processes.

The rhythmic structure (distribution of stress) is accounted for by grouping stressed and unstressed syllable into a prosodic constituent—foot. Morphological processes also make reference to foot as a prosodic category. Foot structure, which has final prominence, is maximally binary on a syllable level (σˈσ) otherwise binary on a moraic level ($ˈ\sigma_{\mu\mu}$) and parsing of syllables into foot is leftward. This distribution of stress and its insensitivity to syllable weight makes foot type in CK *Syllabic Iamb*. The Foot in CK is *Syllabic* in the sense that the foot template normally counts syllables without making reference to the internal structure of the syllables and it is an *Iamb* in the sense that stress is on the right hand syllable in every foot. This foot type is a departure from Hayes (1995) foot typology which divides foot into three types (Syllabic trochee, Moraic trochee, Iamb). Crucially, CK is an addition to a few other languages that fill the asymmetrical gap of iambic systems with syllable weight insensitivity.

As for ω, there is overwhelming evidence corroborating its status as a prosodic category above foot. ω, which represents the interaction between the phonological and morphological components of the grammar, serves as the domain of several phonological processes. The domain of ω is between two primary stresses, i.e. each primary stress identifies the right edge of a ω which maps to the terminal node of a syntactic tree. The analysis of CK data demonstrates that the formation of ω can be recursive when its morphological components include unstressable clitics. It also shows that Match Theory (Selkirk 2011), in contrast to other theories of prosodic phonology, can handle the interface of ω with morphosyntactic structure.

The contribution of this thesis is twofold. First, it is hoped that it has filled the gap in the work of the prosodic system of CK and on CK phonology as such. In addition to tackling the main research question, this study has investigated a broad area in the phonology of CK which has never been addressed before. The contributions include observing unreported segmental processes such as nasal assimilation, final devoicing and identifying the locus of the application of such rules. The second contribution, which is more theoretical in nature, assesses the basic claims of prosodic phonology (Selkirk 1978; Nespor and Vogel 1986) against a different view which argues against constituency in phonology. The findings from CK concerning the prosody-morphosyntax interface support the prediction of Match Theory which argues that prosodic categories are syntactically grounded.

OT through its three sets of constraints (faithfulness, markedness, alignment) and with the available constraints in the literature (apart from some minor modifications), can adequately account for the CK data and analyse the relation between input and output forms. In opaque cases where parallel OT (and other versions of OT) cannot account for, Stratal OT can aptly handle the CK data. Therefore, this thesis adopts Stratal OT to handle opaque phonological processes such as CL and interaction between stress and epenthesis where parallel OT is powerless to explain.

Despite the contributions of this thesis mentioned above, this thesis has not addressed the phonetic evidence that identify edges of prosodic constituents. As the right edge of foot and ω are usually more prominent than the left edge, it is expected that phonetic analysis tools (such as Praat) to mark the right edge of the constituents. Another limitation of this study is its exclusion of the prosodic constituents that interface with syntax, i.e. phonological phrase φ and intonational phrase ι. Nevertheless, further research can tackle these limitations.

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Appendix A: Formant Frequencies for the CK vowels by Five Male speakers

Formant frequencies in (HZ) for the front high vowel /i/

Word list		M1		M2		M3		M4		M5	
		F1	F2	F1	F2	F1	F2	F1	F2	F1	F2
1	siɾ	275	2073	279	2256	315	1215	269	989	731	954
2	si	267	2253	261	1711	366	2194	292	2245	379	1526
3	pis	258	2292	309	1487	289	2212	303	1497	380	1600
4	pit	262	2300	289	1491	293	1735	271	2315	327	2255
5	limo	271	2401	309	1264	315	1313	301	1125	331	2020
6	si.mɨ ɾx	308	2315	475	2000	336	1248	306	1073	463	1830
7	mɨ. ɾiʃk	341	1974	330	1443	306	2087	244	1708	355	2029
8	nisk	342	2485	262	1117	331	1376	304	1003	414	729
9	pis.ka	322	1651	262	1189	322	2052	283	1521	557	1756
10	bist	350	1995	271	1430	350	1271	282	1457	376	1991
11	siɾ	270	1642	265	1361	269	1754	292	2423	307	1428
12	kɨlil	303	2073	285	1847	274	1771	274	1771	323	2073
13	ʃiɾ	262	2181	292	2392	301	2238	301	2238	331	2244
14	pit	268	1810	289	2365	300	2100	300	2100	310	1697
15	lik	287	2097	261	1979	252	1716	323	2354	296	2053
Mean		292.4	2102.8	296	1688.8	308	1752	289.6	1721	392	1745.6

Formants frequencies in (HZ) for the mid front vowel /e/

Word list		M1		M2		M3		M4		M5	
		F1	F2	F1	F2	F1	F2	F1	F2	F1	F2
1	me	489	1745	452	1476	503	1961	461	1009	507	1997
2	fel	521	2007	380	1673	515	1661	487	1245	498	1800
3	ʃet	504	2077	458	1146	494	1728	511	2394	502	1801
4	me.bɑz	549	2179	626	1849	470	1884	487	1869	562	1880
5	me.wuʒ	540	1437	537	1999	444	1396	437	1822	528	1949
6	meʃk	455	2275	562	1202	568	1715	518	1488	532	1953
7	ʧeʃt	477	2050	513	1804	500	1474	517	1918	533	1980
8	penʤ	511	2000	531	1016	486	1847	513	1933	508	1976
9	ʤe.gɑ	490	1965	493	1873	423	1836	454	1845	488	1979
10	rek.xɨrɑw	573	1849	556	951	470	1253	519	1512	578	1462
11	pek	552	2185	460	1483	472	1914	530	1067	498	1704
12	pest	470	2008	480	1383	484	1511	492	1913	498	1734
13	ʃer	486	2253	480	1966	491	1853	480	1887	530	1891
14	rek	552	1802	528	1512	539	1589	469	1543	606	1841
15	leɫ	558	2153	436	1861	592	1490	561	1296	461	1929
Mean		515	1999	499.46	1546	496.73	1674	495.7	1649	522	1858

Formants frequencies in (HZ) for the open-mid central vowel /a/

Word list		M1		M2		M3		M4		M5	
		F1	F2	F1	F2	F1	F2	F1	F2	F1	F2
1	ka	633	1772	619	1194	608	1729	591	1711	649	1438
2	da	660	1838	742	1560	873	1702	538	1626	633	1532
3	dam	734	1654	557	1132	591	1427	511	1504	636	1596
4	bard	636	1731	612	946	754	1787	532	1426	614	1517
5	qap	696	1572	698	1197	789	1433	645	1070	688	1331
6	ʧak	627	1785	553	1566	670	1572	508	1234	647	1540
7	ta.la	684	1305	777	1126	706	1114	581	1077	632	1037
8	ta.la	710	1380	684	1197	633	1118	579	1084	675	1183
9	dast	608	1755	553	1205	518	1662	505	1689	579	1552
10	haʃ.tɑ	586	1636	713	1726	609	1525	549	1564	623	1450
11	ʃap.qa	606	1451	651	1239	561	1337	571	1310	639	1391
12	ʃap.qa	722	1395	724	1259	834	1307	580	1254	701	1298
13	ta.mɑ.ta	359	1329	789	1644	685	1362	528	1093	670	1456
14	ta.mɑ.ta	650	1620	787	1524	766	1484	571	1504	613	1565
15	ʧapɨk	596	1695	736	1945	578	1353	514	1187	607	1430
Mean		633.8	1594.5	679.6	1364	678	1460.8	553.5	1355.5	640	1421

Formants frequencies in (HZ) for the back high vowel /u/

Word list		M1		M2		M3		M4		M5	
		F1	F2	F1	F2	F1	F2	F1	F2	F1	F2
1	mu	348	713	397	795	320	736	291	708	230	664
2	du	359	877	319	886	307	947	278	718	467	902
3	lut	370	903	342	959	351	967	269	1189	398	892
4	ʤut	354	908	333	1009	352	1171	279	1186	433	1153
5	puʃ	340	773	330	853	329	902	310	918	431	840
6	put	365	689	327	856	364	1018	340	931	403	836
7	puxt	455	985	409	937	408	981	410	843	453	843
8	kurt	410	1230	405	1140	339	1385	338	1194	448	1037
9	kurd	421	1243	388	1126	356	1402	377	1261	409	911
10	nuʃ.ta	362	1279	339	951	486	1333	278	1012	458	1312
11	guł	418	966	474	853	454	937	431	830	437	763
12	gul	364	1085	374	997	352	1139	335	1043	428	972
13	kur	429	1001	459	936	445	1115	401	957	453	890
14	kul	409	1158	392	977	395	1362	362	1023	394	934
15	quł	370	725	417	681	323	809	338	686	439	817
Mean		385	969	380	930	372	1080	335.8	966.6	418.7	917.7

Formants frequencies in (HZ) for the back low vowel /ɑ/

Word list		M1		M2		M3		M4		M5	
		F1	F2	F1	F2	F1	F2	F1	F2	F1	F2
1	kɑ	771	1342	671	1137	702	1316	675	1374	651	1266
2	ʔɑw	757	1345	715	1196	773	1307	643	1312	699	1186
3	ʃɑ	741	1322	686	1129	756	1168	547	1057	680	1279
4	ʃɑr	749	1414	769	1263	858	1251	609	1010	679	1325
5	qɑʧ	697	1400	770	1245	807	861	642	1136	701	1277
6	bɑʃ	695	1445	779	803	783	1549	617	1028	687	1256
7	pɑk	738	1434	779	1134	789	1244	656	1258	698	1279
8	sɑt	751	1513	740	770	802	1484	632	1029	668	1348
9	lɑt	746	1522	783	1668	711	998	607	1400	696	1306
10	ʔɑst	776	1468	782	804	844	1544	620	1354	721	1315
11	mɑst	837	1469	800	1254	818	1417	573	1019	679	1123
12	pɑra	715	1484	763	1169	778	1476	636	1218	686	1276
13	pɑʒna	712	1501	795	1434	782	1056	587	1227	680	1250
14	ʧɑɫ	742	1300	735	1038	884	1175	598	1028	711	1055
15	sɑɫ	739	1337	775	1169	738	1095	627	1034	683	1082
Mean		744	1419.7	756	1147.5	788	1262.7	617.9	1165.6	687.9	1241.5

Formants frequencies in (HZ) for the back mid vowel /o/

Word list		M1		M2		M3		M4		M5	
		F1	F2	F1	F2	F1	F2	F1	F2	F1	F2
1	do	530	1117	480	942	512	999	481	896	468	941
2	ko	495	1008	460	817	502	990	431	848	508	920
3	doł	500	1027	498	850	500	952	514	907	540	915
4	Pol	496	919	513	962	479	877	462	1013	509	931
5	roʒ	539	1037	508	959	537	941	500	968	573	943
6	ron	538	1039	570	926	516	1033	518	920	457	997
7	nok	554	1116	542	1000	542	1092	427	1014	604	1013
8	top	569	1099	571	924	551	972	531	938	577	907
9	ʃox	556	1132	495	964	550	1011	556	1037	553	913
10	giłop	554	1018	505	923	496	973	533	923	524	948
11	dost	541	1188	492	1007	499	1077	502	1013	556	952
12	goʃt	507	1114	483	1051	496	1103	465	969	461	922
13	nozda	458	1210	504	1043	550	1125	523	1252	642	1068
14	toła	569	1104	549	966	523	970	529	913	572	929
15	χoʃ	549	1215	467	854	482	922	470	996	530	847
Mean		530	1089.5	509	945.8	515.6	1002	496	973.8	538	943

Appendix B: Durational measurement for CK low vowels

Durational Measurement in millisecond for the vowel /a/

Word List		M1	M2	M3	M4	M5
		Length	Length	Length	length	Length
1	ka	0.142	0.156	0.153	0.163	0.181
2	da	0.164	0.169	0.163	0.132	0.191
3	dam	0.128	0.131	0.133	0.121	0.132
4	bard	0.101	0.181	0.122	0.129	0.119
5	qap	0.081	0.193	0.104	0.094	0.13
6	ʧak	0.082	0.102	0.1	0.092	0.124
7	**ta**.la	0.066	0.081	0.078	0.075	0.089
8	ta.l**a**	0.12	0.126	0.112	0.134	0.163
9	dast	0.107	0.105	0.128	0.113	0.113
10	haʃ.tɑ	0.175	0.093	0.087	0.081	0.093
11	ʃ**a**p.qa	0.187	0.1	0.075	0.088	0.085
12	ʃap.q**a**	0.131	0.126	0.119	0.134	0.143
13	**ta**.mɑ.ta	0.17	0.075	0.075	0.068	0.077
14	ta.mɑ.t**a**	0.126	0.116	0.125	0.126	0.144
15	ka	0.142	0.156	0.153	0.163	0.181
Mean		0.127	0.125	0.112	0.110	0.127

Durational Measurement in millisecond for the vowel /ɑ/

Word List		M1	M2	M3	M4	M5
		Length	Length	Length	length	Length
1	kɑ	0.259	0.261	0.263	0.273	0.22
2	ʔaw	0.218	0.197	0.227	0.224	0.175
3	ʃɑ	0.253	0.261	0.266	0.259	0.211
4	ʃɑr	0.222	0.207	0.221	0.233	0.187
5	qɑʧ	0.201	0.193	0.209	0.206	0.183
6	bɑʃ	0.199	0.222	0.204	0.196	0.194
7	pɑk	0.196	0.178	0.181	0.168	0.188
8	sɑt	0.195	0.221	0.182	0.167	0.195
9	lɑt	0.196	0.184	0.181	0.17	0.206
10	ʔɑst	0.144	0.147	0.152	0.148	0.191
11	ʔɑsk	0.142	0.135	0.1441	0.161	0.169
12	mɑst	0.128	0.144	0.144	0.1388	0.192
13	pɑra	0.182	0.181	0.142	0.164	0.186
14	pɑʒna	0.143	0.122	0.152	0.113	0.173
15	ʧɑɫ	0.19	0.17	0.167	0.175	0.194
16	sɑɫ	0.193	0.183	0.17	0.18	0.188
17	kɑɫ	0.194	0.175	0.184	0.143	0.163
Mean		0.191	0.1871	0.1875	0.1834	0.1891

Appendix C: Standard Deviation of Vowel Formants

	Vowels	F1	F2
1.	/i/	83	428
2.	/e/	42	333
3.	/a/	87	221
4.	/u/	55	182
5.	/ɑ/	70	184
6.	/o/	39	86