4-27-2015

An optimality-theoretic analysis of syllable structure in Qassimi Arabic

Sarah Soror Al Motairi

Follow this and additional works at: http://commons.emich.edu/theses

Part of the Linguistics Commons

Recommended Citation
http://commons.emich.edu/theses/612

This Open Access Thesis is brought to you for free and open access by the Master's Theses, and Doctoral Dissertations, and Graduate Capstone Projects at DigitalCommons@EMU. It has been accepted for inclusion in Master's Theses and Doctoral Dissertations by an authorized administrator of DigitalCommons@EMU. For more information, please contact lib-ir@emich.edu.
An Optimality-Theoretic Analysis of Syllable Structure in Qassimi Arabic

by

Sarah Al Motairi

Thesis

Submitted to the Department of English Language and Literature

Eastern Michigan University

in partial fulfillment of the requirements

for the degree of

MASTER OF ARTS

in

English Linguistics

Thesis Committee:

Beverley Goodman, Ph.D., Chair

T. Daniel Seely, Ph.D.

April 27, 2015

Ypsilanti, Michigan
Dedication

To My Parents
Acknowledgments

This thesis would not have been written without the assistance and encouragement I received throughout my graduate study in the Linguistics Program at Eastern Michigan University.

I am indebted, first and foremost, to my thesis advisor, Professor Beverley Goodman, for sharing her knowledge and expertise with me and for her continuous support of my phonology study and research. I am extremely grateful to Professor Goodman for her patience, enthusiasm, and sincere guidance throughout the process of writing this thesis. My research on syllable structure and related phonological phenomena would not have been pursued and finally presented in this thesis without her insightful discussions, valuable comments, and helpful guidance.

I would like also to express my sincere gratitude to the second reader on my thesis committee, Professor T. Daniel Seely, whose encouragement, stimulating questions, and helpful discussions have always inspired me and deepened my interest in exploring linguistics research.

My gratitude goes also to the rest of the faculty members in the linguistics program at EMU, especially my academic advisor, Professor Veronica Grondona, for her efforts in mentoring and assisting me.

I wish also to acknowledge the support of Professor Christine Neufeld, the director of graduate studies in the Department of English Language and Literature, who has helped and motivated me during my graduate studies at EMU.

Furthermore, I would like to recognize the support of Qassim University and the Ministry of Education in Saudi Arabia for granting me a full scholarship and providing me with this great opportunity to pursue my master’s degree in linguistics at Eastern Michigan University.
Finally, I owe my deepest gratefulness to my mother, Danah Al Ajaji, who, despite the great distance, has always been present during this challenging stage of my life with her love, support, prayers, and continuous encouragement. I am also thankful to my brothers, sisters, and friends for their love and spiritual support.
Abstract

This thesis examines syllable structure in Qassimi Arabic (QA), a Najdi dialect spoken in Al-Qassim region in Saudi Arabia. Syllable-related phenomena in QA have not been fully addressed and understood because QA has not received attention in the available literature on syllable structure within Arabic dialects. Thus, the present study aims to provide an analysis of syllable structure in QA and to contribute to the current research on Arabic syllable structure. Adopting the framework of Optimality Theory, this study explores the effect of high vowel deletion on syllable structure and the treatment of superheavy syllables in QA. Results confirm three main arguments proposed in this study. First: onset clusters in QA are prohibited. Second: trimoraic syllables in QA are prohibited. Third: the concept of contiguity, which prevents internal epenthesis into certain strings, accounts for both the site of the epenthetic vowel and the existence of non-final CVVC and CVCC syllables.
Abbreviations

1. Arabic Varieties:

CA  Cairene Arabic
CLA  Classical Arabic
IA  Iraqi Arabic
MA  Meccan Arabic
NA  Najdi Arabic
QA  Qassimi Arabic
TA  Tunisian Arabic

2. Constraints:

*[3µ]  No trimoraic syllables
*aCV  /a/ is not permitted in non-final open syllables
*CODA  Codas are not allowed
*COMP-COD  Complex codas are not allowed
*COMP-ONS  Complex onsets are not allowed
*FINAL-C-µ  The final consonant is moraless
*iCV  /i/ is not permitted in non-final open syllables
*PLATEAU-[N]σ  No final (Nasal + Nasal) sequences
*RISE-SON]σ  No coda clusters with rising sonority
MAX-A  /a/ should not be deleted
NSµ  No shared mora
O-CONTIG  No internal epenthesis
ONSET  Syllables must have an onset
**R-L/C-L**  
Left edge consonants are remotely licensed

**WBP**  
**WEIGHT-BY-POSITION:** Coda consonants are moraic
Table of Contents

Dedication ................................................................................................................................. ii

Acknowledgments ....................................................................................................................... iii

Abstract ........................................................................................................................................ v

Abbreviations .............................................................................................................................. vi

List of Tables ................................................................................................................................ xi

List of Figures ............................................................................................................................... xii

Chapter 1: Introduction and Background .................................................................................. 1

1.1 Introduction ............................................................................................................................ 1

1.2 Qassimi Arabic: Background ................................................................................................. 2

1.2.1 The place of Qassimi Arabic within Arabic dialects ......................................................... 2

1.2.2 General phonological background of Qassimi Arabic ....................................................... 5

1.2.3 Notes on data ..................................................................................................................... 9

1.3 Theoretical Background ......................................................................................................... 10

1.3.1 The syllable in phonological theory .................................................................................. 10

1.3.2 Syllable structure and syllable weight ................................................................................. 13

1.3.3 The syllable in Optimality Theory ..................................................................................... 16

1.4 Statement of the Problem ...................................................................................................... 21

1.5 Purpose of the Study .............................................................................................................. 22

1.6 Organization of the Thesis ..................................................................................................... 23

Chapter 2: Literature Review .................................................................................................... 24

2.1 Introduction ............................................................................................................................ 24

2.2 Previous Descriptive Studies on Syllable Structure in Qassimi Arabic ............................... 26
2.3 High Vowel Deletion and Syllable Structure in Qassimi Arabic ................... 28
2.4 The Treatment of Word and Phrase-final Coda Clusters ............................. 36
   2.4.1 Background .................................................................................. 36
   2.4.2 Word and phrase-final coda clusters in Qassimi Arabic ....................... 37
2.5 The Treatment of Superheavy Syllables: CVVC and CVCC ......................... 42
   2.5.1 Background .................................................................................. 42
   2.5.2 Previous studies on the behavior of superheavy syllables in Arabic
       dialects .............................................................................................. 43

Chapter 3: An OT Analysis of Syllable Structure in Qassimi Arabic .................... 56
3.1 Introduction ......................................................................................... 56
3.2 Possible Syllable Types and Their Distribution in Qassimi Arabic ............... 56
   3.2.1 Basic syllable types in Qassimi Arabic ........................................... 56
   3.2.2 Restricted syllable types in Qassimi Arabic ..................................... 58
3.3 Syllable Weight in Qassimi Arabic ....................................................... 64
3.4 An OT Analysis of Syllable Structure in Qassimi Arabic ............................ 69
   3.4.1 The ranking of basic syllable structure constraints in Qassimi
       Arabic ................................................................................................. 74
   3.4.2 High vowel deletion and initial onset clusters in Qassimi
       Arabic ................................................................................................. 77
   3.4.3 High vowel deletion and low vowel raising in Qassimi Arabic .......... 80
   3.4.4 Final CVVC and CVCC syllables in Qassimi Arabic ......................... 82
   3.4.5 Non-final CVVC and CVCC syllables in Qassimi Arabic .................. 87
3.5 Summary ............................................................................................. 94
Chapter 4: Conclusion and Suggestions for Further Research ........................................... 95

References ......................................................................................................................... 100
## List of Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Consonants Inventory of Qassimi Arabic</td>
<td>5</td>
</tr>
<tr>
<td>2. CV Syllable Structure Typology</td>
<td>17</td>
</tr>
<tr>
<td>3. Phrase-final Consonant Clusters in Arabic Dialects</td>
<td>37</td>
</tr>
<tr>
<td>4. Possible Syllable Types in Qassimi Arabic</td>
<td>56</td>
</tr>
</tbody>
</table>
## List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Vowels in Qassimi Arabic</td>
<td>8</td>
</tr>
<tr>
<td>2. Syllable-Internal Structure (Onset/ Rime Model)</td>
<td>14</td>
</tr>
<tr>
<td>3. Syllable-Internal Structure (Moraic Model)</td>
<td>15</td>
</tr>
</tbody>
</table>
Chapter 1: Introduction and Background

1.1. Introduction

This thesis aims to provide a constraint-based analysis of syllable structure in Qassimi Arabic (QA), a subgroup of Najdi Arabic, spoken by the sedentary population of the Al-Qassim region in Najd, Saudi Arabia. Adopting the framework of Optimality Theory (OT; Prince & Smolensky, 1993/2004), the present study tries to account for the distribution of possible syllable types and related syllabification patterns in QA. By examining QA’s syllable structure and related phonological phenomena, a ranking of the active constraints in QA will be proposed and the interaction between constraints will be illustrated.

Given the basic syllable structure constraints—ONSET, *CODA, *COMP-ONS, and *COMP-CODA (Prince & Smolensky, 1993/2004)—results from the present analysis show that QA exhibits the pan-Arabic undominated ranking of ONSET and lowest ranking of *CODA. However, while complex onset clusters resulting from vowel deletion seem to be tolerated, the present study argues that evidence gained from syllabification patterns in QA strongly suggests that *COMP-ONS must be inviolable in the grammar of QA, whereas the appearance of word or phrase final coda clusters with the appropriate sonority profile is permitted.

Moreover, the behavior of superheavy syllables of the shape CVVC and CVCC will be accounted for by illustrating the interaction between syllable well-formedness constraints and syllable-weight constraints with other relevant markedness and faithfulness constraints. The present study will show that both final and non-final superheavy syllables are bimoraic in QA, confirming the view that syllables in many Arabic dialects are maximally bimoraic (e.g., Broselow, 1992; Watson, 2007). Finally, the present investigation of the behavior of non-final superheavy syllables in QA illustrates that the grammar of QA utilizes a uniform treatment in
avoiding such syllables. In addition, the restricted cases where these syllables are tolerated will be addressed and explained.

The following sections provide background about QA by showing its place within Arabic dialects and giving a brief description of its phonological system. Then I provide a theoretical background on the syllable within phonological theory. Finally, this chapter concludes with the present study’s main problem, purpose, and organization.

1.2. Qassimi Arabic: Background

This section serves as background on QA. First, in section (1.2.1), I identify the type of this dialect by showing its place within Arabic dialects in general and within Najdi dialects in particular. Then, in section (1.2.2), I provide a brief description of its phonological system by discussing its sound inventory.

1.2.1. The place of Qassimi Arabic within Arabic dialects. QA is classified as a sedentary dialect, but like other sedentary Najdi dialects, linguistically it is of a Bedouin type. Within Najdi dialects, Ingham (1994) refers to “the speech of the sedentary population” such as the dialects of Central Najd and Al-Qassim regions, and “the speech of the main bedouin tribes of those regions” (p. 4). The distinction between the speech of the Bedouin tribes and the speech of the sedentary population in a given area of Najd is even reflected in the lay people’s perception of these dialects because for lay people, the term Qassimi dialect is used exclusively to designate the spoken language of the sedentary people. With this distinction in mind, the present study examines data from the speech of the sedentary people of Al-Qassim region, whereas the speech of the Bedouin tribes, whether they live in nomadic, rural, or urban areas in the Al-Qassim region, is not considered.
A brief sketch of the classification of Arabic dialects will be given here for three reasons. First, this will help us understand the place of QA within Arabic dialects in general and within Najdi dialects in particular. Second, it provides a unified reference for some terms that will be used throughout the present study such as Bedouin dialects and Najdi dialects. Third, it is critical for our understanding of the fact that QA exhibits some phonological phenomena that are found in Bedouin dialects such as those attested in Bedouin Hijazi Arabic. Thus, while QA is a sedentary dialect, linguistically, it is of the Bedouin type because it possesses the typical linguistic Bedouin features.

Generally speaking, two basic criteria are used to classify Arabic dialects: the geographical criterion (East-West dichotomy) and the ecological or demographic criterion (Sedentary-Bedouin dichotomy). Geographically, Arabic dialects are divided into Eastern and Western dialects. The Eastern dialects are composed of four groups: the dialects of the Arabian Peninsula (Saudi Arabia, Yemen, Kuwait, Oman, and the United Arab Emirates), the Mesopotamian dialects (Iraq), the Syro-Lebanese dialects (Syria, Palestine, Jordan, and Lebanon), and the Egyptian dialects (Egypt; Kaye & Rosenhouse, 1997; Versteegh, 1997). The Western dialects, on the other hand, represent one dialectical group called the Maghreb dialects, which are spoken in Libya, Tunisia, Algeria, Morocco, and Mauritania (Kaye & Rosenhouse, 1997; Versteegh, 1997).

As reviewed in Versteegh (1997), the dialects of the Arabian Peninsula are classified into four groups: the north-east Arabian dialects (Najdi dialects), the south-west Arabian dialects, the

---

1 See Cadora (1992) for a detailed ecolinguistic analysis of Arabic.

2 See Rosenhouse (2006, pp. 259-269) for a general overview of Bedouin dialects.
north-west Arabian dialects, and Hijazi dialects. The north-east Arabian dialects (Najdi dialects) include three subgroups: the ‘Anazi dialects, the Shammari dialects, and the Syro-Mesopotamian dialects. Given this classification of Najdi dialects, Qassimi Arabic belongs to the Shammari group (Johnstone, 1967a, 1967b).

It is important to highlight that the term *Najdi dialects* might be used with two references. The first is as a linguistic reference, and the second combines both linguistic and geographical references. The above-mentioned classification is linguistic-based because it labels all the three groups as Najdi dialects, whether or not they are spoken in or around the area of Najd in Saudi Arabia. A classification of Najdi dialects as they are spoken in Najd can be extracted from Ingham (1994) and summarized in the following four subgroups: central Najdi, northern Najdi, mixed northern-central Najdi, and southern Najdi. Within this classification, Qassimi Arabic represents the mixed northern-central Najdi dialect.

To sum up, two points are emphasized from the previous discussion. First, as a Najdi dialect, Qassimi Arabic belongs to the Shammari type and represents the mixed northern-central Najdi dialect. Second, whenever the term *Najdi dialects* is used in the present study, it designates Najdi dialects that are spoken in Najd, in Saudi Arabia.

When it comes to the second basic classificatory criterion, Arabic dialects are divided into Bedouin and sedentary dialects. While both Bedouin and sedentary dialects are present in all geographical areas in the Arab World (Rosenhouse, 2006; Versteegh, 1997), the distinction between Bedouin and sedentary dialects is not always clear in all areas since some dialects show mixed features (Kaye & Rosenhouse, 1997). This observation is particularly evident in the Arabian Peninsula, in which “all dialects including the sedentary ones exhibit Bedouin features” (Versteegh, 1997, p. 149).
In this study, we will see that while QA is a sedentary dialect, it shows typical Bedouin phonological features, not only in terms of its consonantal inventory but also in terms of its syllable structure and some related phonological phenomena such as high vowel deletion and vowel raising.

1.2.2. General phonological background of Qassimi Arabic. The information provided in this section about the consonant system, vowels, and diphthongs in QA draws upon the descriptive accounts of Johnstone (1967a, 1967b), Prochazka (1988), and Ingham (1994). In these works, documenting the sound inventory is generally based on describing the sound system of the dialects under consideration by using Classical Arabic (CLA) as a point of reference. Diachronic sound changes have been proposed in some cases, as we will see in the following description of the consonants, vowels, and diphthongs of QA.

1.2.2.1. Consonant inventory. The table below illustrates the consonant inventory of QA.

Table 1: Consonants Inventory of Qassimi Arabic

<table>
<thead>
<tr>
<th></th>
<th>Bilabial</th>
<th>Labio-dental</th>
<th>Inter-dental</th>
<th>Dental</th>
<th>Alveolar</th>
<th>Palatal</th>
<th>Palatal</th>
<th>Velar</th>
<th>Labio-velar</th>
<th>Uvular</th>
<th>Pharyngeal</th>
<th>Glottal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stop</td>
<td>b</td>
<td>t</td>
<td>d</td>
<td>k</td>
<td>g</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emphatic Stop</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fricative</td>
<td>f</td>
<td>θ</td>
<td>δ</td>
<td>s</td>
<td>z</td>
<td>j</td>
<td>χ</td>
<td>ν</td>
<td>h</td>
<td>Ꙧ</td>
<td>ꙧ</td>
<td>h</td>
</tr>
<tr>
<td>Emphatic Fricative</td>
<td>δˤ</td>
<td>sˤ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affricate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>dʒ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nasal</td>
<td>m</td>
<td></td>
<td></td>
<td></td>
<td>n</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquid</td>
<td></td>
<td>l</td>
<td>r</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glide</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>j</td>
<td>w</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Like in other Najdi dialects, the voiced velar stop /g/ is the reflex of CLA voiceless uvular stop /q/. The realization of Classical /q/ as /g/ is said to be one of the key phonological features that characterize Bedouin dialects in general (Rosenhouse, 2006; Versteegh, 1997). Ingham (1994) includes /q/ in his proposed inventory of the Najdi system, noting that it occurs in borrowings from CLA. Holes (2004) has also reported that /q/ enters the phonological systems of many Arabic dialects through direct borrowing from Modern Standard Arabic (MSA); however, phonologically, the quality of the vowels in borrowed words with /q/ may reflect dialectical norms of pronunciation. Examples (1.a-c) represent some of MSA’s borrowings that enter Arabic dialects.

1) /q/ in borrowings from MSA: (Holes, 2004, pp. 82-83)
   a. /θaqaafa/ ‘culture’
   b. /ʔiqtis‘aad/ ‘economy’
   c. /waaqiʕiyy/ ‘realistic’

   In QA, like in any Najdi dialect, /q/ occurs in Classical borrowings, as example (2.a) shows. QA also exhibits Holes’s (2004) general observation about the dialectical use of /q/ in borrowings from MSA, as shown in the examples in (3).

2) Classical borrowings in Qassimi Arabic:
   a. /ʔigra –l-qurʔaan/ ‘Read the Quran!’ (Quran = Muslims’ Holy Book)

3) MSA’s borrowings in Qassimi Arabic:

<table>
<thead>
<tr>
<th>MSA</th>
<th>QA</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>/θaqaafa/</td>
<td>[θaqaafih]</td>
<td>‘culture’</td>
</tr>
<tr>
<td>/qaanuun/</td>
<td>[qaanuun]</td>
<td>‘law’</td>
</tr>
<tr>
<td>/waaqiʕiyy/</td>
<td>[waaqiʕi]</td>
<td>‘realistic’</td>
</tr>
</tbody>
</table>
Another aspect of the consonantal system of QA is the occurrence of the alveolar affricates [ts] and [dz] as allophonic variants of the velar stops /k/ and /g/, respectively. This allophonic variation usually appears in the environment of front vowels, although some exceptions have been reported (see Johnstone, 1967a, 1967b).

4) Alveolar affricates in Qassimi Arabic:
   
   a.  
      
      tsiðb  ‘lying ; telling a lie’

   b.  
      
      χirdzih  ‘a piece of cloth’

In addition to these consonantal variations, the voiced interdental emphatic “pharyngealized” fricative /ðˤ/ can be described in terms of historical sound change. Unlike CLA, which has a voiced interdental emphatic “pharyngealized” fricative /ðˤ/ and a voiced dental emphatic “pharyngealized” stop /dˤ/, QA has only the voiced emphatic fricative /ðˤ/, as Table 1 shows. As Ingham (1994) explains, in Najdi Arabic, this sound is a result of the merger of the dental pharyngealized stop /dˤ/ and the interdental pharyngealized fricative /ðˤ/.

1.2.2.2. Vowels and diphthongs. As shown in Figure (1), the vowel system of QA includes three short vowels and five long vowels. With its three short phonemic vowels—i, a, and u—QA maintains the traditional triangular three-vowel system of Arabic, but it exhibits a five-vowel system with respect to its five long vowels: ii, aa, uu, ee, and oo. The new long vowels /ee/ and /oo/ occur in non-final positions, corresponding to the diphthongs /aj/ and /aw/ in CLA, respectively (Johnstone 1967a, pp. 2-3; Prochazka, 1988, p. 18).
Figure 1. Vowels in Qassimi Arabic

However, the phonemic status of the two high short vowels is controversial because the appearance of /u/ as a contrastive phoneme is limited to one environment, that is, before /h/ (see Lehn, 1978, p. 326). The common view is that a merger of the Classical short vowels /i/ and /u/ into /i/ has occurred in QA, limiting the appearance of the phonemic short /u/ to a few nouns and some pronominal forms such as -uh ‘his/him’, -hum ‘they/their/them’, and -kum ‘your/you (m. pl.)’ (Johnstone, 1967a, p. 4; Prochazka, 1988, pp. 17-18). One of the possible analyses provided in Lehn (1978) is that in QA, the non-contrastive occurrence of [i] and [u] on the surface can be phonetically attributed to the effect of the consonantal environment. This is because [u] usually appears in the environment of emphatics and [i] elsewhere. Thus, in non-contrastive cases the underlying phoneme is /i/, which is realized as [u] when adjacent to emphatic consonants and as [i] elsewhere. However, a thorough investigation of the phonemic status of short vowels goes beyond the scope of the present study, and an examination of such controversial issues will be left for future research.

In addition to short and long vowels, two diphthongs are attested in QA. These are /aj/ and /aw/. As mentioned earlier, the long vowels /ee/ and /oo/ occur non-finally in QA, corresponding to CLA’s diphthongs /aj/ and /aw/ respectively. The appearance of the diphthongs /aj/ and /aw/ in QA, on the other hand, is restricted to final open unstressed syllables, usually
corresponding to CLA’s final long vowels /ii/ and /uu/, respectively (Johnstone, 1967a). The following examples illustrate vowels and diphthongs in QA.

5) Short vowels in Qassimi Arabic:
   a. [galb] ‘heart’
   b. [lbs] ‘clothes’
   c. [bin.tuh] ‘his daughter’

6) Long vowels in Qassimi Arabic:
   a. [dʒdaar] ‘wall’
   b. [ha.līib] ‘milk’
   c. [nuur] ‘light’
   d. [sˤoom] ‘fasting’
   e. /sˤeed/ ‘hunting’

7) Diphthongs in Qassimi Arabic:
   a. [gaa.law] ‘they (m.) said’
   b. [ʔir.gaj] ‘go upstairs! (f.s.)’

It should be mentioned at this point that the descriptive documentations of QA have also given some details about allophonic realizations of /a/ and /aa/, especially when adjacent to emphatics; however, since the main goal of the current section is to provide a basic phonological background of QA before analyzing its syllable structure, such details are not of significance to the major focus of investigation.

1.2.3. Notes on data. I would like to make two notes regarding data cited in the present study. First, reference to any piece of data cited from another work will be directly indicated. If no reference is given, the data belong to the author of the present study, who is a native speaker
of QA. Second, any data, whether cited or provided by the author, are transcribed in IPA symbols (see Table 1). Data that are cited from other works have been carefully re-transcribed using IPA symbols for sake of consistency and accuracy. The symbols used to transcribe consonants are those given in Table 1. Long vowels are transcribed as (VV) in the present study, so cited examples that originally use the symbol (V:) or (V̄) are replaced with (VV).

1.3. Theoretical Background

In this section, the theoretical background adopted in this thesis will be provided. The first subsection gives an overview of the notion “syllable” and its significance in phonological theory. The second subsection concerns itself with syllable internal structure and syllable weight and concentrates on moraic theory in particular. This approach to syllable weight serves as an essential tool in the present study. Finally, a brief discussion of the syllable in OT will be covered.

1.3.1. The syllable in phonological theory. The basic awareness of the syllable as a linguistic unit can be demonstrated in the ability of native speakers to count the number of syllables in their language. Studies on the role of the syllable in phonological theory (e.g., Blevins, 1995; Khan, 1976; and many others) have taken native intuitions about the existence of the syllable as a plausible piece of evidence to support the status of the syllable as a phonological unit, especially in a theory that seeks to account for the phonological knowledge of native speakers.

Cairns and Raimy (2011) observe that arguments around the existence of the syllable and problems about defining the syllable and identifying its nature have existed since the introduction of the syllable in the scientific discourse. They suggest that the significance of the syllable differs within different areas of phonetic, phonological, and even psycholinguistic
research, and therefore, a unified definition of the syllable that satisfies all these areas does not exist.

Within the phonological literature, however, there seems to be no consensus on the definition of the syllable, but it might be reasonable to accept the definition of the syllable based on the concept of sonority, which conveys the prosodic nature of the syllable as a structural unit within which sounds are grouped around a “sonority peak.”

As discussed in Clements (1990) and Blevins (1995), identifying the syllable as “a sonority peak” is an early notion that has been established in some works such as those of Sievers (1881) and Jespersen (1904). As pointed out by Clements (1990), in such early works, a number of sonority-based observations have been proposed. These include the basic view that segments can be ranked on a scale based on their relative sonority. In addition, within a syllable, the most sonorous element represents its “peak,” and the other elements are its margins. Finally, the closer a consonant is to the peak, the more sonorous it must be.

In Clements’s (1990) version of sonority theory, however, a distinction has been made between syllabic and non-syllabic elements. While syllabic elements exhibit the properties of the nucleus in a given language, non-syllabic elements do not. Given this, the following sonority scale has been proposed:

**Obstruents > Nasals > Liquids > Glides > Vowels.**

Obstruents are the least sonorous elements within the set of syllabic and non-syllabic segments in a given language, whereas vowels are the most sonorous segments that can attract the properties of the nucleus.

While there is no unified definition of the syllable in phonological theory, the significance of the syllable as a phonological unit, according to Blevins (1995), is recognized in
all phonological theories including the Classical generative model, which was developed by Chomsky and Halle in *The Sound Pattern of English* (SPE; 1968). SPE is said to fail in recognizing the syllable as a phonological constituent by ignoring its role in the analysis of some phenomena that need explicit reference to the syllable as a unit. However, Blevins (1995) suggests that reference to the feature [+syllabic] for segments that represent a ‘syllabic peak’ in SPE can be seen as recognition of the significant role of the syllable in phonological theory.

Cairns and Raimy (2011), on the other hand, view the practice of overlooking the syllable while referring to “syllabic” segments in SPE to be similar to that of some American structuralists who referred to the notion “syllabics” but did not identify the syllable.

It can be said that the dominant view surrounding syllables in the literature draws upon Khan’s (1976) analysis of syllable-based generalizations in English, which has established the important role of the syllable as a core unit in generative theory. The theory developed in Khan’s (1976) thesis argues that the representation of syllables constitutes an independent tier in the phonological representations. Many phonological patterns can be better understood by explicitly identifying the syllable. Thus, acknowledging the role of the syllable seems to lie in incorporating it as a unit in the phonological representation rather than merely accepting its existence as a phonological unit.

Finally, arguments for the significance of the syllable in phonological theory are well established in the literature. One argument is that phonotactic constraints are better explained by explicit reference to the syllable (Fudge, 1969; Selkirk, 1982). Another critical argument is the importance of the syllable as a domain for the application of phonological processes (Blevins, 1995; Selkirk, 1982). A further piece of evidence about the role of the syllable comes from
suprasegmental phenomena such as stress and tone that require an identification of the syllable (Selkirk, 1982).

1.3.2. Syllable structure and syllable weight. The history of the syllable, as shown in Cairns and Raimy (2011), indicates that the identification of the internal structural of the syllable in phonological theory has appeared in early proposals such as those of Trubetzkoy (1939) and Pike and Pike (1947). However, within the generative tradition, while many phonological approaches assume the presence of the syllable as a hierarchical unit, they differ in their representation of the internal structure of the syllable (e.g., Clements & Keyser 1983; Hyman 1985; McCarthy, 1979).

There have been different characterizations of the structure of the syllable in different generative approaches. Several models in the generative literature have been proposed to capture syllable-internal structure, such as the branching structure model and the moraic model. Clements and Keyser (1983) have argued that Khan’s flat representation of the syllable fails to distinguish syllable peaks from marginal elements. To resolve this issue, they proposed a CV-tier that appears above the segmental tier and below the syllable tier. However, Hyman (1985) has argued against Clements and Keyser’s (1983) CV-tier theory and proposed a weight-based approach represented in what he called the weight-tier.

According to Hyman (1985), many phonological studies (e.g., Halle & Vergnaud, 1980; Steriade, 1982, and others) have adopted the traditional branching model (such as that used in Pike & Pike, 1947), in which the syllable is viewed as a unit consisting of an onset and a rime (core). The rime, then, branches into a nucleus (peak) and a margin (coda). An example of the traditional onset/rime representation of a syllable of the shape CVC is given in Figure (2).
Figure 2. Syllable-Internal Structure (Onset/Rime Model)

However, besides the onset/rime model, other branching models such as body/coda model (e.g., McCarthy, 1979) and the ternary model (e.g., Davis, 1985) have also been used in the literature (Blevins, 1995).

The representation of syllable-internal structure has also played a significant role in establishing syllable weight. For example, a branching model such as that in McCarthy (1979) acknowledges that only segments dominated by the rime node can determine the syllable weight, whereas the onset contributes no weight to the syllable.

However, syllable weight has been elegantly accounted for within moraic theory (e.g., Hayes, 1989; Hyman, 1985; McCarthy & Prince, 1986). In moraic theory, the traditional weight unit, mora (\( \mu \)), has been used as both a weight unit, which distinguishes between light syllables and heavy syllables, and as a phonological position (Hayes, 1989). Thus, in a moraic representation of the internal structure of the syllable, the mora is a phonological unit. Moraic theory, in general, assumes that prevocalic segments (onset consonants) are moraless and are dominated directly by the syllable node, a vocalic element is linked via a mora, and postvocalic segments may be assigned moras in a language-specific manner. An example of the moraic representation of a syllable of the shape CVV is given in Figure (3).
In terms of syllable weight, a distinction is made between light, heavy, and superheavy syllables based on the number of moras the syllable has. Since only segments in the traditional rime position can contribute to syllable weight, it has been proposed that a light syllable contains one mora (CV), a heavy syllable contains two moras (CVV, CVC), and a superheavy syllable\(^3\) contains more than two moras (CVVC, CVCC; Hyman, 1985, pp. 9-10).

However, moraic studies (e.g., Hayes, 1989; Hyman, 1985; McCarthy & Prince, 1986) have agreed on the observation that languages differ in their moraic structures. While CV syllables are light, and CVV syllables are heavy, some languages treat CVC syllables as light, and others treat them as heavy.

In his contribution to moraic theory, Hayes (1989) has distinguished between universal principles and language-specific parameters in terms of syllable weight. Universally, a short vowel is assigned one mora, a long vowel two moras, a geminate consonant one mora, but an ordinary short consonant is moraless. Since ordinary short consonants are underlyingly moraless, the prevocalic consonants (onset) remain non-moraic when syllabification applies, but postvocalic consonants (coda) may be assigned moras by the application of the Weight-by-Position rule (WBP), which assigns moras to coda consonants. Thus, in languages in which the

---

\(^3\) The term “superheavy” was used in McCarthy (1979) to describe syllables of the shape CVVC and CVCC.
WBP rule, or some specific version of it, applies, postvocalic consonants become moraic, rendering a syllable of the shape CVC, for example, as bimoraic and heavy.

To sum up, in moraic theory, the difference between light and heavy syllables is attributed to the number of moras in a syllable; therefore, a distinction is drawn between two basic syllable types, a monomoraic syllable that has one mora and a bimoraic syllable that has two moras. Syllables that have more than two moras are trimoraic. Since short vowels are assigned one mora and long vowels two moras, then CV syllables are monomoraic and light and CVV syllables are bimoraic and heavy. Based on the prosodic system of some languages, however, CVC syllables can also become bimoraic and heavy.

1.3.3. The syllable in Optimality Theory. The core premises and main aspects of Optimality Theory as a generative model of grammar were introduced by Prince and Smolensky in their (1993) manuscript, which was officially published around ten years later in Prince and Smolensky (1993/2004). Further developments of this model were proposed in a number of subsequent works mainly by McCarthy and Prince (e.g., McCarthy & Prince, 1993, 1995). Inspired by this model, however, several analyses within different linguistic areas, especially phonology, have been pursued.

Within phonology, it can be said that Optimality Theory, as a constraint-based approach to grammar, has become the mainstream analytical tool, replacing rule-based models whose core idea is that grammatical surface forms are derived by the application of a set of rules.

As outlined in Prince and Smolensky (1993/2004) and McCarthy and Prince (1993), the main components of an OT grammar are the constraint set (CON), the generator (GEN), and the evaluator (EVAL). As a generative model of grammar, the core aspect of OT is that Universal Grammar (UG) contains a large universal set of violable constraints that are strictly ranked
within a particular language. Thus, the variation observed in languages is attributed to their difference in terms of constraint ranking.

The component GEN is responsible for generating an infinite number of candidates for a given input. CON, on the other hand, consists of two basic types of constraints: markedness and faithfulness constraints. Both markedness and faithfulness constraints are violable, and their violability is evident in their ranking to each other. Different rankings of these constraints generate different types of grammars. Markedness constraints have access to outputs, and their job is to ensure the well-formedness of an output. Faithfulness constraints, on the other hand, have access to both inputs and outputs, and their main role is to ensure the faithfulness of an output to its input (i.e., Input = Output). Finally, the job of the evaluator is to evaluate the candidates based on the ranking of constraints in a given grammar in order to choose the optimal candidate, which is the actual output.

In Prince and Smolensky’s (1993/2004) typology of syllable structure, the observation made in phonological theory that all languages allow CV syllables, but they may differ in whether or not the onset is required and whether or not the coda is allowed, has been captured in the following typology.

Table 2

*CV Syllable Structure Typology (adapted from Prince and Smolensky, 1993/2004, p. 105)*

<table>
<thead>
<tr>
<th>Codas</th>
<th>Onsets</th>
<th>Required</th>
<th>Not Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forbidden</td>
<td>CV</td>
<td>(C)V</td>
<td></td>
</tr>
<tr>
<td>Allowed</td>
<td>CV(C)</td>
<td>(C)V(C)</td>
<td></td>
</tr>
</tbody>
</table>
Given the typology in Table 2, Arabic, for example, is a CV(C) language because Arabic syllables require onsets and allow codas. To account for the typology of syllable structure within OT, Prince and Smolensky (1993/2004) have proposed the following two basic syllable structure constrains: ONSET and *CODA.

8) **ONSET**: A syllable must have an onset.

9) ***CODA**: A syllable must not have a coda.

These syllable structure markedness constraints impose restrictions on marked syllable types, and the violability of these constraints differs based on their ranking in a given language. Since Arabic is a language that requires onsets but never bans codas, then the constraint ONSET is inviolable in Arabic, whereas the constraint *CODA is ranked lower and is dominated by ONSET. The constraints ONSET and *CODA interact with other universal markedness and faithfulness constraints, given the activity of other constraints and their ranking in a specific language.

Another basic syllable well-formedness constraint, introduced in Prince and Smolensky (1993/2004), is a constraint prohibiting complex margins, *COMPLEX, which requires the margins to be simple. However, languages not only differ in whether they require onsets and admit codas but also vary in their tolerance of complex onsets and codas; therefore, the following anti-complexity constraints have been proposed (Kager, 1999, p. 97).

10) ***COMP-ONS**: Onsets are simple.

11) ***COMP-Cod**: Codas are simple.

The two basic faithfulness constraints belonging to the MAX and DEP constraints family (McCarthy & Prince, 1995) are MAX-IO and DEP-IO.
12) MAX -IO: Every segment of the input has a correspondent in the output. (No deletion.)

13) DEP -IO: Every segment of the output has a correspondent in the input. (No epenthesis.)

If we consider syllable structure in CLA, Mitchell (1990) states that in “Classical Arabic syllables are delimitable by the fact of their beginning with a consonant and containing a vocalic nucleus, as well as by the inadmissibility of syllable-initial clusters and of sequences of more than two consonants” (pp. 19-20). Mitchell’s descriptive generalization reflects the basic syllable structure constraints in CLA. Syllables always begin with a consonant, which, in OT terminology, means that the constraint ONSET is undominated. Also, it is a language that bans syllable-initial clusters, which can be attributed to the undominated ranking of the constraint *COMP-ONS. Its intolerance of sequences of more than two consonants has also been attributed to its avoidance of medial -CCC- clusters.

As indicated in Prince and Smolensky (1993/2004), the interaction between markedness and faithfulness constraints yields the typology of syllable structure given in Table (2). Thus, in Arabic, the optimal candidate for an input with an onsetless syllable is the one that has an epenthetic onset, violating the faithfulness constraint DEP-C and giving the ranking ONSET >> DEP-C >> *CODA. The following tableau illustrates this interaction.

<table>
<thead>
<tr>
<th>/al-bahr-u /</th>
<th>[ʔal.bah.ru]</th>
<th>‘the sea’</th>
</tr>
</thead>
<tbody>
<tr>
<td>/al-bahr-u /</td>
<td>ONSET</td>
<td>DEP-C</td>
</tr>
<tr>
<td>a. al.bah.ru</td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>b. → ?al.bah.ru</td>
<td></td>
<td>*!</td>
</tr>
</tbody>
</table>

4 See Bamakhramah (2009) for a detailed OT analysis of syllable structure in CLA.
As the tableau above shows, the winner is the candidate that satisfies the undominated constraint ONSET, although it violates the faithfulness constraint DEP-C and the other lower ranking markedness constraint *CODA.

In addition, as mentioned earlier, CLA’s intolerance of syllable-initial clusters can be accounted for by the higher ranking of the constraint *COMP-ONS. As shown in McCarthy (2007) and Bamakhramah (2009), in CLA both ONSET and *COMP-ONS belong to the language’s set of undominated constraints, as Tableau 15 demonstrates. Bamakhramah’s (2009) detailed OT analysis of Classical Arabic shows that the faithfulness constraints DEP-V and DEP-C are both dominated by MAX-C. This is because CLA utilizes consonant and vowel epenthesis to satisfy the undominated constraints ONSET and *COMP-ONS, but it does not allow consonant deletion to repair underlingly complex clusters. The following tableau shows the interaction between these constraints.

15) /hmil/ [ʔi newcomers] ‘carry! (m.s.)’

<table>
<thead>
<tr>
<th>/hmil/</th>
<th>ONSET</th>
<th>*COMP-ONS</th>
<th>MAX-C</th>
<th>DEP-C</th>
<th>DEP-V</th>
<th>*CODA</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. → ʔiḥ.ʔil</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td>*</td>
<td>**</td>
</tr>
<tr>
<td>b. ʔiḥ.ʔil</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. ḥmil</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>d. ḥmil</td>
<td></td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As the tableau above illustrates, the unfaithful candidate (d) is ruled out because the consonant /h/ in the input is deleted in the output. Although candidate (b) satisfies the constraint *COMP-ONS, it is ruled out by the undominated constraint ONSET. The optimal candidate is (a) because it satisfies all the undominated constraints, causing violation of only the lower ranking faithfulness constraints that disfavor insertion.
Like Classical Arabic and other Arabic dialects, Qassimi Arabic requires onsets and admits codas; therefore, its core syllable structure exhibits the pan-Arabic undominated ranking of ONSET and the lower ranking of *CODA. In the present study, we will see whether the constraint *COMP-ONS is inviolable in QA.

1.4. Statement of the Problem

The study of syllable structure and syllabification aspects in Arabic dialects such as Egyptian, Yemeni, Iraqi, Hijazi, Sudanese, and Lebanese constitutes a considerable part of the theoretical literature on Arabic phonology within different rule-based and constraint based-approaches (e.g., Abu-Mansour, 1987, 1989, 1995; Al-Mohanna, 1994, 1999; Bamakhramah, 2009; Broselow, 1992; Kiparsky, 2003; Mahfoudhi, 2005; Watson, 2002, 2007).

However, despite the existence of such a substantial body of research on syllable structure in Arabic dialects, Qassimi Arabic has not as yet been the subject of study. Therefore, phenomena found in QA have not received attention in the available literature. Thus, the present study attempts to examine syllable structure and related phonological phenomena in QA, shedding light on the ways in which this dialect differs from many previously examined dialects, especially in terms of its treatment of non-final superheavy syllables.

The current analysis argues that the behavior of superheavy syllables in QA should be understood with reference to the phonology of QA. In QA, both non-final CVVC and CVCC syllables are avoided by inserting a vowel after the last consonant, turning it into an onset of a new syllable. In addition, there are two cases in which internal superheavy syllables are tolerated in QA. The first case is the appearance of non-final CVVC and CVCC syllables as a result of high vowel deletion. The second case is the occurrence of internal superheavy syllables when the dative particle /l/ is attached to verbs ending in syllables of the type CVVC or CVCC.
Moreover, when epenthesis occurs to break up triconsonantal clusters in QA, the epenthetic vowel may appear either between the second and third consonants or between the first and second consonants. Therefore, the present study will show that epenthesis patterns in QA cannot be explained in terms of alignment constraints, proposed in Mester and Padgett (1994) and adopted by many others, but rather by acknowledging the role of contiguity, suggested in Bamakhramah (2009), in preventing stem-internal epenthesis.

Finally, another syllable-related issue found in QA is the treatment of onset clusters resulting from high vowel deletion. The present study throws light on a number of syllabification patterns that indicate that onset clusters must be prohibited in QA; therefore, the occurrence of onset clusters must be accounted for.

### 1.5. Purpose of the Study

This thesis has two main goals. The first goal is to provide a coherent OT analysis of syllable structure and syllabification patterns in QA. An optimality-theoretic analysis will be developed to account for possible syllable types and their distribution in QA, concentrating on the restricted occurrence of superheavy syllables of the shape CVVC and CVCC. By examining syllable structure in QA, the present study will shed light on syllables-related phenomena in one major group of Najdi dialects, filling in the gap in the theoretical research on Najdi dialects in general.

The second goal is to contribute to the current research on syllable structure in general and syllable structure in Arabic dialects in particular by bringing light to syllable-related phenomena in a dialect that has not been given previous attention.


1.6. Organization of the Thesis

This introductory chapter provides background about QA in section (1.2), followed by a theoretical background on the syllable within phonological theory in section (1.3). It concludes with the present study’s main problem and purpose in sections (1.4) and (1.5). The remainder of this thesis is organized as follows. In Chapter 2, a review of the relevant literature is covered in five sections. In Chapter 3, a detailed Optimality-theoretic analysis of syllable structure and related phonological phenomena in Qassimi Arabic is developed. Finally, in Chapter 4, the main arguments and results of the present study will be outlined, and suggestions for further investigation will be provided.
Chapter 2: Literature Review

2.1. Introduction

The interest in the linguistic study of Arabic dialects started around the nineteenth century by European scholars (Versteegh, 1997, p. 132). Together with the traditional interest in Classical Arabic, modern linguistic studies on Arabic dialects have flourished within the field of modern Arabic linguistics. The investigation of phonological and morpho-phonological aspects of Arabic varieties (standard and colloquial) has gained a great deal of consideration. While many of these studies have been pursued within the methods of comparative and descriptive linguistics or the approaches of sociolinguistics, a considerable number of theoretical analyses of different phonological and morpho-phonological phenomena have also been proposed, especially with the advent of generative phonology.

Theoretical studies on Arabic phonology including Brame’s (1970) generative analysis of Arabic phonology, Brame’s (1974) cyclic study of Arabic stress, McCarthy’s (1979) thoughtful examination of aspects of Arabic phonology and morphology, and McCarthy and Prince’s (1990) insightful analysis of Arabic prosodic structure have added significant insights to phonological theory in general and have substantially contributed to our understanding of various phonological and morpho-phonological phenomena in both Standard Arabic and Arabic dialects. These studies, in addition to many others, have collectively advanced the theoretical research on Arabic phonology.

Within linear and non-linear generative approaches, several analyses have been proposed to examine phonological systems of some Arabic dialects. This includes studies on allophonic variation, morphemic alternations, stress assignment, and syllable structure and syllabification patterns. There have been a number of syllable-based studies that have targeted syllabification
patterns and related phenomena in some Arabic dialects. Examples include Abu-Salim’s (1982) study of syllable structure and syllabification rules in Palestinian Arabic, Alghazo’s (1987) analysis of some syllable-related processes (syncope and epenthesis) in Levantine Arabic, Abu-Mansour’s (1987, 1989) examination of syllable structure in Meccan Arabic, and Watson’s (2002) detailed analysis of San’ani and Cairene dialects. In addition, many other studies (e.g., Broselow 1992; Farwaneh, 1995; Ito, 1986, 1989; Selkirk, 1981) have concentrated on some particular syllabification phenomena such as the treatment of medial tri-consonantal clusters with focus on Cairene, Iraqi, Meccan, and Levantine dialects.

With the introduction of Optimality Theory (Prince & Smolensky, 1993/2004), much interest has been given to syllable structure and related syllabification processes such as syncope and epenthesis by examining a number of dialects including Egyptian, Yemeni, Iraqi, Hijazi, Sudanese, and Lebanese (e.g., Abu-Mansour, 1995; Al-Mohanna, 1994, 1999; Bamakhramah, 2009; Davis & Zawaydeh, 1997; Kiprasky, 2003; Mahfoudhi, 2005; Mester & Padgett, 1994; Watson, 2007; Zawaydeh, 1997).

Despite the existence of this substantial body of theoretical research on Arabic syllable structure, Najdi dialects in general and Qassimi Arabic in particular, have not received attention. In his review of the linguistic studies on Arabic dialects, Versteegh (1997) reports that “the Arabian Peninsula, the homeland of the Arab tribes, remains the least known dialect area of the Arabphone world” (p. 148). In today’s Saudi Arabic, which occupies most of the Arabian Peninsula, Najdi dialects, to which QA belongs, constitute one of the largest major dialectical groups (see section 1.2.1).

While the available descriptive studies have shed some light on aspects of syllable structure and syllabification in Najdi dialects (e.g., Ingham, 1994; Johnstone, 1967a, 1967b;
Prochazka, 1988), there is a considerable lack of theoretical-based analyses of syllable-related phenomena found in Najdi dialects in general and in QA in particular. This has led to the near absence of Najdi dialects’ syllabification patterns in the current typological research on syllable structure among Arabic dialects. The present study attempts to fill in this gap in the theoretical research on syllable structure in Arabic dialects by examining syllable structure and related phonological phenomena in one of the Najdi dialects that has not been the subject of any serious analysis in the available literature.

2.2. Previous Descriptive Studies on Syllable Structure in Qassimi Arabic

As mentioned in the previous section, the available literature on QA is mainly descriptive. Descriptive studies have contributed to the phonological study of QA in general. Major studies that have documented phonological and morpho-phonological aspects of QA include Al-Sweel (1981), Ingham (1982), Johnstone (1967a, 1967b), Lehn (1978), and Prochazka (1988). In addition to these studies, Ingham’s (1994) study of Najdi Arabic represents the most comprehensive grammar of the Najdi dialectical group as a whole.

In terms of syllable structure, discussions in Prochazka (1988) and Ingham (1994) provide us with a good descriptive background, especially for the treatment of non-final superheavy syllables.

Prochazka’s (1988) study provides a detailed morphological documentation of verb paradigms and nominal forms in several Saudi dialects, including QA. His data on QA supply us with the basic descriptive generalizations about the treatment of non-final superheavy syllables. His data illustrate that vowel epenthesis occurs in QA when a consonant-initial suffix is added to stems ending in VVC or VCC sequences. The following examples show the difference between
attaching a vowel-initial suffix and a consonant-initial suffix to the stems /beet/ ‘house’ and /bint/ ‘girl; daughter’, respectively.

1) Epenthesis in Qassimi Arabic (Prochazka, 1988, pp. 198-201)

   a. beetah ‘her house’
   b. beetəhin ‘their (f.) house’
   c. binti ‘my daughter’
   d. bintəna ‘our daughter’

Moreover, his data show that no vowel is inserted when the dative particle /l/, followed by a pronoun, is attached to stems ending in VVC or VCC sequences. The following examples illustrate that no epenthesis occurs when the dative particle /l/, followed by the pronoun /i/ ‘me’ is attached to the verbs /gaa/ ‘he said’ and /gilt/ ‘you (m.s.) said’.

2) No epenthesis in Qassimi Arabic (Prochazka, 1988, pp. 212-213)

   a. gaalli ‘he told me’
   b. giltli ‘you (m.s.) told me’

Ingham’s (1994) comprehensive description of Najdi Arabic has also contributed to our understanding of a number of syllable-based phenomena. In terms of the relationship between vowel epenthesis and syllable structure, his analysis shows that vowel epenthesis is triggered mainly in two cases. The first is similar to Prochazka’s (1988) observation that when a consonant-initial suffix is attached to a syllable of the shape CVVC or CVCC, epenthesis applies. The second is that epenthesis occurs to break up a stem-final CC cluster. However, this type of epenthesis occurs only in certain word and phrase-final biconsonantal clusters. Thus, this phenomenon can be captured in terms of sensitivity to the sonority profile, as we will see in the next section.
So far I have briefly reviewed the descriptive literature on some syllable-related phenomena in QA. In the following sections, I will consider three issues. In section (2.3), I will consider the effect of high vowel deletion on syllable structure. Then, in section (2.4), I will provide a detailed review of the treatment of word and phrase-final CC clusters. Finally, in section (2.5), I will briefly review the most relevant theoretical research on the behavior of non-final superheavy syllables in Arabic dialects, suggesting how the present study will account for the behavior of these syllables and related phonological phenomena in Qassimi Arabic.

2.3. High Vowel Deletion and Syllable Structure in Qassimi Arabic

The present study assumes that a discussion of syllable structure and syllabification patterns in QA necessitates an examination of a phonological process under which short high vowels delete in non-final open syllables (HVD). The goal of including this discussion in this chapter is to provide a descriptive generalization about the application of HVD in QA. Then, a review of some relevant literature on this phenomenon will be considered.

The examination of HVD in QA is not a goal by itself, but rather it is critical to our understanding of the distribution of some syllables in QA. We will see that HVD creates two types of restricted, but occurring, syllables in QA. These are syllables with complex onset clusters and non-final superheavy syllables of the shape CVVC and CVCC. The present study will then try to account for the treatment of such syllable types. In other words, it will attempt to explain how the grammar of QA handles syllables with initial onset clusters and non-final superheavy syllables that result from HVD.
Generally speaking, the deletion of short high vowels in non-final open syllables is a common process in many Arabic dialects, but the exact nature of HVD may differ from one dialect to another. The following examples illustrate the process of HVD in QA.

3) HVD in Qassimi Arabic:

a. Word-initial onset clusters from HVD in QA:
   i. /dʒi.daar/ [dʒdaa] ‘wall’
   ii. /χi.rag/ [χrag] ‘rags, pieces of material’

b. No HVD in QA:
   i. /saaʃid/ [saa.ʃid] ‘help! (m.s.)’

b. Non-final CVVC syllables from HVD in QA:
   i. /saaʃid-an/ [saaʃ дан] ‘help (m.s.) me!’
   ii. /saafir-i/ [saaf.ri] ‘travel! (f.s.)’
   iii. /raasib-ih/ [raas.bih] ‘having failed (f.s.)’

d. Non-final CVCC syllables from HVD in QA:
   i. /jaktibuun/ [jakt.buun] ‘they (m.) write’

The examples above demonstrate that HVD is a very active process in QA; it applies whenever a short high vowel occurs in a non-final open syllable, resulting in a considerable effect on syllable structure. As the examples in (a) show, the deletion of short high vowels creates complex onset clusters. The example in (b) illustrates that high vowels do not syncopate when they occur in closed syllables, whereas the example in (c.ii) confirms that high vowels do not delete in final syllables. If we compare the example in (b) to those in (c), we will notice that when a vowel-initial suffix is attached to a closed syllable whose vowel is /i/, re-syllabification

---

5 See, for example, Kiparsky (2003) and Bamakhramah (2009).
takes place, turning the final closed syllable into a non-final open syllable to which HVD applies. Finally, the examples in (c) and (d) reveal that HVD can result in the appearance of non-final superheavy syllables of the shape CVVC and CVCC.

Based on some sets of data documented in descriptive works such as Prochazka (1988) and my examination of data from QA (see the examples in 3 above), using my intuition as a native speaker, I can say that HVD in QA applies whenever the descriptive generalization is met, that is, whenever a short high vowel occurs in a non-final open syllable,\(^6\) except when the surface high vowels result from raising of an underlying /a/, a matter to which we will turn our attention.

As discussed in some descriptive works (e.g., Johnstone, 1967a; Prochazka, 1988), in QA there is a general phonological process under which short low vowels are raised when they occur in non-final open syllables. Interestingly, while high vowels delete in non-final open syllables, low vowels are raised in a similar context. For example, in QA, the high vowel in a word such as [dʒimaʕ] ‘he gathers,’ which is derived from underlying /dʒamaʕ/, is not deleted,\(^7\) whereas the high vowel in words such as /dʒi.daar/ → [dʒdaar] is deleted (see the examples in 3.a).

---

\(^6\) It should be mentioned that from a sociolinguistic perspective, educated people tend to retain the non-final /i/ that follows CVCC syllables (see example 3.d). This might be attributed to the influence of Standard Arabic and other prestigious dialects. This conclusion, however, is primarily based on my knowledge as a native speaker. Statistical studies are required to identify this phenomenon. However, the significance of this observation is relevant to sociolinguistic studies and does not affect our current theoretical analysis of the phenomena under discussion.

\(^7\) The process of vowel raising in QA is covered very briefly in the present study because the concentration is mainly on syllable structure and not on vowel alternations. However, for a detailed descriptive account of vowel raising in QA, see Johnstone (1967a). For an OT analysis of similar phenomenon found in BHA, see McCarthy (2007).
In his rule-based analysis of similar phenomenon in Bedouin Hijazi Arabic (BHA), Al-Mozainy (1981) has accounted for this type of interaction by proposing a strict rule order. Thus, to derive the correct surface forms, the vowel deletion rule is ordered before the raising rule. The following brief derivation cited from Al-Mozainy (1981) illustrates the application of these two rules.

4) Rule ordering in BHA (after Al-Mozainy, 1981, p.5)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>UR</td>
<td>/farib/</td>
<td>/faribat/</td>
</tr>
<tr>
<td>1.</td>
<td>i-deletion</td>
<td>--------</td>
</tr>
<tr>
<td>2.</td>
<td>a → i</td>
<td>fi rib</td>
</tr>
<tr>
<td>SR</td>
<td>[fi rib]</td>
<td>[far bat]</td>
</tr>
</tbody>
</table>

‘he drank’ ‘she drank’

The derivation above demonstrates that the HVD rule must be ordered before the raising rule in order to explain the occurrence of a word with a non-deleted high vowel /farib/ → [fi rib] and another one with a deleted high vowel in the same underlying position, that is, in a non-final open syllable /faribat/ → [far bat]. As Al-Mozainy (1981) has explained, if the raising rule were ordered before the HVD rule, then the incorrect derivation would result, as shown in the following example.

5) Incorrect derivation:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>UR</td>
<td>/farib/</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>a → i</td>
<td>fi rib</td>
</tr>
<tr>
<td>2.</td>
<td>i-deletion</td>
<td>fi rib</td>
</tr>
<tr>
<td>SR</td>
<td>*[fi rib]</td>
<td></td>
</tr>
</tbody>
</table>

‘he drank’
Interestingly, the form [ʃrib] ‘(m) was drunk’ does exist in the passive paradigm of the verb ‘to drink’ in QA and BHA. Thus, Al-Mozainy (1981) has emphasized the importance of this strict order because the form [ʃrib] is derived by the application of the HVD rule from underlying /ʃi.rib/, whereas the form [ʃrib] is derived by the application of the raising rule from underlying /ʃa.rib/.

This type of interaction between HVD and raising is a type of counterfeeding opacity that can be accounted for within Standard (Parallel) OT by ranking the constraint that encourages the raising of non-final low vowels in open syllables *aCV above the constraint that disfavors high vowels in the same position *iCV (McCarthy, 2007).

Based on McCarthy’s (2007) discussion of this phenomenon in BHA, the constraint *iCV must outrank the anti-deletion faithfulness constraint MAX-V. In addition, the faithfulness constraint ID (low), which requires the identity of the output vowel be faithful to the identity of the input vowel, must also be outranked to satisfy *aCV. Another relevant faithfulness constraint is MAX-A. This constraint was proposed by McCarthy (2007) to prevent a → ∅ mapping. It forbids the deletion of underlying /a/ regardless of its identity in the surface form. This means it ensures that /a/ in the input will not be deleted in the output to satisfy the markedness constraint *aCV, even if its identity is different in the surface, a matter which violates the lower-ranked identity constraint ID (low).

Eventually, the proposed ranking MAX-A, *aCV >> *iCV, ID (low) >> MAX-V can capture the observation that in QA the optimal candidate for the input /sabah/ ‘he swam’, for example, is [siba] with a raised low vowel that satisfies MAX-A and *aCV by violating *iCV. Thus, to capture the phenomenon under discussion, this partial ranking will be incorporated
within the ranking of constraints in QA, as we will see in Chapter 3. The following tableau illustrates the interaction between these constraints (adapted from McCarthy, 2007, p. 26). \(^8\)

6) /ðafaʃ/ [ðafa], ‘he pushed’

<table>
<thead>
<tr>
<th>/ðafaʃ/</th>
<th>MAX-A</th>
<th>*aCV</th>
<th>*iCV</th>
<th>Id (low)</th>
<th>MAX-V</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>→ difaʃ</td>
<td></td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>b.</td>
<td>dfaʃ</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>dafaʃ</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As seen in the tableau above, the markedness constraint *aCV assigns a violation mark for every occurrence of /a/ in a non-final open syllable, whereas the markedness constraint *iCV assigns a violation mark for every occurrence of /i/ in a non-final open syllable. However, since *aCV outranks *iCV, for an input /CaCV/ a candidate with /aCV/ will fatally violate *aCV, whereas a candidate with /iCV/ will satisfy it. On the other hand, for an input /CiCV/, a candidate with /iCV/ will fatally violate *iCV because the constraint *aCV does not participate in such evaluation.

Interestingly, for the input /ki.taab/ for example, *iCV cannot be satisfied by changing the quality of the high vowel to low, as in the candidate ka.taab, which would fatally violate the higher ranking constraint *aCV.

So far, I have provided examples from QA, illustrating that high vowel deletion is an active phonological process in QA, the application of which results in a significant effect on syllable structure. It can create two types of marked syllables in QA: syllables with complex onset clusters and non-final superheavy syllables. I have also considered the observation that

\(\text{See McCarthy (2003) for an alternative analysis within sympathy approach. Also, see McCarthy (2007) for a detailed analysis of BHA within OT-CC (OT with candidate chains).}\)
high vowels syncopate in non-final open syllables, except if surface high vowels are underlyingly low. Based on a brief review of the relevant literature on these two phonological processes, the ranking $*aCV >> *iCV$ will be adopted to account for /a/ → i, /i/ → @ in QA.

Now we will reconsider some previously reviewed phenomena in QA. We have observed in the examples cited from the descriptive literature in (1) in section (2.2) that QA avoids non-final superheavy syllables by epenthesis. The following examples demonstrate this process.

7) Epenthesis in Qassimi Arabic:

a. Avoiding non-final CVVC syllable in QA:
   i. /beet/ [beet] ‘house’
   ii. /beet-ah/ [bee.tah] ‘her house’
   iii. /beet-hin/ [beet.hin] ‘their (f.) house’

b. Avoiding non-final CVCC syllable in QA:
   i. /bint/ [bint] ‘girl; daughter’
   ii. /bint-i/ [bin.ti] ‘my daughter’
   iii. /bint-na/ [bin.tu.na] ‘our daughter’

The question now is if QA avoids non-final superheavy syllable by means of epenthesis, then how it would treat internal syllables of the shape CVVC and CVCC, resulting from high vowel deletion, as we have seen in the examples in (3) in this section. Some examples are repeated below for illustration.

8) Non-final CVVC syllables from HVD in QA:

a. /saafid-an/ [saaf.dan] ‘help (m.s.) me!’

b. /saafir-i/ [saaf.ri] ‘travel! (f.s.)’
9) Non-final CVCC syllables from HVD in QA:
   a. /jaktibuun/ [jakt.buun] ‘they (m.) write’

   The examples given in (7) above clearly show that non-final superheavy syllables, resulting from
suffixation, as in CVVC+CV and CVCC+CV sequences, are avoided by inserting a vowel after
the last consonant of CVVC and CVCC syllables, turning them into onsets of new syllables.

   Now, if we think about the sequences CVVCCV and CVCCCV as inputs whose optimal outputs
are CVVC\textsubscript{\text{CV}} and CVCC\textsubscript{\text{CV}}, respectively, then we conclude that candidates such as
CVV.CCV and CVC.CCV must be ruled out by *COMP-ONS.

   However, if we consider the examples in (3.a) in section (2.3), we would assume that the
syllable well-formedness constraint *COMP-ONS is violated in QA to satisfy the markedness
constraint that requires high vowels to delete in non-final open syllables. The examples are
repeated below.

10) Word-initial onset clusters from HVD in QA:
   a. /dʒi.daar/ [dʒdaar] ‘wall’
   b. /χi.rag/ [χrag] ‘rags, pieces of material’

   Given the data above, the assumption that *COMP-ONS is violable in QA seems to be true;
however, if *COMP-ONS is violable in QA, then how we can account for the fact that syllable-
initial onset clusters are not allowed word or phrase-internally, as we have already established?

   More importantly, how we can explain the observation that like in CLA (see 15 in section
1.3.3), in QA morphological forms with underlying biconsonantal onset clusters are avoided by
inserting a prosthetic vowel when they occur in initial or internal phonological domains, which is
usually followed by inserting /ʔ/ phrase-initially? The glottal stop is added to satisfy ONSET,
whereas phrase-internally, ONSET will be satisfied by re-syllabification, as we will see in the next chapter.

Furthermore, if *COMP-ONS is violable in QA, then what constraint is responsible for ruling out the possible candidate CV.CCVC for an input CVCCVC, given the fact that codas are allowed but not required in QA?

The present study will, therefore, attempt to provide a coherent analysis that can account for what seems to be contradictory observations given above.

2.4. The Treatment of Word and Phrase-final Coda Clusters

2.4.1. Background. One of the significant syllable-based differences between Arabic dialects is their treatment of word and phrase-final coda clusters. Kiparsky (2003) classifies across dialects and recognizes four different types of phrase-final coda clusters in Arabic dialects. Interestingly, to date the exact behavior of final CC clusters in QA has not been classified. Kiparsky (2003) has examined a number of Arabic dialects and has suggested that they fall into three large groups: CV dialects, VC dialects, and C dialects. In terms of their treatment of phrase-final CC clusters, CV and C dialects are said to allow final CC clusters, whereas VC dialects are divided into two types. Type (1) allows final CC clusters only with falling sonority, while the second type of VC dialects never allows final CC clusters.

In the following table, I have cited example from Kiparsky (2003) to illustrate the treatment of final CC clusters in his proposed three groups.
Table 3

*Phrase-final Consonant Clusters in Arabic Dialects (Kiparsky, 2003, p. 149)*

<table>
<thead>
<tr>
<th>CV dialects</th>
<th>C dialects</th>
<th>VC dialects Type (1)</th>
<th>VC dialects Type (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allowed</td>
<td>Allowed</td>
<td>Falling SON only</td>
<td>Prohibited</td>
</tr>
<tr>
<td>1. katabt ‘I wrote’</td>
<td>ktɔbt ‘I wrote’</td>
<td>katabit ‘I wrote’</td>
<td>katabit ‘I wrote’</td>
</tr>
<tr>
<td>2. ?:akl ‘food’</td>
<td></td>
<td>kalb ‘dog’</td>
<td>kalib ‘dog’</td>
</tr>
</tbody>
</table>

As seen in Table 3, CV and C dialects seem to allow final CC clusters with no restriction. The final CC cluster in (1) represents a sonority plateau, but the final CC cluster in the word ?:akl in (2) represents a sonority rise. On the other hand, in type (1) of VC dialects, only clusters with falling sonority are permitted. Thus, final /-lb/ cluster in the word kalb is permitted because it represents a sonority fall, whereas the final cluster /-bt / in (1) is prohibited although it represents a sonority plateau. Finally, in type (2) of VC dialects, final CC clusters, as the examples illustrate, are prohibited.

2.4.2. **Word and phrase-final coda clusters in Qassimi Arabic.** To the above four different treatments of phrase-final CC clusters in Arabic dialects, I will add a fifth type found in QA. QA allows word and phrase-final consonant clusters as long as they satisfy the Sonority Sequencing Principle (SSP), according to which, the preferred sonority profile for coda consonants is to represent a sonority fall (Clements, 1999) or sonority plateau (Blevins, 1995). QA obeys the SSP, but it permits final coda clusters not only with falling sonority as one type of Kiparsky’s VC group does but also with sonority plateau, except if both segments in the final cluster are nasals.
Given Clements’s (1990) sonority scale for non-syllabic elements: Obstruent > Nasal > Liquid > Glide, in QA word and phrase-final coda clusters with rising sonority are prohibited and final coda clusters of equal sonority are not permitted if both segments are nasals.

The conclusion proposed here about the treatment of word and phrase-final CC clusters in QA comes from my examination of data from QA and from my review of two previous analyses that have considered word-final coda clusters in Najdi dialects. The first analysis appears as a general descriptive note made in Ingham (1994) about the occurrence of epenthesis in word-final CC clusters in Najdi dialects in general. The second is Alkhonini’s (2014) analysis of the influence of Najdi speakers’ native dialect on their pronunciation of final CC clusters in pause forms in Classical Arabic. I have combined insights from both Ingham (1994) and Alkhonini (2014) to analyze data from Qassimi Arabic and to propose a final generalization. In the following discussion, I will review results achieved in these two studies and conclude with a generalization about the treatment of word and phrase-final CC clusters in QA.

Ingham (1994) reports that in Najdi Arabic, epenthesis occurs to break a final CC cluster “in which the second element is one of the voiced continuants i.e. r, l, w, y, and n (but not, it seems, m)” (p. 17). Alkhonini (2014) has not referred to Ingham’s (1994) descriptive generalization and, therefore, has not offered a possible explanation for such description. The following examples from Ingham (1994) represent his proposed generalization.

11) Epenthesis in word-final coda clusters in Najdi Arabic (Ingham, 1994, p. 17)
   
a. /masˤr/ [masˤur] ‘Egypt’

   b. /radʒl/ [radʒil] ‘husband’

---

9 Ingham’s (1994) descriptive analysis has not provided underlying or input forms; however, I have chosen to include the input forms here to illustrate the process of epenthesis.
Based on the data cited above, if we want to acknowledge the effect of the SSP in motivating epenthesis, we can say that the examples in (a-b) contain a sequence of obstruent-liquid, which represents final rising sonority and violates the SSP. Similar conclusion can be drawn for the examples in (c-d) as they contain a cluster with a sonority rise. The problem appears with the examples in (e-f) as both contain a sequence of a liquid followed by a nasal, representing no violation for the SSP; however, epenthesis occurs with /-rm/, but not with /-lm/.

Now, I will turn my attention to Alkhonini’s (2014) results to see whether they confirm Ingham’s (1994) generalization. Alkhonini’s (2014) study is dedicated exclusively to the study of word-final coda clusters in Najdi Arabic (NA). First, he has provided a sonority-based explanation for inserting a vowel to break a final CC cluster in NA; then he has examined whether Najdi speakers’ pronunciation norms would affect their pronunciation of Classical Arabic. What should concern us in the present study is his conclusion about the correlation between sonority and epenthesis in NA. His results show that word-final CC clusters in NA are sensitive to the SSP, so they are permitted in two restricted cases. The first case is when they have a falling sonority, and the second is when they have equal sonority, except if the final segments are nasals.

Alkhonini’s (2014) analysis of NA emphasizes that no epenthesis occurs with word-final coda clusters that are composed of a liquid followed by a nasal, whereas a vowel is inserted to
break up a final nasal-liquid sequence. This observation has been elegantly explained in terms of the SSP, and my examination of Qassimi data is completely compatible with his overall conclusions.

However, if we reconsider the examples in (11.e-f) cited from Ingham (1994), we will find that (e) represents a contradiction to Alkhonini’s (2014) conclusion. The examples in (11.e-f) are repeated below in (12):

12) Epenthesis in final liquid-nasal clusters in Najdi Arabic (Ingham, 1994, p. 17):
   a. /fîrn/ [fîrn] ‘oven’
   b. /ʕîlm/ [ʕîlm] ‘news’

The examples above show that epenthesis occurs to break up a final liquid-nasal cluster in (a) but not in (b). Interestingly, in QA no epenthesis is triggered in this environment, and both words, /fîrn/ and /ʕîlm/, would be pronounced as [fîrn] and [ʕîlm], respectively, confirming Alkhonini’s (2014) conclusion. However, this does not mean that the data cited above are wrong because they might have come from a documentation of a subgroup of NA whose speakers break up final -RC clusters. In this respect, it is good to mention that a similar phenomenon has been attested in other Arabic dialects. In his discussion of sonority and epenthesis in different Arabic dialects, Kiparsky (2003) notes that “a number of writers report stylistic and sociolectal variation as to epenthesis in -RC clusters of falling sonority” (p. 169).

Alkhonini’s (2014) final conclusion—that NA does not allow word-final nasal clusters—comes from one case in which a final -MN cluster is broken up by a vowel. See the example below.

   a. /sɛ.mn/ [sɛ.mən] ‘fat, (cooking)’
This conclusion is also evident in QA. The examples in (14) illustrate the occurrence of epenthesis with final -MN clusters in QA.

14) Epenthesis with sonority plateau in Qassimi Arabic (-MN word-final clusters):
   a. /sa.mn/ [sa.mən] ‘fat, (cooking)’
   b. /ʔamn/ [ʔamən] ‘security; safety’

   It is also worth mentioning that the exclusion of the nasal /m/ from Ingham’s (1994) descriptive generalization can be avoided by acknowledging the effect of the SSP. This is because epenthesis may or may not occur in words that end in -CM clusters. In QA, epenthesis occurs to break up final -CM clusters only if they rise in sonority. Consider the following examples from QA.

15) Sonority and epenthesis with final -CM in Qassimi Arabic:
   a. /ʕilm/ [ʕilm] ‘news’
   b. /ḥilm/ [ḥilm] ‘dream’
   c. /ḥadʒm/ [ḥadʒəm] ‘size’
   d. /ʕazm/ [ʕazəm] ‘determination’

   The data above clearly illustrate that epenthesis occurs only if the sonority profile of the final clusters violates the SSP. In (15.a-b), /-lm/ codas fall in sonority, triggering no epenthesis, whereas /-dʒm/ cluster in (15.c) and /-zm/ cluster in (15.d) rise in sonority, and therefore, a vowel is inserted to break them up.

   To sum up, this section shows that QA differs from other Arabic dialects in terms of its treatment of word and phrase-final CC clusters. In QA, only final coda clusters with a sonority fall or plateau are allowed, except if both final segments are nasals. Since complex coda clusters with a sonority fall or plateau are allowed, then the constraint *COMP-COD is violated in QA.
Finally, an OT account for the treatment of word-final CC clusters in QA will be developed in Chapter 3.

2.5. The Treatment of Superheavy Syllables: CVVC and CVCC

2.5.1. Background. In their analysis of Classical Arabic’s prosodic structure, McCarthy and Prince (1990) explain that Arabic distinguishes between two core syllable types, monomoraic and bimoraic syllables. Thus, Arabic’s basic syllable inventory includes monomeric (light) CV syllables and bimoraic (heavy) CVV and CVC syllables. Superheavy syllables of the shape CVVC and CVCC, occurring in the final domain, are also bimoraic because the final consonant is an extrasyllabic element. Like CVVC and CVCC syllables, the final consonant in a CVC syllable is also extrametrical in the final position.

In light of McCarthy and Prince’s (1990) analysis of CLA’s core syllable types, Broselow (1992) has argued that syllables in most modern Arabic dialects are also maximally bimoraic, a matter that is evident in the restricted distribution of superheavy syllables of the shape CVVC and CVCC. In the group of dialects examined by Broselow, superheavy syllables of the shape CVVC and CVCC are said to be bimoraic in the final domain because of the extrametricality of the final consonant. However, the dialects’ preference for bimoraicity is manifested in the ways in which they try to avoid non-final trimoraic syllables that result from concatenation of morphemes.

Constraint-based studies of some Arabic dialects such as Bamakhramah (2009) and Watson (2007) have suggested that the syllable-weight constraint that requires all syllables to be bimoraic is inviolable in Arabic dialects. Thus, the constraint *3µ, given in (16), was adopted in Bamakhramah (2009) and many others to explain the prohibition of trimoraic syllables.

16) *3µ: No trimoraic syllables (Kager, 1999, p. 268).
In addition, since the final consonant in syllables occurring in the final domain (e.g., in CVC, CVVC, and CVCC) is extra-prosodic, studies on some Arabic dialects (e.g., Bamakhramah, 2009; Kiparsky, 2003; Watson, 2007) have suggested that the ranking of the constraint *FINAL-C-µ is also undominated. The definition of the constraint *FINAL-C-µ, adopted from Kager (1999), is given in (17).

17) *FINAL-C-µ: The final consonant is weightless (Kager, 1999, p. 268).

So far we have seen that studies on syllable structure in some Arabic dialects (e.g., Broselow, 1992, and others) have argued that superheavy syllables of the shapes CVVC and CVCC are bimoraic in the final domain because of the extrametricality of the final consonant. In OT terms, the constraint *FINAL-C-µ is said to be inviolable in a number of previously examined dialects, as we have already discussed.

However, through affixation or morpheme concatenation, superheavy syllables are no longer in the final position, (e.g., CVVC+CV, CVCC+CV). This triggers a fatal violation of the assumed inviolable constraint *[3µ]. Studies on Arabic dialects, however, have shown that the dialects utilize different ways to avoid non-final superheavy syllables. The following subsections of the review will cover the relevant literature on the treatment of non-final superheavy syllables.

2.5.2. Previous studies on the behavior of superheavy syllables in Arabic dialects.

The behavior of non-final superheavy syllables in different Arabic dialects has been the subject of extensive study, beginning with Selkirk (1981) and later in the subsequent works within different rule-based and constraint-based approaches. This includes Broselow’s (1992) extension of Selkirk’s onset/rime proposal and Ito’s (1986, 1989) directionality proposal. Ito’s (1986, 1989) directionality proposal was extended in Farwaneh (1995) and later reproduced within OT
framework in Mester and Padgett’s (1994) alignment-based analysis, a proposal that was adopted in Zawaydeh (1997), among others.

In addition, Kiparsky’s (2003) Stratal OT proposal covers a number of syllable-based phenomena in different Arabic dialects, suggesting two distinct constraint systems for word phonology and sentence phonology. Moreover, Watson (2007), following Kiparsky’s (2003) Stratal OT model, has proposed a detailed analysis for non-final CVVC syllables in some Arabic dialects.

It should be mentioned, however, that none of these studies has covered data from QA or attempted to account for phenomena found in QA. Although some of the previous studies that have tackled the treatment of non-final CVVC and CVCC syllables in Arabic dialects have covered some aspects found in QA, as we will see soon, there are still other phenomena that should be understood with reference to the phonology of QA, as the present study will highlight.

2.5.2.1. The behavior of non-final CVCC syllables. Much attention in the theoretical literature has been given to the ways in which Arabic dialects avoid medial triconsonantal clusters (-CCC-). This is evident in the two main proposals mentioned above, that is, Selkirk’s (1981) onset/rime analysis and Ito’s (1986,1989) directionality analysis. These analyses have addressed syllabification phenomena mainly found in Cairene and Iraqi or the Levant dialects, each of which is later considered to be a prototype of a given syllabification pattern, encouraging a number of subsequent studies to test syllabification patterns in other Arabic dialects within one of these approaches, as reviewed above.

Generally speaking, many Arabic dialects try to avoid medial triconsonantal clusters that result from the concatenation of morphemes. For example, a medial -CCC- cluster may occur when consonant-initial suffixes are attached to stems ending in VCC sequences.
Dialects such as Cairene Arabic (CA) resolve a medial -CCC- cluster by inserting a vowel between the second and the third members of the cluster, yielding -CCVC. These dialects have been described as onset dialects (Broselow, 1992) because the unsyllabified consonant is linked to the onset of a degenerate syllable (Selkirk, 1981) or in moraic representation; it is attached directly to a syllable node (Broselow, 1992). Dialects such as Iraqi Arabic (IA), on the other hand, avoid a medial -CCC- cluster by adding a vowel between the first and the second members of the cluster, yielding -CVCC. They are called rime dialects because the unsyllabified consonant is attached to the rime of a degenerate syllable (Selkirk, 1981) or in moraic representation; it is linked to a mora (Broselow, 1992). The following examples, cited from Zawaydeh (1997), illustrate the treatment of medial -CCC- clusters in CA and IA.

18) -CCC- in Cairene Arabic:
   a. /bint-ha/ [binte]ha ‘her daughter’ (CCC→ CCVC)

19) -CCC- in Iraqi Arabic:
   a. /bint-ha/ [binitha] ‘her daughter’ (CCC→ CVCC)

In Kiparsky’s (2003) analysis, the term CV dialects is used to designate dialects that break up a medial triconsonantal cluster as -CCVC-, such as CA [ʔultelu] ‘I/you (m.) said to him’ (p. 150), whereas the term VC dialects is used to refer to dialects that split such a cluster as -CVCC-, such as IA [giltila] ‘I/you (m.) said to him’ (p. 150).

The directionality analysis, (Ito, 1986, 1989), however, attributes this process to the direction of syllabification. In dialects such as CA, the syllabification algorithm applies from left-to-right, whereas in dialects such as IA, it applies from right-to-left.

Within a constraint-based analysis, Master and Padgett (1994) have followed Ito’s (1986, 1989) directionality proposal by resorting to syllable alignment constraints to account for the site
of the epenthetic vowel in dialects such as CA and IA, which, as mentioned earlier, differ in their treatment of medial -CCC- clusters. Their alignment-based proposal, which is adopted in Zawaydeh (1997) among others, has suggested that CA utilizes the Syll-Align-R constraint, which requires the alignment of the right edge of every syllable with the right edge of some prosodic word, whereas the Syll-Align-L constraint, which requires the alignment of the left edge of every syllable with the left edge of some prosodic word, is utilized in IA.

While Syll-Align-R and Syll-Align-L constraints may explain the treatment of -CCC- clusters in CA and IA respectively, a similar conclusion cannot be achieved for QA. QA typically breaks up medial -CCC- clusters by inserting a vowel between the second and the third consonants in a way similar to that found in CA. The example in (7.b.iii) in section (2.3) is repeated below in (20).

20) Avoiding non-final CVCC syllable by epenthesis in Qassimi Arabic:
   a. /bint-na/         [bin.ta-na] ‘our daughter’

However, attributing this treatment to the Syll-Align-R constraint cannot be established. This argument is based on three reasons. First, unlike both CA and IA, there are cases in QA in which epenthesis cannot occur to break up medial -CCC- clusters. This appears when the dative particle l, followed by a pronoun, is attached to syllables of the shape CVCC, for example, /gilt-l-i/ → [giltli] ‘you (m.) told me’, as we have seen in section (2.2). Second, while the typical site of the epenthetic vowel in QA is similar to that in CA, there are cases in QA in which the site of the epenthetic vowel is similar to that in IA, as we will soon see.

A third reason comes from the observation that while alignment constraints have captured the treatment of non-final CVCC syllables in CA and IA, they have not addressed the treatment of non-final CVVC syllables. We will see in the following part of our discussion that CA utilizes
closed syllable shortening to avoid non-final CVVC syllables, whereas IA tolerates them. However, unlike CA and IA, in QA, non-final CVVC syllables behave in exactly the same way as CVCC syllables. QA avoids both non-final CVVC and CVCC syllables by inserting a vowel after the last consonant of the superheavy syllable, turning it into an onset of a new syllable; at the same time it tolerates both types of syllables in certain cases for similar reasons.

Alignment constraints cannot explain the fact that in some cases QA follows CA’s way of epenthesis, whereas in other cases it follows that of IA. More importantly, they cannot account for the observation that there are cases in which epenthesis cannot break up a medial -CCC- cluster.

We will see in the present study that a generalization about all these observed phenomena in QA can be elegantly achieved by adopting the concept of contiguity. In addition, both the site of the epenthetic vowel and the tolerance of surface non-final CVVC and CVCC syllables will be explained in terms of syllable weight and the concept of contiguity that prevents stem-internal epenthesis. The examples in (21) and (22) show the difference between CA and IA (cited from Zawaydeh, 1997, p. 193), whereas in (23) the treatment of medial -CCC- clusters in QA is illustrated.

21) -CCC- in Cairene Arabic:

a. /bint-ha/ [bintًاha] ‘her daughter’ (CCC➔ CCVC)
b. /ʔult-l-u/ [ʔultُlu] ‘I told him’ (CCC➔ CCVC)

22) -CCC- in Iraqi Arabic:

a. /bint-ha/ [bintًاha] ‘her daughter’ (CCC➔ CVCC)
b. /gilt-l-a/ [gilَّlًا] ‘I told him’ (CCC➔ CVCC)
c. /triid-ktaab/ [triidًاktaab] ‘do you want a book?’ (CCC➔ CVCC)
23) -CCC- in Qassimi Arabic:

a. /bint-na/ [bintəna] ‘our daughter’ (CCC → CCVC)

b. /gilt-l-uh/ [giltluh] ‘I told him’ (NO epenthesis)

c. /ʃareet-ktaab/ [ʃareetkiptaab] ‘I bought a book’ (CCC → CVCC)

d. /ʃif-ktaabi/ [ʃifkiptaabi] ‘see my book!’ (CCC → CVCC)

As seen in the examples above, the treatment of medial -CCC- clusters in QA differs from both CA and IA. In (23.a), like CA, the epenthetic vowel is inserted between the second and third consonants, whereas in (23.c-d), the epenthetic vowel appears between the first and the second consonants. Moreover, in (23.b) no epenthesis occurs. The present study will show that epenthesis in QA is morphologically determined; thus, what seems to be a random behavior will be accounted for with reference to some highly ranked active constraints in the grammar of QA.

In the previous subsections of our discussion, a review of the relevant literature on the behavior of non-final CVCC syllables and the treatment of medial -CCC- clusters in Arabic dialects and QA have been provided. Now, we will turn our attention to the treatment of non-final superheavy syllables of the type CVVC.

2.5.2.2. The behavior of non-final CVVC syllables. In the dialects examined by Broselow (1992), non-final CVVC syllables are either tolerated or avoided. Dialects that avoid them show their preference for bimoraic syllables either by utilizing long vowel shortening CVVC+CV → CVC.CV or vowel epenthesis CVVC+CV → CVV.CV.CV. As Broselow’s (1992) analysis shows, Meccan Arabic (MA) uses epenthesis, whereas CA uses closed syllable shortening. However, some dialects such as IA appear to tolerate surface CVVC syllables. The following examples illustrate the treatment of CVVC syllables in CA, IA, and MA.
24) Non-final CVVC syllables are allowed (Iraqi):

   a. /baab-ha/ [baab.ha] ‘her door’ (as cited in Kiparsky, 2003, p.148)

25) Non-final CVVC syllables are avoided by closed syllable shortening (Cairene):

   a. /baab-ha/ [bab.ha] ‘her door’ (Kiparsky, 2003, p.150)

26) Non-final CVVC syllables are avoided by epenthesis (Meccan):

   a. /baab-na/ [baa.ba-na] ‘our door’ (Bamakhramah, 2009, p. 91)

As seen in the examples above, in IA non-final CVVC syllables are tolerated, whereas in CA and MA they are avoided by either shortening or epenthesis, respectively. To account for the phenomena found in dialects such as IA (see the example in 24-a), Broselow (1992) has proposed an Adjunction-to-Mora rule, under which a mora can dominate two segments, arguing that surface CVVC syllables in dialects that tolerate them are in fact bimoraic by the application of the adjunction rule.

Since none of the dialects examined in Broselow (1992) tolerates non-final CVCC syllables, she has suggested restricting the Adjunction-to-Mora rule to CVVC syllables, an argument that has been justified in terms of sonority. According to Broselow, since the sonority distance between vowels and consonants is greater than that between consonants of any type, one can assume that the Adjunction-to-Mora rule can create a VC mora, which is less marked than a CC mora, and if a language allows a mora to dominate a CC cluster by the Adjunction-to-Mora rule, then it would allow the less marked VC mora.

In constraint-based analysis, the Adjunction-to-Mora rule has been translated into the constraint NOSHAREDMORA (NSµ). The definition of this constraint is given in (27), as cited in Watson (2007, p. 359).
27) **NO\textsc{SHARED}\textsc{MORA}**: Moras should be linked to single segments (Broselow et al. 1997). Assign a * for each segment (beyond one) attached to a mora (if a mora is attached to \(N\) segments, the number of violation marks = \(N-1\); Frazier, 2005). Based on Watson’s (2007) discussion, in dialects that allow non-final CVVC syllables, the constraint **NO\textsc{SHARED}\textsc{MORA}** is ranked low, whereas in those that do not permit non-final CVVC syllables, it is ranked high. Given this, in QA the **NO\textsc{SHARED}\textsc{MORA}** constraint must be ranked high because like MA, QA typically utilizes epenthesis to avoid non-final CVVC syllables, as we have seen in sections (2.2) and (2.3). Examples from section (2.3) are repeated below.

28) **Avoiding non-final CVVC syllable in Qassimi Arabic**:

a. /beet/ [beet] ‘house’

b. /beet-i/ [bee.ti] ‘my house’

c. /beet-na/ [beet.na] ‘our house’

Bamakhramah (2009) has argued that in MA the constraint **NS_{\mu}** is inviolable because MA typically resorts to epenthesis to repair ungrammatical sequences, although surface non-final superheavy syllables may exist as a result of high vowel deletion. When it comes to QA, his argument also holds. As we have seen in the previous sections, QA may tolerate surface superheavy syllables that result from high vowel deletion, such as [saaʕ.dan] ‘help (m.s.) me!’ or from concatenating some specific morphemes, like [gaal.li] ‘he told me.’ However, QA usually avoids non-final trimoraic syllables by epenthesis, giving evidence that the constraint **NS_{\mu}** must be inviolable in the grammar of QA, and therefore, either a CC shared mora or a VC shared mora will be ruled out, as we will see in the next chapter.

A final point about the treatment of non-final CVVC syllables has to do with the faithfulness constraint **MAX-\mu-V**, which prevents long vowel shortening by ruling out candidates
with output vowels that have less moras than input vowels. Given the job of this constraint, the most faithful output for an input with a bimoraic long vowel is a candidate in which the two moras are preserved, whereas a candidate in which the input long vowel becomes short will crucially violate \textsc{max-µ-v}. In CA, for example, this constraint must be outranked because closed syllable shortening is utilized to satisfy the inviolable anti-trimoraicity constraint *[3µ], such as: /baab-ha/ \(\rightarrow\) [bab.ha] ‘her door.’ However, as highlighted earlier, QA chooses to inset a vowel to avoid non-final VVC sequences rather than to shorten the long vowel (see the examples in 28 above). Since closed syllable shortening is not employed in QA, the present analysis assumes that the faithfulness constraint \textsc{max-µ-v} belongs to QA’s set of inviolable constraints.

So far we have seen that the phonology of QA utilizes a uniform treatment for non-final superheavy syllables. They are avoided by epenthesis; therefore, neither mora sharing nor vowel shortening is allowed. Moreover, the site of the epenthetic vowel is claimed to be morphologically determined. Surface non-final superheavy syllables, on the other hand, are tolerated in two cases. The first is when they result from high vowel deletion, and the second is when they result from attaching the dative particle / to verbs ending in VCC or VVC sequences, followed by a pronoun. The present study owes much to the insightful analysis of non-final superheavy syllables in MA proposed in Bamakhramah (2009). The next subsection of this literature review will consider Bamakhramah’s (2009) constraint-based analysis of superheavy syllables in MA.

\textbf{2.5.2.3. The analysis of non-final superheavy syllables in Meccan Arabic.}

Bamakhramah (2009) provides a detailed OT analysis of syllable structure in three Arabic varieties, concentrating on the behavior of superheavy syllables. The most relevant part of his analysis to the phenomena under discussion is his treatment of superheavy syllables in MA. He
accounts for the behavior of these syllables in terms of the interaction between syllable structure constraints and constraints on syllable-weight with some other markedness and faithfulness constraints.

Recall from section (1.3.2) that in Hayes’s (1989) moraic theory, short vowels are assigned one mora, long vowels are assigned two moras, and single consonants are underlyingly moraless. Since onsets are assumed to be moraless, the parametric rule “Weight-by-Position” was then proposed to account for the observation that consonants in the coda position can be moraic. This rule has been expressed in Kager (1999) by the following violable constraint:

29) \textit{WIGHT-BY-POSITION}: Coda consonants are moraic (Kager, 1999, p. 269).

Adopting the \textit{WIGHT-BY-POSITION (WBP)} constraint, Bamakhramah (2009) explains that in MA the constraint *[3µ] outranks WBP; therefore, all syllables are bimoraic. Since WBP assigns moras to coda consonants, it must outrank the faithfulness constraint DEP-µ-C, which prevents consonants in the output from having more moras than consonants in the input. However, like many other Arabic dialects (see section 2.5.1), the inviolable constraint *FINAL-C-µ dominates WBP; thus, final C is always moraless. Moreover, like many Arabic dialects, the core syllables in MA are CV, CVV, and CVC. Superheavy syllables of the type CVVC and CVCC are restricted to final position, but when they occur non-finally as a result of concatenation, they are avoided by epenthesis, causing no violation of *[3µ].

However, there are cases in which non-final superheavy syllables, resulting from high vowel deletion, seem to be tolerated in MA. Bamakhramah (2009) argues that these syllables are also bimoraic. This is because in MA there is no difference between final and non-final superheavy syllables in terms of stress. He then proposes that the constraint that requires high
vowels to be deleted should be ranked higher than WBP, ensuring that the final consonant is never moraic.

In addition, the faithfulness constraint O-CONTIG, proposed in McCarthy and Prince (1995), was adopted in Bamakhramah (2009) to account for epenthesis and some related phenomena in MA. The definition of this constraint is cited below:

30) O-CONTIG (No Intrusion): If S2 stands in correspondence with S1, S2 forms a contiguous string (McCarthy & Prince, 1995).

The constraint O-CONTIG prevents internal epenthesis in contiguous strings (McCarthy & Prince, 1999). Since O-CONTIG bans internal epenthesis in “an output string2 that corresponds to an input string1,” defining the input string1 is critical to identify the job of this constraint (Bamakhramah, 2009, p. 26). Following Kiparsky’s (2003) analysis in which the dative particle l is treated as a “stem-level” morpheme like subject suffixes, S1 strings in MA are defined as stems. Stems include nouns, verbs followed by subject suffixes, and CVVC verbs followed by the dative particle l. Thus, in MA epenthesis cannot occur noun-internally, nor can it split a verb from its subject suffix or a CVVC verb from the dative particle. In the phonology of MA, when a verb of the shape CVVC is followed by the dative particle l, no epenthesis occurs, but rather the long vowel shortens. However, epenthesis occurs between verbs of the shape CVCC and a following dative l. To account for this, Bamakhramah (2009) has suggested that in MA, one type of the contiguous strings in which internal epenthesis cannot occur is CVVC verbs with the following dative particle.

2.5.2.4. The analysis of non-final superheavy syllables in the present study. In the present analysis of QA, I have adopted Bamakhramah’s (2009) proposal in terms of presenting
the interaction between syllable structure constraints, syllable weight constraints, and other markedness and faithfulness constraints.

The present study also argues that the role of contiguity is even more robust in the phonology of QA. The concept of contiguity in QA not only accounts for the site of the epenthetic vowel but also explains the inadmissibility of epenthesis in certain strings. If we reconsider the data given in (23) in section (2.5.2.1), we will see that unlike the alignment constraints, the faithfulness constraint O-CONTIG can elegantly capture the phenomena observed in QA. The examples are repeated in (31) below.

31) -CCC- in Qassimi Arabic:

a. /bin.t-na/ [bin.ta.na] ‘our daughter’ (CCC→ CCVC)

b. /gil.t-luh/ [gil.lu.h] ‘I told him’ (No epenthesis)

c. /faret-kt-taab/ [fa.ree.tik.taab] ‘I bought a book’ (CCC→ CVCC)

In (a) the epenthetic vowel appears between the second and the third members of the medial-CCC- cluster, whereas in (c), the epenthetic vowel appears between the first and the second members of the medial triconsonantal cluster. In (b), on the other hand, no epenthesis occurs. To account for this, the present study proposes that the constraint O-CONTIG is highly ranked in the grammar of QA; thus, epenthesis does not occur stem-externally. Stems in the present analysis of QA are defined minimally as nouns with or without the definite article /al/, such as [bint] ‘girl/daughter,’ and maximally as verbs with subject suffixes such as /katab-t/ [kitabt] ‘I wrote,’ or verbs followed by the dative particle l/gaal-l-i/ [gaal.li].

This proposal explains all the phenomena we just observed above in (31). Since the epenthetic vowel cannot appear stem internally, it is inserted after the last consonant of the stem /bint/ in (31.a), whereas in (31.c), the vowel is inserted after the first consonant of the cluster
because its internal insertion between the second and the third consonants of the stem /ktaab/ will violate O-CONTIG. Finally, the most interesting case appears in (31.b) in which epenthesis is not allowed because an intrusive vowel cannot split the verb /gilt/ from the following dative particle. It should be noted that QA differs from MA in that in QA, no epenthesis can occur between the dative particle and a verb ending in either CVVC or CVCC syllables, and vowel shortening is not allowed.

Moreover, we will see that there is no difference between stress placement between internal and final superheavy syllables. Therefore, the proposal suggested in Bamakhramah (2009) that surface non-final superheavy syllables in MA are also bimoraic is evident in QA. The present study argues that this postulation is achieved by ranking the constraints that are responsible for the occurrence of surface non-final superheavy syllables above the WBP constraint, which assign moras to coda consonants. These constraints are the markedness constraint *iCV, which requires high vowels to delete in non-final open syllables, and the faithfulness constraint O-CONTIG, which prohibits stem-internal epenthesis. However, both QA and MA allow stem-internal epenthesis to break up a final CC cluster whose sonority profile is inappropriate. Given this, the sonority constraint must outrank the contiguity constraint, as we will see in the analysis of QA in the next chapter.
Chapter 3: An OT Analysis of Syllable Structure in Qassimi Arabic

3.1. Introduction

This chapter provides a detailed constraint-based analysis of syllable structure and related phonological phenomena in Qassimi Arabic. The arguments established in the previous chapter and the proposals suggested in other studies on syllable structure in Arabic dialects will be brought together to propose a coherent OT analysis of syllable structure in QA. This chapter is organized as follows. Section 3.2 examines possible syllable types and their distribution in QA. Section 3.3 discusses syllable weight in QA. In section 3.4, an OT analysis of syllable structure and related syllable-based phenomena will be developed. Finally, a summary of the analysis proposed in this chapter will be given in 3.5.

3.2. Possible Syllable Types and Their Distribution in Qassimi Arabic

The table below lists all syllable types that may occur in QA. However, the distribution of syllables in QA is very restricted; therefore, the syllable inventory of QA can be classified into basic syllable types and restricted syllable types. The following analysis shows the distribution of each group.

Table 4

Possible Syllable Types in QA

<table>
<thead>
<tr>
<th>Light syllables</th>
<th>Heavy syllables</th>
<th>Superheavy syllables</th>
</tr>
</thead>
<tbody>
<tr>
<td>(C) CV</td>
<td>(C) CVC</td>
<td>(C) CVCC</td>
</tr>
<tr>
<td></td>
<td>(C) CVV</td>
<td>(C) CVVC</td>
</tr>
</tbody>
</table>

3.2.1. Basic syllable types in Qassimi Arabic. Like many Arabic dialects, the core syllable inventory of QA is limited to three syllable shapes: the light open syllable (CV), the
heavy open syllable (CVV), and the heavy closed syllable (CVC). These three basic syllables occur word-initially, word-medially, and word-finally. However, as we have already seen in the previous discussion, the phonology of QA disfavors the occurrence of light syllables with high vowels. Therefore, high vowels are deleted to satisfy the highly ranked constraint *iCV, resulting in syllables with complex initial clusters or internal superheavy syllables.

Moreover, we can also add that the distribution of CVV syllables is somewhat restricted because they do not usually appear in word or phrase-final position, a matter that might be explained in terms of diachronic change. Recall from section (1.2.2.2) that the appearance of the diphthongs /aj/ and /aw/ in QA is restricted to final open unstressed syllables, usually corresponding to Classical Arabic’s final long vowels /ii/ and /uu/, respectively (Johnstone, 1967a). This descriptive generalization gives us two pieces of information. The first is that final /ii/ and /uu/ in CLA are realized as diphthongs in QA. The second is that these diphthongs occur in unstressed syllables.

According to Watson (2002), diphthongs in Arabic are treated as two adjacent units (vowel + consonant) because the second elements in the diphthongs /aj/ and /aw/ are glides, which are classified as consonants in Arabic. Interestingly, the description above states that the diphthongs /aj/ and /aw/ in QA occur only in final unstressed syllables. The fact that they are unstressed confirms the consonantal status of the final glide and that diphthongs in QA do not count as long vowels. This is because, given the moraic theory, long vowels are assigned two moras, whereas coda consonants may be assigned moras by WBP. However, a final consonant is moraless because of its extrametricality as a peripheral element, as we will see soon. With the previous discussion in mind, the following examples show the unrestricted distribution of the core syllables in QA.
1) The distribution of basic syllable types in Qassimi Arabic:

   a. CV syllable in QA:
      i. [ki.tab] ‘he wrote’
      ii. [ʔa.χa.ðat] ‘she took’
      iii. [ga.ra] ‘he read’

   b. CVV syllable in QA:
      i. [saa.fir] ‘travel! (m.s.)’
      ii. [ʃa.ree.ti] ‘you (f.s.) bought’

   c. CVC syllable in QA:
      i. [jal.ʕab] ‘he plays’
      ii. [ta.ħar.rak] ‘move! (m.s.)’
      iii. [ʃaa.lan] ‘they (f.) lifted’
      iv. [ʔim.faj] ‘walk! (f.s.)’
      v. [ʔim.faw] ‘walk! (m.p.)’

3.2.2. Restricted syllable types in Qassimi Arabic. As mentioned in the previous section, like other Arabic dialects, the core syllable types in QA are CV, CVV, and CVC syllables. The remainder of syllable types that appear in Table 4 are restricted to certain positions. Restricted syllable types in QA are of two kinds: syllables with complex onsets and superheavy syllables. The following sections will illustrate the restricted occurrence of these marked syllable types in QA.
3.2.2.1. Syllables with initial CC clusters. As mentioned in section (2.3), QA seems to allow word and phrase-initial CC clusters under the effect of short vowel deletion. The present study has considered the role of high vowel deletion in creating marked syllable types in QA. As discussed in section (2.3), one of the highly ranked constraints in QA is the markedness constraint *iCV, which requires the deletion of high vowels in non-final open syllables. The deletion of high vowels then results in syllables with initial tautosyllabic clusters or internal superheavy syllables. Descriptively speaking, syllables of the shapes CCV, CCVV, CCVC, CCVVC, and CCVCC may appear in word or phrase-initial position as a result of high vowel deletion, as the following examples illustrate.

2) Word/phrase-initial CC clusters in Qassimi Arabic from HVD:

a. /gi.tˤaʕ/ [gtˤaʕ] ‘pieces’
b. /ji.sa.a.fir/ [jsaa.fir] ‘he travels’
c. /ħimaar/ [hmaar] ‘donkey’

The present study has not addressed low vowel deletion in QA because this discussion goes beyond the scope of the present study. Excluding this phenomenon, however, does not affect the analysis of syllable types and their distribution in QA. The significance of low vowel deletion is relevant to the metrical analysis of the dialect, which is not the goal of the present study. In general, /a/ is deleted when it occurs in non-final open syllable, followed by a non-final open syllable. McCarthy’s (2003) analysis of similar phenomenon found in BHA attributes this process to constraints on foot well-formedness. According to him, Bedouin dialects have iambic stress; therefore, /a/ in a non-final open syllable is deleted when it is followed by a /Ca/ syllable in order to improve the LL iambic foot. Since an LL iamb is improved by lengthening in many languages, an LL iamb in Bedouin Arabic is improved by weakening the first syllable by vowel deletion. Thus, the LL iamb becomes ΔL where Δ stands for a moraless syllable. The moraless weak syllable and the strong moraic syllable are then adjoined to the foot. Note that this metrical account of low vowel deletion is compatible with the present study’s general assumption that complex onset clusters are not allowed. For a detailed analysis, see McCarthy (2003, 2007).
However, recall from the previous discussion on high vowel deletion in section (2.3) that the present study argues that there are a number of compelling reasons to propose that the constraint *COMP-ONS is inviolable in the phonology of QA. Thus, the present study will resort to the assumption that the first consonant in such complex onset clusters is actually an extrasyllabic element, similar to those occurring in the final domain. This extrasyllabic element is licensed remotely by a semisyllable (a degenerate syllable), which is attached directly to the prosodic word. A detailed OT account for this phenomenon will be developed in the analysis section of this chapter.

3.2.2.2. Superheavy syllables. As Table 4 demonstrates, besides the three basic syllable types, the syllable inventory of QA includes superheavy syllables of the shape CVVC and CVCC. However, the distribution of these two syllables is quite restricted. While CVVC syllables occur freely in word and phrase-final position, their occurrence internally is restricted. CVCC syllables, on the other hand, are allowed word and phrase-finally only if they cause no violation of the sonority constraints in QA, whereas their internal occurrence is constrained.

From our discussion in the previous chapter, the restricted appearance of non-final superheavy syllables has been established. Descriptively speaking, they appear in two cases, either as a result of high vowel deletion or as a result of attaching the dative particle $l$, followed by a pronoun, to verbs ending in CVVC and CVCC syllables. In the following examples, the distribution of CVVC and CVCC syllables in final and non-final phonological positions will be illustrated.

3) Final CVVC syllables in Qassimi Arabic (No restriction):

a. /naar/ [naar] ‘fire’
b. /himaar/ [hmaar] ‘donkey’
c. /jaʃ.ri.buun/ [jaʃ.ri.buun] ‘they (m.) drink’

4) Non-final CVVC syllables in Qassimi Arabic (Restricted distribution):
a. /beet-na/ [bee.tə.na] ‘our house’
b. /gaal-l-i/ [gaal.li] ‘he told me’
c. /saafir-i/ [saaf.ri] ‘travel! (f.s.)’
d. /gaal-l-na/ [gaal.lə.na] ‘he told us’

The examples in (3) validate the generalization that final CVVC syllables occur with no restriction in QA. The examples in (4), on the other hand, demonstrate the restricted distribution of internal CVVC syllables. As shown in (4.a), a non-final CVVC syllable is avoided by vowel epenthesis, whereas the example in (4.b) shows that when the dative particle l is attached to verbs ending in CVVC syllables, no vowel is inserted between the verb and the particle because in QA they constitute a contiguous string, which cannot be broken up by a vowel. The example in (c) represents another case in which surface CVVC syllables are tolerated, this time as a result of high vowel deletion. Note that even in this case, at least in principle, a possible candidate in which a schwa is inserted will be ruled out because verb-internal epenthesis is prohibited in QA: /saafir-i/ → [saaf.ri], but /saafir-i/ → *[saa.fə.ri]. Needless to say, inserting vowels such as /a/ or /u/ will be crucially ruled out by both O-CONTIG and the markedness constraints *aCV and *iCV. In other words, /a/ will violate the highly ranked constraint *aCV, whereas /u/ is a high vowel, and the constraint *iCV disfavors any short high vowel occurring in non-final open syllables.

Finally, the example in (4.d) throws light on two aspects of the phonology of QA. The first is that non-final CVVC syllables are tolerated when they are followed by the dative particle
The second is that when a consonant-initial pronoun is attached to the dative particle, epenthesis will occur between the particle and the pronoun but not between the verb and the particle. This clearly illustrates how the concept of contiguous strings determines the site of the epenthetic vowel in QA.

5) Final CVCC syllables in Qassimi Arabic (Sonority-governed):

a. /bint/ [bint] ‘girl; daughter’

b. /hilm/ [hilm] ‘dream’

c. /sa.baht/ [si.baḥt] ‘I swam’

d. /ʔamn / [ʔamən] ‘security; safety’

e. /ʔaml/ [haməl] ‘pregnancy’

f. /nahl/ [naḥl/ ‘bees’

g. /hadʒm/ [ḥadʒm] ‘size’

The examples above show that word and phrase-final CC clusters in QA are sensitive to the SSP. The first three examples illustrate that no epenthesis occurs if the final CC cluster represents a sonority fall or sonority plateau. However, the final CC cluster in the example in (d) also represents a sonority plateau, but epenthesis occurs. Thus, it seems that the grammar of QA allows final segments with equal sonority except if those segments are nasals. The last three examples, on the other hand, show that epenthesis is triggered to break up final clusters whose sonority profiles violate the SSP. The clusters /-ml/, /-hl/, and /-dʒm/ represent a sonority rise, which crucially violates the sonority-sequencing requirement that codas should fall in sonority.

Conclusions established for the distribution of non-final CVVC syllables that we have seen in the explanation of the examples in (4) are exactly the same for non-final CVCC syllables, as shown in (6).
6) Non-final CVCC syllables in Qassimi Arabic (Restricted distribution):

a. /bint-na/ [bin.ta@na] ‘our daughter’
b. /gilt-l-i/ [gilt.li] ‘you (m.) told me’
c. /jak.ti.buun/ [jakt.buun] ‘they (m.) write’
d. /gilt-l-na/ [gilt.la@na] ‘you (m.) told us’

The role of both high vowel deletion and contiguity in allowing surface internal CVCC syllables is evident in the above examples. The job of the constraint O-CONTIG in preventing epenthesis into certain defined strings and in determining the site of the epenthetic vowel is supported in the examples above. First, in (6.a), the vowel is inserted after the last consonant of the stem ‘bint’, respecting O-CONTIG. Second, in (6.b-d), no vowel is inserted between the verb and the dative particle l. Since the dative particle in (6.b) is followed by a vowel-initial pronoun, no epenthesis occurs, whereas in (6.d) a vowel is inserted between the dative particle and the following consonant-initial pronoun. This is because the mapping /gilt-l-na/ $\Rightarrow$ *[gilt.lna] must be ruled out by *COMP-ONS, whereas the mapping /gilt-l-na/ $\Rightarrow$ *[gil.tal.na] will be ruled out by O-CONTIG.

To capture the difference between QA, on one hand, and Cairene Arabic (CA) and Iraqi Arabic (IA), on the other hand, in terms of the treatment of this type of affixation, consider the following examples:

7) Verb +l+ CV pronoun in Cairene Arabic:

a. /ʔult-l-ha/ [ʔultilha] ‘I told her’

8) Verb +l+CV pronoun in Iraqi Arabic:

a. /gilt-l-ha/ [giltlilha] ‘I told her’
9) Verb + l + CV pronoun in Qassimi Arabic:

a. /gilt-l-na/ [gilt.lə-na] ‘you (m.s) told us’

The above examples clearly illustrate how QA differs from both CA and IA in handling this type of affixation. In the above examples, both CA and IA insert the vowel between the verb and the dative particle, whereas in QA, it is inserted between the dative particle and the following pronoun. This gives strong evidence about the job of the constraint O-CONTIG in the grammar of QA.

To sum up, the previous section has provided us with a detailed discussion about possible syllable types and their distribution in QA. The next section will concentrate on analyzing syllable weight in QA.

3.3. Syllable Weight in Qassimi Arabic

As we have already established in the previous chapter, the present study follows the moraic theory (e.g., Hayes, 1989) in terms of recognizing syllable weight. It also adopts Bamakhramah’s (2009) insights in terms of presenting the interaction between syllable structure constraints, syllable weight constraints, and other markedness and faithfulness constraints.

The basic assumptions of Hayes’s (1989) moraic theory are that vowels are underlyingly moraic and coda consonants are assigned moras by the WBP rule, which has been expressed in OT terminology by the constraint WBP, which requires coda consonants to be moraic. Other relevant active constraints discussed in the previous chapter are the undominated constraints *|[3µ|, which require syllables to be maximally bimoraic, and the *FINAL-C-µ constraint, which ensures that the final consonant is moraless because it counts as a peripheral extra prosodic element. While the constraint WBP is outranked by the constraints *|[3µ| and *FINAL-C-µ, it must dominate the faithfulness constraint DEP-µ-C, which prevents consonants in the output
from acquiring a mora that is absent in the input because coda consonants occurring in a non-
peripheral position are assigned moras by WBP.

When it comes to QA, Ingham’s (1982) general discussion of stress placement in Najdi
dialects shows that in all Najdi dialects, stress falls on heavy “long” syllables nearest to the end
of the word, and if no heavy syllable occurs, stress falls on the initial syllable. He explains that
final heavy “long” syllables, which may attract stress, are CVVC, CVCC, and CVV, whereas
non-final heavy syllables include CVVC, CVCC, CVV, and CVC. This descriptive
generalization clearly indicates that the constraint WBP is active in the grammar of Najdi
dialects, as the following moraic explanation will clarify. The first basic assumption is that
syllables of the type CVC are treated as heavy syllables only when they occur non-finally,
whereas syllables of the shape CVV are heavy either finally or non-finally. This difference can
be easily captured by moraic theory. CVV syllables are always bimoraic because long vowels are
assigned two moras, whereas CVC syllables are bimoraic non-finally by WBP, but in the final
position, the final C is moraless, satisfying the undominated constraint *FINAL-C-\mu.

The other observation is very interesting. We already know that the final consonant is
always moraless under *FINAL-C-\mu; thus, final CVVC and CVCC syllables are bimoraic. CVVC
syllables are bimoraic because long vowels are assigned two moras, whereas CVCC syllables are
bimoraic because the vowel is assigned one mora, and the pre-final consonant is also assigned
one mora by WBP. However, the descriptive generalization given above about Najdi dialects, to
which QA belongs, indicates that non-final CVVC and CVCC syllables are also treated as final
CVVC and CVCC.

As explained earlier, such syllables occur in QA as a result of high vowel deletion or as a
result of concatenating the dative particle l, followed by a pronoun, to verbs ending in CVVC or
CVCC syllables. This supports Bamakhramah’s (2009) proposal, which suggests that the constraint that encourages high vowel deletion and the constraint that prevents internal epenthesis must outrank WBP. Thus, the final consonant in these syllables is moraless although it is not a peripheral element. This explains the observations that both final and non-final superheavy syllables are treated similarly in Ingham’s (1982) description and that there is no difference between these syllables in terms of stress assignment.

Stress placement in QA confirms the present study’s basic argument that, like many Arabic dialects, syllables in QA must be maximally bimoraic. This conclusion is achieved by the postulation that if both final and non-final superheavy syllables of the shape CVVC and CVCC attract stress similarly, and if final CVVC and CVCC syllables are essentially bimoraic syllables, then non-final CVVC and CVCC syllables are also bimoraic.

The following examples from QA are given just as a means of illustration to show how stress falls on heavy (bimoraic) syllables. However, a detailed account of stress assignment in QA goes beyond the scope of the present study.

10) Stress on CVCC syllables in Qassimi Arabic:
   a. ki’tabt ‘I wrote’
   b. ‘gilt.luh ‘I told him’

11) Stress on CVVC syllables in Qassimi Arabic:
   a. jan.fi.’duun ‘they (m.) ask’
   b. ‘saaf.ri ‘travel! (f.s.)’

12) Stress on CVC and CVV syllables in Qassimi Arabic:
   a. ‘bee.tah ‘her house’
   b. mi.’fee.ti ‘you (f.s.) walked’
c. ‘dar.ra.san ‘they (f.) taught’

d. ta.'har.ra.kan ‘they (f.) moved’

e. ‘si.bah ‘he swam’

The examples above shed light on two basic assumptions about syllable-weight in QA. First, the WBP constraint must be active in the grammar of QA because the final consonant in non-peripheral CVC syllables is moraic, as the examples in (12.c-d) demonstrate. Also, a final CVC syllable is monomoraic because of the non-moraicity of the final consonant. The second assumption is that both final and non-final CVVC and CVCC syllables attract stress, a matter that is compatible with Bamakhramah’s (2009) proposal about syllable weight in MA and the present study’s postulation about similar phenomena in QA, which suggests that both final and non-final CVVC and CVCC syllables are bimoraic.

Based on the analysis above, the moraic representation of syllables in the output “surface” forms in QA is given below.

13) Moraic representation of final and non-final CV and CVV syllables in Qassimi Arabic:

<table>
<thead>
<tr>
<th>µ</th>
<th>µ µ</th>
</tr>
</thead>
<tbody>
<tr>
<td>CV</td>
<td>CVV</td>
</tr>
</tbody>
</table>

14) Moraic representation of final and non-final CVC syllables in Qassimi Arabic:

<table>
<thead>
<tr>
<th>Final</th>
<th>Non-final</th>
</tr>
</thead>
<tbody>
<tr>
<td>µ</td>
<td>µ µ</td>
</tr>
<tr>
<td>CVC</td>
<td>CVC</td>
</tr>
</tbody>
</table>

15) Moraic representation of final CVVC and CVCC syllables in Qassimi Arabic:

<table>
<thead>
<tr>
<th>µ µ</th>
<th>µ µ</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVVC</td>
<td>CVCC</td>
</tr>
</tbody>
</table>
16) Moraic representation of non-final CVVC and CVCC syllables in Qassimi Arabic in cases resulting from HVD or in cases in which the constraint O-CONTIG is involved. Both *iCV and O-CONTIG outrank WBP.

<table>
<thead>
<tr>
<th>µ µ</th>
<th>µ µ</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVVC</td>
<td>CVCC</td>
</tr>
</tbody>
</table>

17) Moraic representation of non-final CVVC and CVCC syllables in Qassimi Arabic in candidates that would satisfy WBP and cause no violation for both *iCV and O-CONTIG. Note that these syllables will be ruled out by the undominated constraint *[3µ], as we will see in the OT analysis in the next section.

<table>
<thead>
<tr>
<th>µ µ µ</th>
<th>µ µ µ</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVVC</td>
<td>CVCC</td>
</tr>
</tbody>
</table>

To summarize, the present study of QA supports the basic proposal assumed in some studies on syllable structure in Arabic dialects, which suggests that syllables are maximally bimoraic. Evidence comes from two observations in the phonology of QA. The first is that QA avoids non-final trimoraic syllables that result from affixation or morpheme concatenation by vowel epenthesis, causing no violation of the undominated constraint *[3µ]. The second is that stress assignment indicates that there is no difference between final and non-final superheavy syllables in terms of attracting stress. This proves that surface CVVC and CVCC syllables that are tolerated to satisfy the highly ranked constraints *iCV and O-CONTIG are actually bimoraic.

From an optimality-theoretic perspective, this observation can be accounted for in terms of constraints ranking. In other words, the constraints *iCV and O-CONTIG, which are crucially
responsible for the appearance of non-final superheavy syllables, must dominate the WBP constraint whose job is to assign moras to coda consonants.

So far, we have discussed possible syllable types and their distribution in QA. We have also established syllable weight in QA. In the next section, a detailed OT analysis will be provided.

3.4. An OT Analysis of Syllable Structure in Qassimi Arabic

Before beginning our illustration of the interaction between constraints in QA, I will attempt to propose a possible ranking of the active constraints in the phonology of QA based on the discussions provided in the previous chapter and in the previous sections in the current chapter. Beginning with our discussion of the interaction between high vowel deletion and low vowel raising in section (2.3), the ranking proposed in McCarthy (2007) was adopted to account for similar phenomena found in QA. This partial ranking is repeated in (18):

\[ 18) \text{MAX-A, } *aCV \gg *iCV, \text{ ID (low)} \gg \text{MAX-V.} \]

Note from the above ranking that \(*aCV\) outranks both \(*iCV\) and \(\text{ID (low)}\) and that the constraints \(*iCV\) and \(\text{ID (low)}\) are not ranked with respect to each other. Besides the above partial ranking, based on our previous discussion of moraic representation and syllable weight, the following partial ranking is proposed.

\[ 19) *\text{FINAL-C-}\mu, \text{ *[3}\mu] \gg \text{O-CONTIG, } *iCV \gg \text{WBP} \gg \text{DEP-}\mu-C. \]

We have established that the constraints \(*\text{FINAL-C-}\mu\) and \(*\text{[3}\mu]\) belong to the set of undominated constraints in QA, whereas the equally ranked constraints \(\text{O-CONTIG}\) and \(*iCV\) must outrank WBP. The faithfulness constraint \(\text{DEP-}\mu-C\), on the other hand, is dominated by WBP. The ranking of these constraints will be justified by illustrating the interaction between the given constraints.
Now we will turn our attention to establishing the ranking of the other relevant constraints. As mentioned earlier, the constraints *F\text{INAL-C}-\mu \text{ and } *[3\mu] \text{ are inviolable in QA.} In addition, our discussion in section (2.5) about mora sharing suggests that the constraint \text{NO\text{SHARED-MORA}} (\text{NS}_\mu) \text{ should be included in the set of undominated constraints in QA.} To this set, the constraint \text{MAX-\mu-V}, \text{ which prevents vowel shortening, should also be added.} This is because, unlike other Arabic dialects such as CA, QA \text{ does not utilize closed syllable shortening to avoid the occurrence of internal CVVC syllables that result from the concatenation of morphemes.} The modified ranking is given in (20).

\begin{equation}
20) \ *\text{FINAL-C-}\mu, \ *[3\mu], \ \text{NS}_\mu, \ \text{MAX-}\mu-V >> \text{MAX-A, } \ *a\text{CV} >> \text{O-CONTIG, } *i\text{CV, ID (low)} >> \text{WBP} >> \text{DEP-}\mu-C, \ \text{MAX-V.}
\end{equation}

However, as mentioned earlier, the constraint \text{O-CONTIG} is violated in one case in QA. This occurs when a final CC cluster violates the SSP. The SSP is used here just as a cover constraint because, given our previous discussion, we need more specific constraints that can account for the relation between sonority and epenthesis QA. However, at this point of discussion, we can say that the SSP constraint, or some version of it, must outrank both \text{O-CONTIG} \text{ and the syllable well-formedness constraint } *\text{COMP-COD}. \text{ The constraints WBP and } *\text{COMP-COD}, \text{ on the other hand, are equally ranked in QA.} \text{ This ranking will be justified in the following discussion of the analysis. In addition, note that the sonority constraints belong to the set of the highly ranked constraints in QA. They dominate } \text{O-CONTIG, which is equally ranked with } *i\text{CV. Since } *a\text{CV outranks } *i\text{CV, and the SSP constraints outrank } \text{O-CONTIG and } *i\text{CV, then the ranking of the SSP constraints must be equal to or higher than that of the raising constraint } *a\text{CV. However, since the SSP constraints and } *a\text{CV are not ranked with respect to}

each other, I will use a semicolon to separate them. A modified version of the ranking is given in (21).

\[
21) *\text{FINAL-C-}\mu, *[3\mu], \text{NS}\mu, \text{MAX-}\mu-V \gg \text{SSP}; \text{MAX-A}, *a\text{CV} \gg \text{O-CONTIG}, *i\text{CV}, \text{ID (low)} \gg \text{WBP}, *\text{COMP-COD} \gg \text{DEP-}\mu-C, \text{MAX-V}.
\]

Now, after establishing the ranking of the general sonority constraint, specific sonority constraints will be proposed to capture the phenomena found in QA. In OT analyses, the \text{SONORITY-SEQUENCING} constraint (\text{SON-SEQ}) is used as a common cover constraint on the sonority profiles of complex clusters (McCarthy, 2008, p. 255). Given Clements’s (1990) SSP, this common constraint requires onsets to rise in sonority and codas to fall in sonority (Kager, 1999). However, in some languages, as shown in Baertsch (2002), Kager (1999), and others, more specific constraints are needed to capture the behavior of specific sequences of segments. It is evident that the constraint \text{*COMP-COD} is violated in QA because codas that do not violate the SSP are allowed; therefore, constraints that require vowel epenthesis to break up a coda cluster must be ranked higher.

In his study of coda clusters in Najdi Arabic, Alkhonini (2014) proposes four constraints on coda clusters, ranked with respect to each other as the following:

\[
22) \text{NO RISING SON} \gg \text{NO SON+SON} \gg \text{NO OBS+OBS}, \text{NO FALLING-SON}, \text{*COMP-COD}.
\]

However, the present study rejects this proposal for two reasons. The first is that the ranking is not motivated by the universal constraint on coda clusters that requires codas to fall in sonority; thus, it does not seem to be legitimate to propose a constraint that bans codas with falling sonority such as \text{NO FALLING-SON}. The second is that the constraint \text{NO SON+SON} will rule out
candidates with any final sonorant clusters even if they actually occur in the dialects under discussion.

As we have seen in the previous discussion on final clusters in NA in section (2.4), data from Ingham (1994), Alkhonini (2014), and from my examination of QA show that a final cluster such as /-lm/ in the word [ʔilm] ‘news’ is allowed because it satisfies the SSP. However, if we assumed that the constraint NO SON+SON is active, then it would rule out the candidate ʔilm because its has a sequence of SON+SON. To clarify the issue in QA, I can say that the treatment of final sonorant clusters differs based on the sonority class of the segments. In words such as /naml/ \(\rightarrow\) [naməl] ‘ants,’ epenthesis occurs because the final cluster represents a sonority rise because the liquid /l/ is more sonorous than the nasal /m/. In words such as [fim] ‘oven’ or [hilm] ‘dream,’ on the other hand, no epenthesis occurs because the final (liquid-nasal) cluster falls in sonority. Finally, in words such as /ʔamn/ \(\rightarrow\) [ʔamən] ‘security; safety,’ epenthesis occurs because the final (nasal-nasal) cluster is not allowed.

Therefore, I will propose two alternative constraints on coda clusters that are highly ranked in QA. These are *RISE-SON]_o and *PLATEAU-N]_o. The constraint *RISE-SON]_o allows only coda clusters with a sonority fall or plateau. In other words, it rules out any candidate with final rising sonority. The constraint *PLATEAU-N]_o, on the other hand, disfavors clusters with equal sonority if they are nasals. It is a cover constraint that requires the attested final /-mn/ cluster in the dialect under discussion to be broken up by an epenthetic vowel. Both *RISE-SON]_o and *PLATEAU-N]_o are among QA’s set of the highest ranking constraints. However, *PLATEAU-N]_o must outrank *RISE-SON]_o because it assigns a violation mark for any candidate with final (Nasal-Nasal) cluster even though this candidate satisfies *RISE-SON]_o.
The following tableaux illustrate this ranking. In Tableau 23, \*RISE-SON\_\(\sigma\) outranks \*PLATEAU-N\_\(\sigma\) and both candidates in (a) and (b) satisfy \*RISE-SON\_\(\sigma\) because the final /-mn/ cluster does not represent a sonority rise. Thus, both the optimal actual candidate in (a) and the loser candidate in (b) satisfy the highest-ranking constraint \*RISE-SON\_\(\sigma\). However, the ranking \*PLATEAU-N\_\(\sigma\) >> \*RISE-SON\_\(\sigma\), on the other hand, is justifiable in that when \*PLATEAU-N\_\(\sigma\) is ranked above \*RISE-SON\_\(\sigma\), as seen in Tableau 24, the candidate (b) is immediately ruled out. In Tableau 25, on the other hand, the ranking of \*PLATEAU-N\_\(\sigma\) and \*RISE-SON\_\(\sigma\) does not affect the evaluation process because \*PLATEAU-N\_\(\sigma\) is not active in this evaluation. It is neither satisfied nor violated.

23) /ʔamn/ → [ʔamən] ‘security; safety’

<table>
<thead>
<tr>
<th>/ʔamn/</th>
<th>*RISE-SON_(\sigma)</th>
<th>*PLATEAU-N_(\sigma)</th>
<th>*COMP-COD</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ʔamən</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. ʔamn</td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

24) /ʔamn/ → [ʔamən] ‘security; safety’

<table>
<thead>
<tr>
<th>/ʔamn/</th>
<th>*PLATEAU-N_(\sigma)</th>
<th>*RISE-SON_(\sigma)</th>
<th>*COMP-COD</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. → ʔamən</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. ʔamn</td>
<td>*!</td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

25) /naml/ → [naməl] ‘ants’

<table>
<thead>
<tr>
<th>/naml/</th>
<th>*PLATEAU-N_(\sigma)</th>
<th>*RISE-SON_(\sigma)</th>
<th>*COMP-COD</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. → naməl</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. naml</td>
<td>*!</td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

The incorporation of these constraints is given in (26).
26) $\text{*FINAL-C-µ, *[3µ], NSµ, MAX-µ-V} >> \text{*PLATEAU-N]}_\circ >> \text{*RISE-SON]}_\circ$; MAX-A, $\text{*aCV} >> \text{O-CONTIG, *iCV, ID (low)} >> \text{WBP, *COMP-COD} >> \text{DEP-µ-C, MAX-V}$.

So far, we have established a possible ranking of the constraints in QA. A more detailed discussion about this possible ranking, together with the illustration of the interaction between these constraints, will be provided in the following subsections.

3.4.1. The ranking of basic syllable structure constraints in Qassimi Arabic. In Chapter 1, we have encountered the syllable typology proposed in Prince and Smolensky (1993/2004), and we have seen that Arabic is a language that requires onsets and admits codas. Also, we have established the generalization that like Classical Arabic (CLA), in QA the basic syllable structure constraint ONSET is inviolable, whereas the constraint *CODA is ranked low. In addition, we have seen that in CLA, the constraint *COMP-ONS is inviolable, and it is equally ranked with ONSET. The tableau illustrating this interaction is repeated below.

27) /hmil/ [ʔiħ.mil] ‘carry! (m.s.)’

<table>
<thead>
<tr>
<th>/hmil/</th>
<th>ONSET</th>
<th>*COMP-ONS</th>
<th>MAX-C</th>
<th>DEP-C</th>
<th>DEP-V</th>
<th>*CODA</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. → ʔiħ.mil</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>b. ih.mil</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>c. hmil</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>d. mil</td>
<td></td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The tableau above illustrates that the unfaithful candidate (d) is ruled out because the consonant /h/ in the input is deleted in the output. Although candidate (b) satisfies the constraint *COMP-ONS, it is ruled out by the undominated constraint ONSET. The optimal candidate is (a) because it satisfies all the undominated constraints, causing violation of only the lower ranking faithfulness constraints that disfavor insertion.
Like CLA, in QA, the constraint \textsc{onset} is inviolable and the faithfulness constraint \textsc{dep-c} has a lower ranking because a prosthetic glottal stop is always inserted before any onsetless syllable, occurring domain-initially. For example, for an input with the definite article \textit{al-} as in \textit{al-beet} ‘the house,’ a glottal stop is inserted to satisfy \textsc{onset}. In the internal domain, no glottal stop is inserted because \textsc{onset} is satisfied by re-syllabification, as the following example shows: 
\[ /\text{fa.reet} \# \text{albeet/} \rightarrow [\text{fa.ree.tal.beet}] \text{ ‘I bought the house.’} \]
In addition, although coda is allowed in QA, an input CVCVC is never syllabified as CVC.VC because onset is obligatory.

However, before illustrating the undominated tanking of \textsc{onset} in QA, we should establish the ranking of the constraint \textsc{*comp-ons}. As discussed in the previous chapter, there are a number of compelling reasons to assume that \textsc{*comp-ons} is inviolable in QA. First, syllabification patterns in QA confirm that \textsc{*comp-ons} must be inviolable. For example, for an input CVCCVC, the optimal candidate is CVC.CVC. However, since coda is not required in QA, the constraint \textsc{*comp-ons} must rule out the mapping CVCCVC \rightarrow *CV.CCVC. Another piece of evidence comes from the treatment of medial -CCC- clusters. For example, as we have seen in Chapter 2, attaching a consonant-initial suffix to a stem ending in a VCC sequence triggers vowel epenthesis: \textsc{cvcc+cv} \rightarrow \textsc{cvc.cv.cv}. Thus, the mapping CVCCCV \rightarrow *CVC.CCV must also be ruled out by \textsc{*comp-ons}. A final piece of evidence comes from the treatment of forms with underlying complex clusters. As we have seen in Tableau 27 above, the optimal candidate for the input /\text{h}mil/ is [\text{?ih.mil}]. We will see in the following tableau that like CLA, QA avoids morphological forms with underlying onset clusters by inserting a prosthetic (?V) to satisfy both \textsc{onset} and \textsc{*comp-ons}. In the following tableau, the undominated ranking of \textsc{onset} and \textsc{*comp-ons} and the lower ranking of \textsc{*coda} in QA are illustrated.
This tableau confirms two critical aspects about the phonology of QA. The first is that ONSET is inviolable and *CODA is ranked low. The second is that *COMP-ONS must belong to QA’s set of undominated constraints. While candidate (b) satisfies *COMP-ONS but violates ONSET, the optimal candidate (a) satisfies both ONSET and *COMP-ONS, violating the lower ranking faithfulness constraints DEP-C and DEP-V. Candidate (d) is ruled out because the consonant /h/ in the input is deleted in the output, whereas candidate (a) fails because it violates *COMP-ONS, validating the assumption that *COMP-ONS is inviolable in QA.

The ranking of the constraints given in (26) will be now modified as the following:


In QA, the faithfulness constraint DEP-C has a lower ranking because a prosthetic glottal stop is usually inserted before any onsetless syllable, occurring domain-initially. In the internal domain, however, no glottal stop is inserted because ONSET is satisfied by re-syllabification, as mentioned earlier. Moreover, for morphological forms with underlying onset clusters such as the imperative /dris/ ‘study’ (see Tableau 28), the glottal stop is required when this word is used domain-initially, that is, when it occurs in isolation or at the beginning of a phrase. However, no
glottal stop is inserted when the word is used domain-internally because vowel epenthesis, as candidate (b) shows, will be sufficient to satisfy *COMP-ONS. Consider the following examples:

30) Vowel epenthesis and glottal stop epenthesis in Qassimi Arabic:

a. /dris/ [ʔid.ris] ‘study! (m.s.)’

b. /dris# bukra/ [ʔid.ris.buk.ra] ‘study tomorrow!’

c. /ta.ʕaal # dris/ [ta.ʕa.lid.ris] ‘come to study!’

So far, it has become evident that QA is a dialect that always requires onsets and never bans codas; therefore, ONSET is undominated and *CODA is always ranked low and never participates in an evaluation. This means no candidate is ruled out because it violates *CODA and, therefore, this constraint will not be included in the next evaluations. In addition, since ONSET is inviolable in QA, outranking the anti-consonant epenthesis constraint DEP-C, ONSET and DEP-C will not be included in any next tableau to save space. Moreover, since QA does not resort to consonant deletion to repair onset clusters or medial tri-consonantal clusters, the faithfulness constraint MAX-C will not be included. Candidates that would in principle violate ONSET, DEP-C, or MAX-C will not be considered. Their ranking in the grammar of QA, however, has already been established in (29).

However, the faithfulness constraints DEP-V and MAX-V will be included in the next evaluations. This is because vowel deletion usually occurs in QA to satisfy the markedness constraint *iCV, which requires high vowels to syncopate when they occur in non-final open syllables. In addition, vowel epenthesis is utilized in two cases. The first is to satisfy the sonority constraints, and the second is to satisfy the undominated constraint *[3µ].

3.4.2. High vowel deletion and initial onset clusters in Qassimi Arabic. Based on the discussion given above, the constraint *COMP-ONS, as clearly shown in Tableau 28, is inviolable
in QA. Now let us consider the observation that in QA complex, initial CC clusters may result from high vowel deletion. In section (3.2.2), I have briefly discussed that the present study argues that onsets must be simple in QA. This means only one consonant is directly attached to a syllable node as its onset and, therefore, any extra peripheral consonant in this position will be assumed to be extrasyllabic. Since the final consonant in syllables such as CVCC and CVVC is moraless, it is usually illustrated as an extrasyllabic segment that is attached to a headless syllable. Extra segments in the onset position will be treated similarly in the present study. Suggestions in Mahfoudhi’s (2005) analysis to account for a somewhat similar phenomenon found in Tunisian Arabic (TA) will be considered.

Mahfoudhi (2005) has examined left-edge effects on syllable structure in three Arabic dialects: Cairene Arabic (CA), Meccan Arabic (MA), and TA. His study has shown that only TA allows domain-initial onset clusters. Following Piggott’s (1999) remote licensing proposal, which allows edge consonants that are not licensed directly by syllables like non-peripheral elements to be licensed remotely by the prosodic word, Mahfoudhi (2005) proposes that the constraint Remote-License-C-Left (R-L/C-L) requires the left consonant in the onset cluster in TA to be licensed remotely. Thus, in TA for an input /qlam/, the candidate qlam ‘a pen’ is ruled out by R-L/C-L, but the optimal candidate q.lam wins.

In line with McCarthy’s (2003) proposal of moraless semisyllables (see footnote 10), I will assume in my analysis of QA that when the high vowel deletes, the remaining consonant is adjoined by a moraless semisyllable (i.e., a degenerate syllable) and licensed remotely by the prosodic word. This satisfies the Remote-License-C-Left constraint because the consonant is not licensed directly by a syllable, but rather when the syllable-head /i/ deletes; the remaining
consonant is licensed remotely by an extra-syllabic semisyllable, causing no violation to the crucial requirement that all segments must be licensed by syllables or moras.

In QA, I will propose that the constraint *COMP-ONS is undominated, whereas the constraint Remote-License-C-Left (R-L/C-L) is equally ranked with *iCV, the constraint that requires high vowels to delete in non-final open syllables, creating initial CC clusters. This proposal will also elegantly account for the fact that as in CLA, in QA, morphological forms with underlying onset clusters such as the imperative are avoided by inserting a vowel followed by a prosthetic glottal stop to satisfy ONSET (see Tableau 28). The new ranking of the constraints in QA is given in (31):


In the following tableau, the interaction between the constraints *iCV, *COMP-ONS, and Remote-License-C-Left (R-L/C-L) will be illustrated by showing that the constraint *iCV assigns a violation mark to any candidate with a non-final short high vowel, whereas the constraint Remote-License-C-Left (R-L/C-L) rules out any candidate with an extra consonant in the left edge that is not licensed remotely.

As shown in Tableau 32, candidate (a) is ruled out by the highly ranked constraint *iCV. While candidate (b) would satisfy *iCV, it immediately fails because it violates the undominated syllable well-formedness constraint *COMP-ONS. The optimal candidate (c) satisfies all the highly ranked constraints. First, it does not cause any violation to *COMP-ONS because the first segment at the left edge of the word is assigned to an extra-prosodic syllable. Second, it satisfies the equally highly ranked constraints *iCV and R-L/C-L in that the high vowel in the first open
syllable is deleted and the remaining consonant (its onset) is licensed remotely by a semisyllable. The requirement that all segments should be parsed into syllables or moras is crucially met because all segments have been licensed.

32) /dʒi.daar/ [dʒi.daar] ‘wall’

<table>
<thead>
<tr>
<th>segmentation</th>
<th>constraint</th>
<th>R-L/C-L</th>
<th>DEP-V</th>
<th>MAX-V</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. dʒi.daar</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. dʒdaar</td>
<td>*!</td>
<td>*!</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>c. → dʒ.daar</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

3.4.3. High vowel deletion and low vowel raising in Qassimi Arabic. Based on the analysis of syllable structure and related phonological phenomena in QA, the ranking of the constraints proposed in the present study is repeated in (33).

33) ONSET, *COMP-ONS, *FINAL-C-μ, *[3μ], NSμ, MAX-μ-V >> *PLATEAU-N]σ >>
   *RISE-SON]σ; MAX-A, *aCV >> O-CONTIG, *iCV, R-L/C-L, Id (low), MAX-C
   >>WBP, *COMP-COD >> DEP-C, DEP-V >> DEP-μ-C, MAX-V >> *CODA.

In the above ranking, constraints whose job and ranking have already been established and will not be included in the following tableaux are underlined as a means of clarification.
Now, we will turn our attention to the interaction between high vowel deletion and low vowel raising. The partial ranking, extracted from (33) and given in (34), is sufficient to account for this phenomenon in QA.

34) *COMP-ONS >> MAX-A, *aCV >> *iCV, R-L/C-L, Id (low) >> MAX-V.

Given the ranking in (34), the following tableau demonstrates the interaction between high vowel deletion and low vowel raising in QA.

35) /dʒamaʕ/ [dʒimaʕ] ‘he gathers’

<table>
<thead>
<tr>
<th></th>
<th>*COMP-ONS</th>
<th>MAX-A</th>
<th>*aCV</th>
<th>*iCV</th>
<th>R-L/C-L</th>
<th>Id (low)</th>
<th>MAX-V</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. →</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. dʒmaʕ</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. dʒa.maʕ</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. dʒ.maʕ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

The tableau above clarifies that the faithful candidate (c) fails because it violates *aCV, whereas the winning candidate (a) satisfies both MAX-A and *aCV. Although the constraint *iCV belongs to the set of the highest-ranking constraints in QA, it is outranked by *aCV; therefore, its violation is tolerated in the above evaluation. We also notice that while candidate (b) satisfies *aCV, it violates both *COMP-ONS and MAX-A. However, MAX-A is crucially required to rule out candidate (d), which does not violate *COMP-ONS.
So far we have seen that *aCV and MAX-A outrank both *iCV and the identity constraint ID (low). The ranking of ID (low) is equal to *iCV because there is no candidate that would in principle violate *iCV but satisfy ID (low), or vice versa. This is clearly shown in the tableau above. From now on, in the next evaluations, the constraints *aCV, MAX-A, and ID (low) will be excluded because their jobs in the grammar of QA have been established and illustrated in Tableau 35.

The interaction between constraints on syllable-weight and other constraints will be examined in the following subsections. The ranking of the constraints is repeated below.

36) **ONSET, *COMP-ONS, *FINAL-C-µ, *[3µ], NSµ, MAX-µ-V >> *PLATEAU-N]**;


3.4.4. Final CVVC and CVCC syllables in Qassimi Arabic. We will begin our examination by illustrating the status of final CVVC syllables. Because of the limited space, in every following evaluation, only relevant constraints will be included. The following tableau demonstrates the optimality of the bimoraic candidate [naar] ‘fire’.

As seen in the tableau below, the winning candidate is (e), which satisfies the undominated constraints *FINAL-C-µ, *[3µ], NSµ, and MAX-µ-V. The relationship between *FINAL-C-µ and *[3µ] is not clear in this evaluation because a possible candidate such as that in (a) violates both of them. The assumption that these two constraints are both inviolable will be evident with non-final superheavy syllables because the moraicity of the final consonant cannot be ruled out by *FINAL-C-µ. The tableau below also shows that candidates (b) and (c) are ruled out immediately by the undominated constraint NSµ and MAX-µ-V, respectively. We also notice that a candidate such as that in (d) crucially violates both *FINAL-C-µ and MAX-µ-V.
In the next tableaux, the status of final CVCC syllables will be illustrated. However, as explained earlier, the job of the constraint *[3µ] is irrelevant when it comes to superheavy syllables in the final position because the final consonant is always moraless. Any candidate appears with a final moraic consonant will be ruled out by the constraint *FINAL-C-µ. Thus, the constraint *[3µ] will not be included in the next evaluations. Moreover, the constraint MAX-µ-V will be excluded for obvious reasons.

Beginning with Tableau 38, the behavior of final CVCC syllables will be examined. We will begin our illustration by considering a case in which the final CC cluster does not violate the sonority constraints. Then we will examine two cases that trigger epenthesis to satisfy the sonority constraints.
In the tableau above, we notice that candidate (e) is ruled out immediately by the undominated constraint *FINAL-C-µ. This candidate satisfies WBP in that both final consonants in the coda are assigned moras; however, actual outputs in QA, as we have previously seen, are bimoraic. Their bimoraicity is, as clearly shown in the tableau above, attributed to the undominated ranking of *FINAL-C-µ in the grammar of QA. Candidate (b) also fails immediately by violating NSµ. Candidate (d), on the other hand, appears with an internal epenthetic vowel, violating O-CONTIG. It has been evident from the arguments developed earlier that internal epenthesis in QA is not tolerated, except when an epenthetic vowel is inserted to break up a final coda cluster that violates one of the specified sonority constraints. If the epenthetic vowel in (d) were inserted to satisfy one of the sonority constraints, then its violation of O-CONTIG would be minimal because the sonority constraints outrank O-CONTIG. However, as illustrated in Tableau
above, the sonority constraints are inactive in this evaluation because the final coda cluster /-nt/ does not violate *PLATEAU-N]σ or *RISE-SON]σ. The competition appears to be between candidates (a) and (c). Both (a) and (c) cause no fatal violation to any of the highly ranked constraints. Thus, the concept of minimal violation seems to be the determining factor in the above evaluation. The WBP constraint is equally ranked with *COMP-COD because in principle, there is no violation of COMP-COD that would be tolerated to satisfy WBP. The determining factor in the above evaluation is, therefore, based on the concept of minimal violation. Given the assumption that both *COMP-COD and WBP outrank DEP-µ-C, the optimal candidate is the bimoraic candidate (a), which incurs two violation marks for violating *COMP-COD and WBP, whereas the loser monomoraic candidate (c) fails the competition because it incurs three violation marks for violating *COMP-COD and WBP.

Next, we will turn our attention to cases in which internal epenthesis is triggered by the sonority constraints. Tableau 39 demonstrates the interaction between internal epenthesis and the sonority constraint *PLATEAU-N]σ, which disfavors outputs with final nasal clusters.

The tableau below illustrates that the possible candidates in (a, b, c, and e) violate the sonority constraint *PLATEAU-N]σ. Note that candidates (b) and (e) not only violate *PLATEAU-N]σ but also violate the undominated constraints NSµ and *FINAL-C-µ, respectively, whereas the optimal candidate (d) achieves the satisfaction of all the highly ranked constraints by satisfying the inviolable constraints NSµ and *FINAL-C-µ, on one hand, and the constraint *PLATEAU-N]σ, on the other hand. The evaluation illustrated in the tableau below clearly shows how the violation of the constraint O-CONTIG by the winning candidate (d) is tolerated to satisfy *PLATEAU-N]σ. Finally, candidate (f) exhibits an interesting case. While it satisfies *PLATEAU-N]σ by breaking
up the final cluster, it is ruled out by the inviolable constraint *FINAL-C-µ. This gives evidence that syllables of the type CVC are monomoraic when they occur in the final position.

Tableau 40 shows how internal epenthesis is triggered to break up a final coda cluster with rising sonority. The tableau below clarifies the treatment of an input with final CC cluster that rises in sonority. In the word /naml/ ‘ants,’ the final cluster /-ml/ represents a sonority rise, violating the constraint *RISE-SON]σ, which disfavors final clusters with rising sonority. The previous conclusion achieved in Tableau 39 is also justified in Tableau 40. The winning candidate (f) satisfies *RISE-SON]σ, causing no violation to any of the undominated constraints. Candidates (a, b, c, and e) violate *RISE-SON]σ, with (b) and (e) being ruled out immediately by
the undominated constraints NS\(\mu\) and *FINAL-C-\(\mu\), respectively. As we have already observed in the previous tableau, although candidate (d) satisfies *RISE-SON]\(\sigma\), its failure in satisfying *FINAL-C-\(\mu\) is fatal.

\[
\begin{array}{c|c|c|c|c|c|c}
\mu & \mu & \mu & \mu & \mu & \mu & \mu \\
| /naml/ & [na.m\,a\,l] & \text{‘ants’} \\
40)
\end{array}
\]

<table>
<thead>
<tr>
<th></th>
<th>*FINAL-C-(\mu)</th>
<th>NS(\mu)</th>
<th>*PLATEAU-N](\sigma)</th>
<th>*RISE-SON](\sigma)</th>
<th>O-CONTIG</th>
<th>*COMP-COD</th>
<th>WBP</th>
<th>DEP-V</th>
<th>DEP-(\mu)-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>/naml/ &amp;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>/naml &amp;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>/naml &amp;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>/naml &amp;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e</td>
<td>/naml &amp;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f</td>
<td>/naml &amp;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the previous subsection, we have illustrated the interaction between the proposed constraints in establishing the status of final CVVC and CVCC syllables in QA. In the next subsection, we will focus on the treatment of non-final CVVC and CVCC syllables.

3.4.5. Non-final CVVC and CVCC syllables in Qassimi Arabic. The present analysis of QA has argued that the phonology of QA utilizes a uniform treatment for both CVVC and
CVCC syllables. Since syllables in QA are maximally bimoraic, non-final trimoraic syllables are avoided by epenthesis.

We will begin our examination by looking at cases in which epenthesis is triggered to satisfy *[3µ]. Then we will consider cases in which internal CVVC and CVCC syllables are tolerated to satisfy *i/CV or O-CONTIG.

\[
\begin{array}{ccccccccc}
\mu\mu\mu & & \mu\mu\mu & & \\
\mid & & \mid & & \\
41)/beet-na/ & [bee.tə.na] & \text{‘our house’}
\end{array}
\]

<table>
<thead>
<tr>
<th></th>
<th>*COMP-ONS</th>
<th>*[3µ]</th>
<th>NS\mu</th>
<th>MAX-µ-V</th>
<th>WBP</th>
<th>DEP-V</th>
<th>DEP-µ-C</th>
<th>MAX-V</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>!</td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td></td>
<td></td>
<td></td>
<td>!</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e.</td>
<td></td>
<td></td>
<td></td>
<td>!</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f.→</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>!</td>
<td></td>
</tr>
</tbody>
</table>

As illustrated in Tableau 41, when a syllable of the shape CVVC occurs non-finally, epenthesis is triggered. Note that the constraint O-CONTIG is irrelevant in this case. The optimal candidate (f) is chosen in the evaluation above because it is the only candidate that causes no violation to the undominated constraints *[3µ], *COMP-ONS, NS\mu, and MAX-µ-V. These
constraints are violated by the candidates in (a), (b), (c), and (d), respectively. We can see that the constraint WBP is involved in the evaluation above because the winner does not violate this constraint, whereas the loser candidate in (e) does.

In the following tableau the treatment of internal CVCC syllables will be illustrated.

As we see in Tableau 42, the optimal candidate (d) satisfies all the inviolable constraints. Also, the evaluation above illustrates the job of the constraint O-CONTIG because like the winning candidate, candidate (f) does satisfy the first three inviolable constraints; however, it is ruled out by O-CONTIG. As we have seen in the previous tableaux, candidates such as those in (a), (b), and (c) are never chosen as optimal outputs in the phonology of QA because of the
undominated status of *COMP-ONS, *[3µ], and NSµ. A final point worth noticing in the tableau above is that while the winner (d), which is the actual output, causes only a minimal violation of the lower ranked faithfulness constraint Dep-V, the loser candidate in (e) incurs three violation marks for violating both *COMP-COD and WBP.

It has been clear that the grammar of QA satisfies the constraint *[3µ] by vowel epenthesis every time a syllable of the type CVVC or CVCC occurs non-finally. It has also been explained that there are two cases in QA in which surface superheavy syllables seem to be tolerated. However, given the observation that in QA there is no difference in terms of stress between final and non-final superheavy syllables, it is plausible to postulate that non-final CVVC and CVCC syllables are actually bimoraic because, as we have seen in the previous tableaux, final superheavy syllables are bimoraic. In other words, if both final and non-final superheavy syllables attract stress in the same way, then it is legitimate to assume that like final bimoraic syllables, non-final syllables of the shape CVVC and CVCC are actually bimoraic. This assumption has been accounted for in terms of constraints’ ranking.

Non-final CVVC and CVCC syllables in QA are tolerated in two restricted cases. The first case is when they result from high vowel deletion, and the second is when they result from attaching the dative particle / to verbs ending in CVVC or CVCC syllables. In the first case they satisfy *iCV, while in the second case they satisfy O-CONTIG. Thus, it has been concluded that in QA both *iCV and O-CONTIG must dominate WBP, which requires coda consonants to be moraic. Below, the ranking of the constraints in QA is repeated.

Based on the ranking above, the partial ranking given in (44) is involved in the treatment of non-final CVVC and CVCC syllables in QA. However, in each case only relevant constraints will be included. For example, for obvious reasons the constraint MAX-µ-V is active in the evaluations of candidates with CVVC syllables only.

44) *COMP-ONS, *[3µ], NSµ, MAX-µ-V >> O-CONTIG, *iCV >> WBP, *COMP-COD >> DEP-V >> DEP-µ-C, MAX-V.

As explained above, the grammar of QA allows the occurrence of non-final bimoraic CVVC and CVCC syllables in two cases. These will be illustrated in the following three tableaux. First, the tolerance of verbs ending in CVVC and CVCC syllables with a following dative particle will be shown in Tableaux 45 and 46.

\[
\begin{array}{|l|l|l|l|l|l|l|l|}
\hline
\text{45)/gaal-li/} & \text{maal-li} & \text{maal-li} & \text{maal-li} & \text{maal-li} & \text{maal-li} & \text{maal-li} & \text{maal-li} \\
\hline
\end{array}
\]

As explained above, the grammar of QA allows the occurrence of non-final bimoraic CVVC and CVCC syllables in two cases. These will be illustrated in the following three tableaux. First, the tolerance of verbs ending in CVVC and CVCC syllables with a following dative particle will be shown in Tableaux 45 and 46.
The winner in Tableau 45 is the candidate that satisfies O-CONTING in not allowing stem internal epenthesis. It does not incur any violation mark for any constraint belonging to the set of the undominated constraints. Its bimoraicity, however, is due to its violation of the constraint WBP, which is dominated by O-CONTING.

Similar results are observed in Tableau 46. The optimal candidate is the bimoraic candidate in (d), which unlike the loser in (f) violates WBP minimally. It should be clear from the tableau below that candidates (a), (b), and (c) fail the competition immediately. In addition, candidate (e) is also ruled out because an intrusive vowel is inserted stem internally.

![Tableau 46: gilt-li/][gilt.li] ‘you (m.s.) told me’

<table>
<thead>
<tr>
<th></th>
<th>*COMP-ONS</th>
<th>*[3µ]</th>
<th>NSµ</th>
<th>O-CONTIG</th>
<th>*COMP-COD</th>
<th>WBP</th>
<th>DEP-V</th>
<th>DEP-µ-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td></td>
<td>![]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b</td>
<td></td>
<td>![]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c</td>
<td></td>
<td>![]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d</td>
<td></td>
<td>![]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e</td>
<td></td>
<td>![]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f</td>
<td></td>
<td>![]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Finally, the treatment of internal superheavy syllables, resulting from high vowel deletion, will be presented in the following tableau.

<table>
<thead>
<tr>
<th></th>
<th>*COMP-ONS</th>
<th>*[3µ]</th>
<th>NSµ</th>
<th>MAX-µ-V</th>
<th>O-CONTIG</th>
<th>*jCV</th>
<th>WBP</th>
<th>DEP-µ</th>
<th>DEP-µ-C</th>
<th>MAX-V</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. saa.fi.ri</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. saaf.ri</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. saaf.ri</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. saa.fi.ri</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. saa.fa.ri</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. saf.ri</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. saa.fri</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tableau 47 shows the treatment of internal superheavy syllables that result from HVD in QA by demonstrating a case in which an internal bimoraic CVVC syllable, resulting from HVD, is chosen as an optimal candidate. The winning candidate (d) satisfies *jCV, causing no violation to any of the undominated constraints. Candidates in (b), (c), (f), and (g) are immediately ruled out by the inviolable constraints NSµ, *[3µ], MAX-µ-V, and *COMP-ONS, respectively. The faithful candidate in (a) fails the competition because it retains the non-final
high vowel, violating the markedness constraint *iCV, whereas the candidate in (e) violates the equally ranked constraint O-CONTIG by admitting stem-internal epenthesis.

3.5. Summary

This chapter provides a detailed constraint-based analysis of syllable structure in QA. It begins with investigating the distribution of syllables and exploring syllable weight in QA. After establishing the distribution of syllables and their weight, an OT analysis of the phenomena under consideration has been developed. The following ranking of the constraints in QA has been justified and illustrated throughout the analysis.

Chapter 4: Conclusion and Suggestions for Further Research

This thesis has proposed an optimality-theoretic analysis of syllable structure and related phonological phenomena in a dialect of Arabic that has not received attention in the available theoretical literature on syllable structure within Arabic dialects. Three main syllable-based issues have been tackled in the present analysis of QA. First, we have considered the effect of high vowel deletion on syllable structure. Second, we have looked at the treatment of final CC clusters in terms of sonority. Third, we have explored the treatment of non-final superheavy syllables.

The main goal of this study was to propose a possible coherent OT analysis of the phenomena under discussion in QA. To achieve this, the present study has investigated possible syllable types and their distribution in QA and has considered the ways in which QA differs from some other previously studied Arabic dialects in terms of syllable structure. Descriptively speaking, like many Arabic dialects, the core syllable types in QA are CV, CVV, and CVC, and the occurrence of syllables of the shapes CVVC and CVCC is restricted.

Three arguments about syllable structure in QA have been validated in this thesis. The first is that syllables may not have more than two moras. The second is that complex onset clusters must be prohibited in the grammar of QA. Finally, internal epenthesis cannot occur in certain defined strings in the phonology of QA.

Results from the present analysis show that trimoraic syllables are prohibited in QA, confirming the view that syllables in many Arabic dialects are maximally bimoraic (e.g., Broselow, 1992). Evidence comes from the way in which internal superheavy syllables are avoided when they result from morphological concatenation. We have seen that QA avoids the occurrence of both non-final superheavy syllables of the shapes CVVC and CVCC by
epenthesis. A vowel is inserted after the last consonant of the superheavy syllable, and a new syllable is created.

The avoidance of internal superheavy syllables in QA supports the assumed inviolability of the constraint *[[3μ] in many previously studied Arabic dialects (e.g., Bamakhramah, 2009; Watson, 2007). However, we have observed that QA differs from Arabic dialects that resolve internal CVVC syllables by vowel shortening, verifying the postulation that the constraint MAX-μ-V must be inviolable in QA. Moreover, we have also seen that QA does not allow mora sharing because superheavy syllables are typically prohibited and therefore avoided by epenthesis. Thus, unlike those Arabic dialects whose typical retention of non-final CVVC syllables has been attributed to mora sharing, the constraint NOSHAREDMORA belongs to the set of undominated constraints in QA.

Moreover, given the assumptions of moraic theory (e.g., Hayes, 1989), the interaction between constraints on syllable structure and constraints on syllable weight with other markedness and faithfulness constraints has been illustrated throughout the proposed analysis of QA. As in many previously studied Arabic dialects (e.g., Bamakhramah, 2009; Kiparsky, 2003; Watson, 2007), the extrametricality of the final consonant in syllables occurring phrase-finally is attributed to the inviolable constraint *FINAL-C-μ, whose job in the phonology of QA has been demonstrated in the present study.

However, we have observed two interesting cases in which QA seems to tolerate internal trimoraic syllables that result from high vowel deletion or from attaching the dative particle l, followed by a pronoun, to verbs ending in VCC or VVC sequences. These cases have been explained by showing the interaction between the constraints that are responsible for creating internal superheavy syllables and the WBP constraint, which requires consonants in the coda to
be moraic. This interaction is captured in terms of constraint ranking. The OT analysis of this phenomenon in QA has demonstrated the validity of assuming that both \( *iCV \) and O-CONTIG must outrank WBP in QA. By this ranking, an output that satisfies the inviolable constraint \( *[3\mu] \) and the constraints \( *iCV \) and O-CONTIG in a given evaluation is optimal.

It has been shown that the higher ranking of the constraints \( *iCV \) and O-CONTIG is remarkably evident in the phonology of QA. The previous analysis has emphasized that syllables with onset clusters and internal superheavy syllables may result from the deletion of high vowels in non-final open syllables to satisfy the markedness constraint \( *iCV \). However, the present study has discussed several pieces of evidence from syllabification patterns in QA that confirm the assumption that the constraint \( *\text{COMP-ONS} \) must be inviolable in the phonology of QA. Given this argument, the present analysis has accounted for the occurrence of initial onset clusters by assuming that the peripheral segment in an initial onset cluster that results from high vowel deletion is an extrasyllabic element, which is adjoined to a semisyllable that is remotely licensed by the prosodic word.

Moreover, the present analysis of QA has confirmed the plausibility of adopting the concept of contiguity to account for epenthesis patterns in QA. The investigation has shown that the job of the faithfulness constraint O-CONTIG, which prevents internal epenthesis in some specified strings, is evident in both the occurrence and non-occurrence of epenthesis in QA. This has been achieved by defining S1strings in QA as stems. Stems include nouns, verbs followed by subject suffixes, and verbs followed by the dative particle \( l \). We have seen that epenthesis does not occur stem-internally in QA. This, for example, appears when a noun such as /bint/ ‘daughter’ is followed by the suffix /-na/; the epenthetic vowel cannot appear stem internally, as
in *[binatna]. Also, when the verb /gilt/ ‘I said’ is followed by the dative particle /l/, an intrusive vowel cannot break up this string; thus [gilt.li] ‘you told me’ is accepted.

However, as we have seen in the previous chapter, an exception appears with the treatment of word and phrase-final consonant clusters whose sonority profile is not accepted, and therefore, an intrusive vowel is inserted to break them up. This illustrates the violability of the highly ranked constraint O-CONTIG because it is outranked by the proposed constraints on sonority sequencing in QA.

By bringing light to syllable-based phenomena found in QA, the present study aims to provide a basic foundation for further research on QA. Due to the limited scope of this study, other interesting phenomena have been left for future investigation. This includes several aspects related to vowels and vowel alternations in QA. For example, we have observed in the descriptive part of QA that the phonemic status of high short vowels is controversial in the available literature on QA and that surface allophonic variants of vowels may be governed by the adjacent consonantal environment. The correlation between these descriptive observations and other phonological processes in QA such as high vowel deletion, low vowel raising, and the quality of the epenthetic vowel is worth investigating.

In addition, the present study has not attempted to account for some observed phenomena from a metrical perspective, leaving this task to a future study whose main goal is to explore the stress system and other related aspects in QA.

Moreover, the present study has attempted to contribute to the typological studies on Arabic syllable structure by shedding some light on the ways in which QA differs from previously studied Arabic dialects. However, it has been established that the major goal of the current study was to provide an analysis of syllable structure in QA. By exploring phenomena in
a dialect that has not gained any serious attention, however, results from the present study can supply future typological and comparative studies on Arabic syllable structure with some more interesting cases that require attention and investigation.

Finally, since this thesis covers syllable-based phenomena found mainly in QA, it suggests conducting studies on syllable structure in other Najdi dialects. Such studies are needed to fill in the gap in the theoretical research on Najdi dialects in general. While descriptive studies are available, theoretical research is critical to our understanding of the phonology of these dialects. A further step is to establish a typological analysis of syllable structure in Najdi dialects and other relevant Bedouin dialects and eventually to bring phenomena observed in these dialects to the growing body of research on syllable structure within Arabic dialects.
References


McCarthy, J., & Prince, A. (1986). *Prosodic morphology.* Unpublished manuscript, University of Massachusetts at Amherst and Brandeis University, Waltham, MA.


