

## ABSTRACT

### OPTIMALITY THEORITIC ANALYSIS OF NAJDI BROKEN PLURAL

Broken plural (BP) is an interesting yet complex phenomenon in Arabic. It has been studied extensively in Classical Arabic and Modern Standard Arabic. However, researchers do not find any source addressing BP in Najdi Arabic extensively. Wright (1971) claims that the BP is derived out of 31 patterns and the only way to learn it is to memorize these patterns. I undertake this study to answer two questions: How is broken plural derived in Najdi Arabic? What are the morpho-phonological processes that participate in the BP formation? McCarthy and Prince (1990a) devise a theory deriving the BP from roots mapped on an iambic template of (LH). This thesis presents a proposal that derives BP stems from singular stems through moraic correspondence and root consonantal identity. Every mora in the singular stem has a correspondent mora in the BP stem. Root consonants in the BP stem are identical to root consonants in the singular stem. McCarthy (2000) is the first to apply output-output moraic correspondence to the BP of Classical Arabic. Moraic correspondence allows the BP stem to have equal moras with its singular stem (less common BP) or an extra mora in the BP stem (common BP in Najdi). The extra mora (or affixed mora) has three main functions: It lengthens the vowel in the rightmost syllable of the BP stem or geminates (doubles) the second root consonant or initiates a new syllable if the rightmost one is full of moras. Vowel lengthening that is done by the affixed mora shifts to the syllable that is adjacent to the affix when there is an affix attached to the BP stem. Data analysis of this study follows the Optimality Theory posited by Prince and Smolensky (1993).

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OPTIMALITY THEORITIC ANALYSIS OF NAJDI  
BROKEN PLURAL

by  
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For the Department of Linguistics:

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## CHAPTER 1: INTRODUCTION

Najdi is a variety of Arabic spoken in Saudi Arabia. Najdi is derived from the word Najd that means a ‘highland’. This dialect has not received much attention in Arabic literature. It differs considerably from Modern Standard Arabic, which is the official language of education and media in Saudi Arabia. These differences include but not limited to plural forms, syllable structures and allophones of certain phonemes. Lewis (2013), Alghmaiz (2013), Alqahtani (2014), and Al-Ghizzy (2006) are among few researchers who explore Najdi Arabic. These reasons prompt me to undertake this study on broken plural in Najdi Arabic. Nouns in Najdi Arabic have three types of plural forms: the first is the sound masculine plural which attaches the suffix / *i:n* / to the singular stem.

(1) / mʕallemi:n / ‘teachers’                      / ʕeribi:n / ‘strangers’

The second is the sound feminine plural which attaches the suffix / *a:t* / to the singular stem.

(2) / tʕa:lba:t / ‘female students’                      / tʕa:wla:t / ‘tables’

The third is the broken plural, which breaks the common rule of suffixation. Instead, it works through thirty plus patterns that internally modify the stem in earlier literature. My main proposal, to account for broken plural in Najdi, is that the BP stem has an equal number of moras with the singular stem or an extra mora. It is also called an affixed mora as in Al Aghbari (2012). Moraic identity in both singular (SG) and BP stems forms a less common BP whereas an extra mora in the BP stem forms a common BP. My hypothesis is that the data collected on Najdi BP will match the proposal of output-output correspondence ( $O_{\mu}$ - $O_{\mu}$ ) in mora counts in the BP stem. No example of BP will break both moraic distributions and shows fewer moras in the BP stem or more than one extra mora.

## CHAPTER 2: LITERATURE REVIEW

McCarthy and Prince (1990a) explore broken plural in Arabic and come up with a theory viewing BP as a (LH) iambic foot template. Their main claim is the BP is derived from root consonants then mapped on an uneven iambic foot (LH). “The major Broken Plural pattern is iambic as well, but the most important secondary one is trochaic”, McCarthy and Prince (1990a: 262). In addition, tri-syllabic templates are viewed as LHX where X stands for L or H. Najdi and possibly other dialects of Arabic like Classical Arabic, derive broken plural from the singular (SG) stem not roots by copying the exact number of moras on different vowel qualities. Root consonants appear in both singular and plural nominals, but they do not derive the BP stem. My proposal, to explain BP in this study, is fundamentally different from M&P (1990a). It links BP to the singular stem not roots through moraic correspondence. I am going to show that my proposal on Najdi BP suits Classical Arabic (CA) and Modern Standard Arabic (MSA) in the discussion.

Meir (2015) addresses the broken plural patterns in Urban Jordanian Arabic (UJA). He views the BP as an outcome of phonetic and semantic gang effects enhanced by frequency distribution and entrenchment. A gang is a group of singular nominals that shares a CV template in both BP and SG words. His work begins with a critique of McCarthy and Prince (1990a) approach to the BP and templates. Meir claims that they do not provide adequate evidence of the iambic template dominance over other templates of BP. In addition, the writer continues in his criticism and questions the BP as a default system over sound plural (another type of plural). The writer tries to establish links between the SG and the BP in vocalism. He also recognizes ‘plural groups’ that exist in UJA and Classical

Arabic as well. These plural groups meet the templates of LHL, H, LH, HLL, LLH but written in CV notation. This presents UJA as a dialect that does not conform to only one possible template of BP. Affixes are present in Urban Jordanian Arabic BP as well.

Al Aghbari (2012) studies broken plural in Muscat Arabic within Optimality Theory (OT). The same uneven iambic foot (LH) in McCarthy and Prince (1990a) exist in Muscat BP with an ‘affixed mora ( $\mu$ )’. This notion of an affixed mora ( $\mu$ ) is crucial to my study of Najdi BP since it gives an objective account to the common BP in Najdi. This affixed mora extends the LH template in two more shapes. An even iambic template HH that forms BP in Muscat Arabic as well as LHL. He uses a ranked set of OT constraints to analyze data on Muscat Arabic. He highlights Universal Grammar as a responsible mechanism filtering the final shape of BP after adding the affixed mora. The writer also attacks McCarthy and Prince (1990a) work of deriving BP out of roots and advances the idea of deriving BP out of the SG stem.

Rashid and Shaker (2014) address broken plural in Modern Standard Arabic (MSA) within OT framework. They base their work on McCarthy (2000) who views the difference between the singular and the BP in an extra mora added somewhere in the locus of the BP. The authors insist that the BP in MSA is iambic. OT constraints used in their study is similar to the ones used in Al Aghbari (2012). They draw a similar conclusion of an affixed mora switching BP stem to an uneven iamb.

(3)

/ (mas). ba.ħ / + $\mu$	DEP <sub>OO</sub> - $\sigma$ F ( $\mu$ )	DEP <sub>OO</sub> F1 ( $\mu$ )
☞ a. (ma.sa:). (bi).ħ		*
b. (mas). (bi:).ħ	*!	

quoted from Rashid & Shaker (2014:24)

(4) DEP<sub>OO-σ</sub> F (μ): Every mora in final syllable of output 2 (BP) has a correspondent mora in the final syllable of output 1 (SG).

(5) DEP<sub>OO</sub> F1 (μ): Every mora in the first foot of output2 (BP) has a correspondent mora in the first foot of output1 (SG).

Winchester (2014) explores inflectional processes in a complex broken plural system of Egyptian Arabic. He tests the proposed realization approach in Kihm (2006) called ‘root and site hypothesis’. He views inflection by site not only by segments. The writer builds his work on an idea proposed by Kihm and others to account for broken plural through roots as a source of derived BP stems. Sites that were discussed in Kihm (2006) could be inside or outside the stem. Data in Winchester (2014: 20) shows that all BP stems have an extra mora compared with the SG stem or an equal number of moras copied from the SG stem to the BP stem.

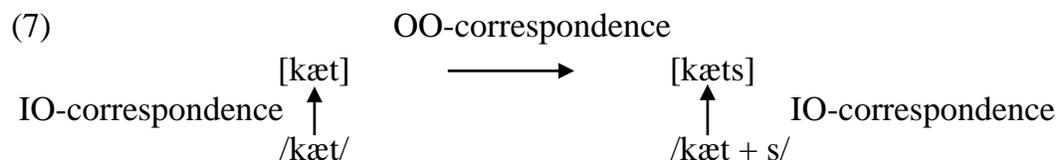
(6)

Singular	Broken plural	Gloss
(ga.ba)l μ μ	(gi.baa)l μ μμ	mountains
(yu.raa)b μ μμ	(yir.baa)n μμ μμ	crow
(dib)b μμ	(di.ba)b μ μ	bear

quoted with a slight change of adding parenthesis to help distinguish moras. Winchester (2014:20)

Benua (1997) studies morphologically related words that, according to her thesis, are required to be phonologically identical through ranked and violable OT constraints. She is the first to put forth a relation of output-output (O-O) correspondence between two surface forms. The basic Correspondence theory first comes from McCarthy and Prince (1995). The theory states that given two strings S1, S2, correspondence is a relation R from an element of S1 to those of S2.

Benua explains O-O correspondence as a morphological derivation governed by a phonological faithfulness relation between the derived output and an output base.



O-O correspondence maintains the consonants' identity between the derived output and the base. In OT, this correspondence relation between two output forms is governed by identity constraints (OO-MAX, OO-DEP, OO-IDENT [F]).

(8) OO-MAX: for every segment in output1, there is a correspondent segment in output2. Deletion of segments is banned.

(9) OO-DEP: for every segment in output 2, there is a corresponding segment in output 1. Epenthesis (addition) of segments is banned.

(10) OO-IDENT [F]: The feature of segments in output 2 must be identical to the corresponding segment in output 1. In addition, moraic correspondence is maintained as a part of O-O correspondence. Benua (1997:149) briefly hints to moraic correspondence (OO-MAX mora), in a footnote, to explain the optimal imperative verb 'ten' in Tiberian Hebrew. This constraint is the relevant O-O constraint in this paper on Najdi BP.

McCarthy (2000) addresses prosodic faithfulness constraints. He builds his work on McCarthy and Prince (1995) correspondence theory that requires identity between segments, features. McCarthy (2000:176) views broken plural in Arabic as a segment-to-segment correspondence and a mora-to-mora correspondence. In other words, every segment in the SG stem has to have a corresponding segment in the BP stem and every mora in the SG stem has to have a corresponding mora in the BP stem. This proposal by McCarthy is similar to my proposal on Najdi BP

with regard to moras but segment identity concerns just consonants not vowels. The writer uses four OT faithfulness constraints to account for BP when respected. MAX-seg, DEP-seg that mean no deletion or addition of segments. MAX- $\mu$ , DEP- $\mu$  are also used in analyzing the BP and they prevent deletion or addition of moras. These four constraints refer to output forms of both the SG stem and the BP stem.

### CHAPTER 3: PHONOLOGY OF BROKEN PLURAL

This chapter explores the phonological processes of forming the broken plural (BP) in Najdi Arabic and briefs about the morphology involved in such processes. Data is elicited from two Najdi speakers (the author, M, 26) and (Mayyadah, F, 23) who once lived in the western region of Saudi Arabia. They completed their Bachelor's degrees at King Abdul Aziz University.

(11) **The rule of broken plural formation:**

The BP is formed by a moraic correspondence and root consonantal identity with the SG. Moraic correspondence produces equal moras in SG, BP stems (less common BP) or an extra mora in the BP stem (common BP). Root consonants must be identical in the SG, BP. Vowels shift in an unpredictable way in the BP.

**In OT constraints:**

**MAX<sub>00</sub> (μ, BP, SG):** Every mora in the SG stem has a correspondent mora in the BP stem. This correspondence implies equal moras or an extra mora in the BP.

(12)	Root	Singular	Broken Plural	Gloss
	ʔ s d	(ʔa.sa)d	(ʔu.su:)d	'lions'
		μ μ	μ μμ	
	ʕ r ʃ	(ʕar)ʃ	(ʕru:)ʃ	'thrones'
		μμ	μμ	

The example above shows two different BP forms. The first word for 'cars' has two moras in the SG stem but three moras in the BP stem. The affixed mora marks the BP nominal and lengthens the vowel in the rightmost syllable. The second word for 'thrones' has equal moras in the SG and BP stems. This moraic identity constitutes the less common BP in Najdi. Crucially, Both BP forms follows the rule of BP formation in moraic correspondence and root consonantal identity. Vowels change in an unpredictable way from the SG stem to the BP stem in (12).

(13) *HL trimoraic shape of BP with / a i / melody, a prefix ma-. subgroup*

Root	Singular word	Broken plural	Gloss
k t b	ma-(k.ta)b	ma-(ka:ti)b	‘offices’
l dʒ ʔ	ma-(l.dʒa)ʔ	ma-(la:dʒi)ʔ	‘shelters’
x b z	ma-(x.ba)z	ma-(xa:bi)z	‘bakeries’
r k z	ma-(r.ka)z	ma-(ra:ki)z	‘centers’
s <sup>ʃ</sup> d r	ma-(s <sup>ʃ</sup> .da)r	ma-(s <sup>ʃ</sup> a:di)r	‘sources’
ʃ m l	ma-(ʃ.ma)l	ma-(ʃa:mi)l	‘labs’
f r ʃ	ma-(f.ra)ʃ	ma-(fa:ri)ʃ	‘bedcovers’
l ʃ b	ma-(l.ʃa)b	ma-(la:ʃi)b	‘playgrounds’
g ʃ d	ma-(g.ʃa)d	ma-(ga:ʃi)d	‘sitting areas’
t h f	ma-(t.ha)f	ma-(ta:hi)f	‘museums’
t <sup>ʃ</sup> l b	ma-(t <sup>ʃ</sup> .la)b	ma-(t <sup>ʃ</sup> a:li)b	‘requests’
s <sup>ʃ</sup> n ʃ	ma-(s <sup>ʃ</sup> .na)ʃ	ma-(s <sup>ʃ</sup> a:ni)ʃ	‘factories’
s dʒ d	ma-(s.dʒi)d	ma-(sa:dʒi)d	‘mosques’
ð <sup>ʃ</sup> h r	ma-(ð <sup>ʃ</sup> .ha)r	ma-(ð <sup>ʃ</sup> a:hi)r	‘appearances’
ʃ d n	ma-(ʃ.da)n	ma-(ʃa:di)n	‘minerals’
t <sup>ʃ</sup> ʃ m	ma-(t <sup>ʃ</sup> .ʃa)m	ma-(t <sup>ʃ</sup> a:ʃi)m	‘restaurants’
dʒ l s	ma-(dʒ.li)s	ma-(dʒa:li)s	‘councils’
ʃ l m	ma-(ʃ.la)m	ma-(ʃa:li)m	‘landmarks’
l b s	ma-(l.ba)s	ma-(la:bi)s	‘clothes’
ʃ r t <sup>ʃ</sup>	mi-(ʃ.ra)t <sup>ʃ</sup>	ma-(ʃa:ri)t <sup>ʃ</sup>	‘lancets’
s k n	ma-(s.ka)n	ma-(sa:ki)n	‘housing areas’
f r ʃ	ma(f.ra)ʃ	ma-(fa:ri)ʃ	‘carpet’
l m h	ma-(l.ma)h	ma-(la:mi)h	‘features’
w r d	ma-(w.ri)d	mu-(wa:ri)d	‘resources’
n dʒ m	ma-(n.dʒa)m	ma-(na:dʒi)m	‘mines’
n h dʒ	ma-(n.ha)dʒ	ma-(na:hi)dʒ	‘courses’
s b h	ma-(s.ba)h	ma-(sa:bi)h	‘swimming pools’

x z n      ma-(x.za)n      ma-(xa:zi)n      ‘warehouses’

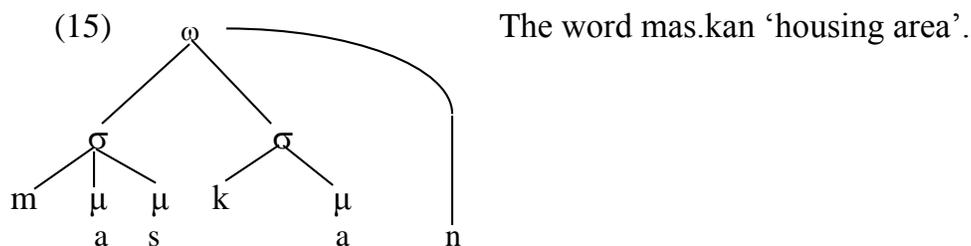
A broken plural stem that is derived from a singular stem with prefix *ma-*. This prefix in the singular attracts the first root consonant as its coda. This provides a mora as root consonants are part of the stem. However, the prefix *ma-* in the BP nominal does not provide a mora to the BP stem, since it does not have a coda filled with a root consonant. Throughout this paper, we copy moras from the singular stem to the BP stem **not** word. A basic definition of the stem is a smallest meaningful morpheme to which affixes are attached. Stems cannot be broken down into smaller meaningful morphemes in Arabic. Aronoff (1994:2) defines a stem as a sound form of phonological domain of realization to which affixes are attached. Stems in Najdi data contain root consonants and vowels that together can convey a meaning. The BP stem has three moras but the singular stem has only two moras. The extra mora marks the common BP in Najdi and it lengthens the vowel in the syllable adjacent to the prefix *ma-*. The singular words in (13) have no suffixes attached to the stem.

(14) *HL shape of BP with / a i / melody, a prefix mV-, II subgroup*

Root	Singular word	Broken plural	Gloss
ʃ k l	mi-(ʃ.ki.l)-ah	mi-(ʃa:ki)l	‘problems’
s <sup>ʕ</sup> l ħ	ma-(s <sup>ʕ</sup> .la.ħ)-ah	ma-(s <sup>ʕ</sup> a:li)ħ	‘interests’
ɣ s l	ma-(ɣ.sa.l)-ah	ma-(ɣa:si)l	‘laundries’
k n s	mi-(k.na.s)-ah	mi-(ka:ni)s	‘cleaners’
dʒ z r	ma-(dʒ.za.r)-ah	mi-(dʒa:zi)r	‘massacres’
l ʕ g	mi-(l.ʕa.g)-ah	ma-(la:ʕi)g	‘spoons’
n ʃ f	mi-(n.ʃa.f)-ah	ma-(na:ʃi)f	‘towels’
dʒ m r	mi-(dʒ.ma.r)-ah	mi-(dʒa:mi)r	‘braziers’
z r ʕ	ma-(z.ra.ʕ)-ah	ma-(za:ri)ʕ	‘farms’
d r s	ma-(d.ri.s)-ah	ma-(da:ri)s	‘schools’

n t<sup>ʕ</sup> g      ma-(n.t<sup>ʕ</sup>i.g)-ah      ma-(na:t<sup>ʕ</sup>i)g      ‘regions’

Another set on a trimoraic (contains three moras) BP stem that is derived from a bimoraic (contains two moras) singular stem. The difference between (13), (14) lies in the presence of the suffix -ah, in (14) that means a feminine nominal. This -ah suffix carries a mora but we do not count it as it is off the stem. The prefix ma- in the BP, SG nominals means a collective noun. It turns the first syllable in the singular into a bimoraic (CVC) one by attracting the first root consonant to fill its coda. Final consonants in all words of the data are extrasyllabic (they belong to the prosodic word not the last syllable). They do not fill the coda of the last syllable.



Spaelti (2002) discusses this in an OT constraint called WEAKEDGE.

(16) WEAKEDGE (P-CAT): ‘The right periphery of (P-CAT) should be empty’, Spaelti (2002:10). This constraint restricts syllable structure through banning a coda at the right edge of the prosodic word, which in turn affects moras number in CVC syllable at the right edge of Prosodic words. CVC structure in the left edge of words is bimoraic but at the right edge is monomoraic thanks to WEAKEDGE. HL shape in (14) shows an extra mora in the BP stem. This affixed mora lengthens the vowel in the first syllable of the BP stem since it is adjacent to the prefix ma-. This affixed mora also marks the common BP in Najdi dialect. The extra mora matches the proposal of output-output (O-O) moraic correspondence, root consonantal identity.

(17) *H bimoraic, monosyllabic shape of BP with / u / melody. I subgroup*

Root	Singular word	Broken plural	Gloss
x j l	(xe:)l	(xju:)l	‘horses’
tʰ j r	(tʰe:)r	(tʰju:)r	‘birds’
ðʰ j f	(ðʰe:)f	(ðʰju:)f	‘guests’
ʕ j n	(ʕe:)n	(ʕju:)n	‘eyes’
ɖʒ j b	(ɖʒe:)b	(ɖʒju:)b	‘pockets’
ʃ j x	(ʃe:)x	(ʃju:)x	‘tribal leaders’
t j s	(te:)s	(tju:)s	‘goats’
ʕ j b	(ʕe:)b	(ʕju:)b	‘vices’
x j tʰ	(xe:)tʰ	(xju:)tʰ	‘strings’
b j t	(be:)t	(bjju:)t	‘houses’
s j l	(se:)l	(sjju:)l	‘floods’
ɖʒ j ʃ	(ɖʒe:)ʃ	(ɖʒju:)ʃ	‘armies’

A bimoraic BP stem is derived from a bimoraic SG stem with a CVV syllable structure. Moraic identity matches the proposal of O-O moraic correspondence. This type of BP stem that copies the same number of moras constitutes the less common BP in Najdi. No affixes participate in BP formation process in (17) and the vocalism shifts from / e: / to / u: / during the derivation. This change in vowel quality happens consistently during BP derivation thanks to singular stems modification. Another interesting factor is the emergence of complex onsets (CCVV) in BP word-initial position. Al-Ghizzy (2006) views this complex onset as a characteristic of a C-dialect (with others like medial gemination). This feature of Najdi violates an OT constraint called \*COMPLEXONS put forth by Prince and Smolensky (1993). Semivowels (j or w) disappear in the SG stem due to the long vowel but they do not challenge the principle of root consonantal identity.

(18) \*COMPLEXONS: A syllable must not have more than one onset segment.

(19) *H bimoraic, shape of BP with / u or a / melody, II subgroup*

Root	Singular word	Broken plural	Gloss
ʕ r ʃ	(ʕar)ʃ	(ʕru:)ʃ	‘thrones’
n h d	(nah)d	(nhu:)d	‘breasts’
f ʕ l	(fɛʕ)l	(fʕu:)l	‘deeds’
ð n b	(ðan)b	(ðnu:)b	‘sins’
ħ r b	(ħar)b	(ħru:)b	‘wars’
ʕ r dz	(ʕir)dz	(ʕru:)dz	‘veins’
s <sup>ʕ</sup> ħ n	(s <sup>ʕ</sup> ah)n	(s <sup>ʕ</sup> ħu:)n	‘plates’
x ʃ m	(xəʃ)m	(xʃu:)m	‘noses’
s dʒ n	(sidʒ)n	(sdʒu:)n	‘jails’
x d	(xad)d	(xdu:)d	‘cheeks’
k f	(kaf)f	(kfu:)f	‘hands’
d r s	(dar)s	(dru:)s	‘lessons’
g l b	(gal)b	(glu:)b	‘hearts’
r dʒ l	(ridʒ)l	(rdʒu:)l	‘feet’
k n z	(kan)z	(knu:)z	‘treasures’
ʃ m s	(ʃam)s	(ʃmu:)s	‘suns’
l ħ m	(lah)m	(lħu:)m	‘meat’
dʒ n d	(dʒin)d	(dʒnu:)d	‘soldiers’
g d r	(gid)r	(gdu:)r	‘pots’
ʕ g l	(ʕag)l	(ʕgu:)l	‘brains’
t <sup>ʕ</sup> b l	(t <sup>ʕ</sup> ab)l	(t <sup>ʕ</sup> bu:)l	‘drums’
b ʃ t	(biʃ)t	(bʃu:)t	‘man’s cloaks’
b t <sup>ʕ</sup> n	(bat <sup>ʕ</sup> )n	(bt <sup>ʕ</sup> u:)n	‘abdomens’
s <sup>ʕ</sup> g r	(s <sup>ʕ</sup> ag)r	(s <sup>ʕ</sup> gu:)r	‘falcons’
dʒ l d	(dʒil)d	(dʒlu:)d	‘skins’
ð <sup>ʕ</sup> l ʕ	(ð <sup>ʕ</sup> il)ʕ	(ð <sup>ʕ</sup> lu:)ʕ	‘ribs’
ʕ l m	(ʕil)m	(ʕlu:)m	‘news’

f s <sup>ɕ</sup> l	(fas <sup>ɕ</sup> )l	(fs <sup>ɕ</sup> u:)l	‘classes’
s <sup>ɕ</sup> t <sup>ɕ</sup> l	(sat <sup>ɕ</sup> )l	(s <sup>ɕ</sup> t <sup>ɕ</sup> u:)l	‘buckets’
x t <sup>ɕ</sup>	(xat <sup>ɕ</sup> )t <sup>ɕ</sup>	(xt <sup>ɕ</sup> u:)t <sup>ɕ</sup>	‘boulevards’
n f s	(naf)s	(nfu:)s	‘selves’
ð <sup>ɕ</sup> r s	(ð <sup>ɕ</sup> ir)s	(ð <sup>ɕ</sup> ru:)s	‘teeth’
ʃ m ɕ	(ʃam)ɕ	(ʃmu:)ɕ	‘candles’
g s <sup>ɕ</sup> r	(gas <sup>ɕ</sup> )r	(gs <sup>ɕ</sup> u:)r	‘palaces’
g b r	(gab)r	(gbu:)r	‘graves’
h b l	(hab)l	(hba:)l	‘ropes’
ts l b	(tsal)b	(tsla:)b	‘dogs’
ʃ h r	(ʃah)r	(ʃhu:)r	‘months’
dʒ f n	(dʒaf)n	(dʒfu:)n	‘eyelids’
g r ʃ	(gar)ʃ	(gru:)ʃ	‘cents’
f l s	(fil)s	(flu:)s	‘money’
m ʃ t <sup>ɕ</sup>	(miʃ)t <sup>ɕ</sup>	(mʃu:)t <sup>ɕ</sup>	‘combs’
s <sup>ɕ</sup> f	(s <sup>ɕ</sup> af)f	(s <sup>ɕ</sup> fu:)f	‘rows’
s g f	(sag)f	(sgu:)f	‘ceilings’
ʃ b k	(ʃab)k	(ʃbu:)k	‘fences’
ʃ h m	(ʃah)m	(ʃhu:)m	‘fats’

II subgroup provides examples of a bimoraic BP stem that is derived from a bimoraic singular stem with CVC syllable structure. Both SG and BP stems carry the same number of moras ( $\mu\mu$ ). The BP stem maintains its syllable structure CVVC with singular stems that have CVC structure. No affixes used in deriving this bimoraic stem of BP. Another OT constraint, that all BP stems with a H shape violate is \*COMPLEXNUC.

(20) \*COMPLEXNUC: No lengthened vowel or a diphthong is in syllable nuclei.

(21) *H bimoraic, shape of BP with / u or a or i / vocalism, III subgroup*

Root	Singular word	Broken plural	Gloss
ɣ j m	(ye:.m)-ah	(ɣju:)m	‘clouds’
x j m	(xe:.m)-ah	(xja:)m	‘tents’
ʃ n tʰ	(ʃan.tʰ)-ah	(ʃna:)tʰ	‘backpacks’
z h r	(zah.r)-ah	(zhu:)r	‘flowers’
ħ m r	(ħma:)r-ah	(ħmi:)r	‘donkeys’

III subgroup of the bimoraic BP stems contains a suffix -ah attached to the singular stem that means a feminine noun. No affixes take part in the BP formation in (21). The singular stems contain two moras copied to the BP stem and no presence of an extra mora. BP onsets turned into a complex one, which supports Al-Ghizzy (2006) analysis of Najdi as a C- dialect. C dialects ‘can have phrase-initial onset CC- clusters’ Al-Ghizzy (2006:1). This does not affect the way we measure stem shapes since onsets have no moras. Glide /j/ as a second root consonant disappears in the singular since it is a semivowel but shows up in the BP onset. This glide interestingly maintains the syllable structure of the BP stem (CVV) in the singular.

(22) *LH shape of BP with / a / melody and ?a- prefix. I subgroup*

Root	Singular word	Broken plural	Gloss
ʃ dʒ r	(ʃa.dʒa.r)-ah	?a-(ʃ.dʒa:)r	‘trees’
ɣ n m	(ɣa.na.m)-ah	?a-(ɣ.na:)m	‘sheep’
w r g	(wa.ra.g)-ah	?a-(w.ra:)g	‘papers’
x ʃ b	(xa.ʃa.b)-ah	?a-(x.ʃa:)b	‘woods’
l ʕ b	(liʕ.b)-ah	?a-(l.ʕa:)b	‘toys’
f k r	(fik.r)-ah	?a-(f.ka:)r	‘ideas’
ʕ ʃ b	(ʕiʃ.b)-ah	?a-(ʕ.ʃa:)b	‘plants’

In the first subgroup of trimoraic BPs, we notice a prefix ?a- that indicates a collective noun. SG nominals share the suffix -ah that means a feminine nominal. We do not count moras ( $\mu$ ) of affixes as they are outside the SG and BP stems. The BP stem shape is LH not H because of the first root consonant occupying a coda position and being inside the stem. Syllable structure in the SG stem varies from CV.CV to another bimoraic structure with a coda CVC. Two moras exist in the SG stem but three moras appear in the BP stem. The extra mora in the BP stem marks the BP nominal and lengthens the vowel in the rightmost syllable. It does not lengthen root consonants that fill the coda of the prefix ?a- because these are not syllables. This matches output-output (O-O) moraic correspondence that allows BP stems to have either equal moras with SG stems or an extra mora in the BP stem.

(23) *LH shape of BP with / a / melody and ?a- prefix. II subgroup*

Root	Singular word	Broken plural	Gloss
l w n	(lɔ:)n	?a-(l.wa:)n	‘colors’
r w h	(ru:)h	?a-(r.wa:)h	‘spirits’
ʕ w d	(ʕu:)d	?a-(ʕ.wa:)d	‘wood pieces’
k w x	(ku:)x	?a-(k.wa:)x	‘cottages’
n w r	(nu:)r	?a-(n.wa:)r	‘lights’
s <sup>ʃ</sup> w t	(so:)t	?a-(s <sup>ʃ</sup> .wa:)t	‘sounds’
k j s	(ki:)s	?a-(k.ja:)s	‘bags’
f j ʃ	(fi:)ʃ	?a-(f.ja:)ʃ	‘outlets’
g w l	(go:)l	?a-(g.wa:)l	‘sayings’
j t m	(jti:)m	?a-(j.ta:)m	‘orphans’

II subgroup provides examples of trimoraic BP stems derived from bimoraic singular stems with a single syllable structure of CVV. No affixes appear in the singular nominals of this subgroup. However, the prefix ?a- shows up attached to

the BP stem. Likewise, the extra mora here lengthens the vowel in the rightmost syllable and marks the common BP nominal in Najdi.

(24) *LH shape of BP with / a / melody and ?a- prefix. III subgroup*

Root	Singular word	Broken plural	Gloss
ħ dʒ m	(ħadʒ)m	?a-(ħ.dʒa:)m	‘sizes’
x t m	(xat)m	?a-(x.ta:)m	‘stamps’
s r	(sir)r	?a-(s.ra:)r	‘secrets’
dʒ d	(dʒad)d	?a-(dʒ.da:)d	‘grandparents’
ħ k m	(ħuk)m	?a-(ħ.ka:)m	‘decrees’
b r dʒ	(bur)dʒ	?a-(b.ra:)dʒ	‘towers’
r b ħ	(rib)ħ	?a-(r.ba:)ħ	‘profits’
w z n	(waz)n	?a-(w.za:)n	‘weights’
ħ l m	(ħil)m	?a-(ħ.la:)m	‘dreams’
s l k	(sil)k	?a-(s.la:)k	‘cables’
ɣ s <sup>ʕ</sup> n	(ɣis <sup>ʕ</sup> (n))	?a-(ɣ.s <sup>ʕ</sup> a:)n	‘branches’
dʒ s m	(dʒis)m	?a-(dʒ.sa:)m	‘bodies’
f l m	(fil)m	?a-(f.la:)m	‘movies’
f r n	(fir)n	?a-(f.ra:)n	‘stoves’

III subgroup shows examples of a trimoraic BP stem derived by matching moras with a singular stem of CVC structure. Similar to II subgroup, a bimoraic SG stem derives a trimoraic BP stem. The extra mora marks the common BP nominal and lengthens the vowel of the rightmost syllable in the BP stem. O-O moraic correspondence is still a valid account of this kind of BP that takes an extra mora.

(25) *LH shape of BP with / a / melody and ?a- prefix. IV subgroup*

Root	Singular word	Broken plural	Gloss
b t <sup>ʕ</sup> l	(ba.t <sup>ʕ</sup> a)l	?a-(b.t <sup>ʕ</sup> a:)l	‘heroes’
ʕ l f	(ʕa.la)f	?a-(ʕ.la:)f	‘animal food’

h dʒ r	(ħa.dʒa)r	ʔa-(ħ.dʒa:)r	‘stones’
g f l	(gi.fi)l	ʔa-(g.fa:)l	‘locks’
ʕ m r	(ʕə.mə)r	ʔa-(ʕ.ma:)r	‘ages’
ʕ l m	(ʕa.la)m	ʔa-(ʕ.la:)m	‘flags’
g l m	(ga.la)m	ʔa-(g.la:)m	‘pens’
n h r	(na.ha)r	ʔa-(n.ha:)r	‘rivers’
g m r	(gə.ma)r	ʔa-(g.ma:)r	‘satellites’
ʕ m r	(ʕə.mə)r	ʔa-(ʕ.ma:)r	‘ages’
m tʕ r	(mi.ta)r	ʔa-(m.tʕa:)r	‘rains’
r g m	(ra.gi)m	ʔa-(r.ga:)m	‘numbers’
m ə l	(ma.əa)l	ʔa-(m.əa:)l	‘maxims’
ʕ m l	(ʕa.ma)l	ʔa-(ʕ.ma:)l	‘acts’
h d f	(ha.da)f	ʔa-(h.da:)f	‘goals’
s b b	(sa.ba)b	ʔa-(s.ba:)b	‘reasons’
m r ɔʕ	(ma.ra)ɔʕ	ʔa-(m.ra:)ɔʕ	‘diseases’
w tʕ n	(wa.tʕa)n	ʔa-(w.tʕa:)n	‘nations’
s ʕ r	(si.ʕi)r	ʔa-(s.ʕa:)r	‘prices’
tʕ f l	(tʕi.fi)l	ʔa-(tʕ.fa:)l	‘babies’
tʕ r f	(tʕa.ra)f	ʔa-(tʕ.ra:)f	‘party’

Last subgroup shows examples of trimoraic BP stems that are derived from bimoraic singular stems with a syllable structure of CV.CV. The extra mora in the BP stem marks the common BP in Najdi Arabic and lengthens the vowel in the rightmost syllable of the BP stem. No affixes appear in the singular nominals. Root consonants are identical in both SG and BP stems. The affixed mora in the BP stem does not contradict the proposal of O-O moraic correspondence. It states that for every mora in the SG stem, there is a correspondent mora in the BP stem. The mapping of moras starts from the SG stem to the BP stem not vice versa.

(26) *LH trimoraic shape of BP with / a / vocalism and prefix / ʔa /*

Root	Singular word	Broken plural	Gloss
g w j	(gu.wi)j	ʔa-(g.wja:)	‘strong’
ɣ n j	(ya.ni)j	ʔa-(ɣ.nja:)	‘rich’
ð k j	(ða.ki)j	ʔa-(ð.kja:)	‘clever’
ɣ b j	(ya.bi)j	ʔa-(ɣ.bja:)	‘stupid’
ʃ g j	(ʃa.gi)j	ʔa-(ʃ.gja:)	‘rowdy’
n b j	(na.bi)j	ʔa-(n.bja:)	‘prophets’
w f j	(wa.fi)j	ʔa-(w.fja:)	‘loyal’
ø r j	(øa.ri)j	ʔa-(ø.rja:)	‘wealthy’
w l j	(wa.li)j	ʔa-(w.lja:)	‘guardians’

BP stems in (26) represent trimoraic shape with the prefix ʔa- attached before BP stem. This BP stem is the First group that shows complex onsets (CVC.CCVV) in the word-medial position. This type of complex onsets also constitutes another characteristic of a C- dialect, which Najdi follows. This group of Najdi BP in (26) supports Al-Ghizzy’s (2006) claim of Najdi as a C-dialect that allows complex onsets in word-initial and medial syllables. Crucially, complex onsets (regardless of their position) do not add, delete moras as they occupy a morales position. A bimoraic SG stem derives a trimoraic BP stem with an extra mora added to the BP stem to lengthen the vowel in the rightmost syllable and marks the common type of BP in Najdi.

(27) *LH trimoraic shape of BP with a single vocalism / u /. I subgroup*

Root	Singular word	Broken plural	Gloss
ʔ s d	(ʔa.sa)d	(ʔu.su:)d	‘lions’
B ħ r	(ba.ħa)r	(bu.ħu:)r	‘seas’
n m r	(ni.mi)r	(nu.mu:)r	‘tigers’
ʕ tʕ r	(ʕi.tʕi)r	(ʕu.tʕu:)r	‘perfumes’

f h d	(fa.ha)d	(fu.hu:)d	‘leopards’
dʒ ð r	(dʒa.ði)r	(dʒu.ðu:)r	‘roots’

First subgroup of LH as a BP stem with a single vowel quality / u / is derived from a singular stem with CV.CV syllable structure. Bimoraic SG stems in (27) copy both moras to BP stem but an extra mora is inserted to the BP stem to lengthen the vowel in the rightmost syllable of the BP stem. No affixes appear in SG and BP stems of this subgroup. Notice the single vowel quality / u / copies over both syllables in the BP stem. The proposal, of output-output moraic correspondence and root consonantal identity, is still a valid one even with a single vowel quality BP.

(28) *LH shape of BP with a single vocalism / u or i or a /. II subgroup*

Root	Singular word	Broken plural	Gloss
ʃ b d	(ʃab)d	(ʃi.bi:)d	‘slaves’
ʃ r ð <sup>s</sup>	(ʃar)ð <sup>s</sup>	(ʃu.ru:)ð <sup>s</sup>	‘shows’
ħ r f	(ħar)f	(ħu.ru:)f	‘letters’
? l f	(?al)f	(?u.lu:)f	‘thousands’
k h f	(kah)f	(ku.hu:)f	‘caves’
s m	(sum)m	(su.mu:)m	‘poisons’
d r ʃ	(dir)ʃ	(du.ru:)ʃ	‘shields’
ə l dʒ	(əal)dʒ	(əu.lu:)dʒ	‘ices’
w r d	(war)d	(wu.ru:)d	‘roses’
s <sup>s</sup> k	(s <sup>s</sup> ak)k	(s <sup>s</sup> u.ku:)k	‘records’
b n k	(ban)k	(bu.nu:)k	‘banks’
n s r	(nas)r	(nu.su:)r	‘eagles’
s h l	(sah)l	(su.hu:)l	‘plains’
b n t	(bin)t	(ba.na:)t	‘girls’
ħ r m	(ħur.m)-ah	(hi.ri:)m	‘women’

Second subgroup of LH with a single vocalism gives examples of trimoraic stems of BP that are derived from bimoraic SG stems with a CVC syllable structure. The extra mora in BPs lengthens the vowel of the rightmost syllable. No affixes appear in SG, BP stems except the last word. The suffix -ah means a feminine nominal.

The vowel / u / is more common than /a or i / in a single vocalism BP of Najdi

(29) *LH shape of BP with a single vocalism / i or a /. III subgroup*

Root	Singular word	Broken plural	Gloss
ħ d	(ħi.di:.d)-ah	(ħi.di:)d	‘iron’
n ʕ m	(na.ʕa:.m)-ah	(na.ʕa:)m	‘ostriches’
ð <sup>s</sup> b	(ð <sup>s</sup> a.ba:b)-ah	(ð <sup>s</sup> a.ba:)b	‘fogs’
dʒ r d	(dʒa.ra:.d)-ah	(dʒa.ra:)d	‘grasshopper’
ħ m	(ħa.ma:.m)-ah	(ħa.ma:)m	‘pigeons’
ħ m t <sup>s</sup>	(ħa.ma:.t <sup>s</sup> )-ah	(ħa.ma:)t <sup>s</sup>	‘figs’
d dʒ	(da.dʒa:.dʒ)-ah	(da.dʒa:)dʒ	‘chicken’

III subgroup of LH is an interesting one because it shows a very rare type of broken plural that does not modify vowel qualities of BP stem in any way. We cannot put these seven BP forms under sound plural since the latter require suffixes in the plural. This BP maintains the stem of both SG and BP but just disposes the suffix -ah during BP formation. The seven BP stems above adhere to the output-output moraic correspondence and root consonantal identity. There is an equal number of moras exists in both SG and BP stems in III subgroup. It is understood when there is no BP stem modification that the vocalism (vowel quality) must be identical. Moraic identity in both SG and BP stems indicates a less common type of Najdi BP. Vowel lengthening in the rightmost syllable is due to absence of stem modification.

(30) *LH trimoraic shape of BP with /i a/ vocalism*

Root	Singular word	Broken plural	Gloss
n g tʰ	(nug.tʰ)-ah	(ni.ga:)tʰ	‘points’
n ʕ dʒ	(naʕ.dʒ)-ah	(ni.ʕa:)dʒ	‘moutons’
b y l	(bay)l-ah	(bi.ya:)l	‘mules’
l j l	(le:l)-ah	(li.ja:)l	‘nights’
n j g	(na:.g)-ah	(ni.ja:)g	‘camels fm’

This set demonstrates vocalism shift in BP stem. It has the suffix -ah attached to the SG stem. A bimoraic SG stem derives a trimoraic BP stem through moraic correspondence and root consonantal identity. The extra mora in the BP stem marks common BP in Najdi and lengthens the vowel in the rightmost syllable. SG nominals, in this subgroup, have two syllable structures CVV and CVC but both structures are bimoraic. The CVV structure in the singular stem is due to the semivowel /j/ as a second root consonant, that disappears with long vowels. I highlight the fact that so far, the data on Najdi follows the proposal of O-O moraic correspondence that mandates moras in BP and SG stems to be identical or greater by one mora. The data also follows the proposal of root consonantal identity.

(31) *HH shape of BP with /a i/ vocalism and a prefix mV- or ?a-*

Root	Singular word	Broken plural	Gloss
w ɔ̌ ʕ	ma-(w.ɔ̌u:)ʕ	mu-(wa:.ɔ̌i:)ʕ	‘topics’
w r ɔ̌	ma-(w.ru:)ɔ̌	mu-(wa:.ri:)ɔ̌	‘heritages’
ʃ w r	mi-(ʃ.wa:)r	mi-(ʃa:.wi:)r	‘errands’
r s m	mi-(r.sa:)m	ma-(ra:.si:)m	‘pencils’
g n sʰ	mi-(g.na:)sʰ	mi-(ga:.ni:)sʰ	‘hunting trips’
ʕ l g	mi-(ʕ.la:)g	ma-(ʕa:.li:)g	‘hang ups’
f t h	mi-(f.ta:)h	ma-(fa:.ti:)h	‘keys’
sʰ r f	ma-(sʰ.ru:)f	mi-(sʰa:.ri:)f	‘allowances’

h s <sup>ɬ</sup> l	ma-(h.s <sup>ɬ</sup> u:)l	ma-(ħa:.s <sup>ɬ</sup> i:)l	‘crops’
ɖʒ d f	mi-(ɖʒ.da:)f	mi-(ɖʒa:.di:)f	‘paddles’
s t <sup>ɬ</sup> r	ʔu-(s.t <sup>ɬ</sup> u:.r)-ah	ʔa-(sa:.t <sup>ɬ</sup> i:)r	‘legends’

Tetramoraic (contain four moras) BP stems in (31) are derived from SG stems with three moras. The affixed mora that appears in the BP stem marks a common Najdi BP and lengthens the vowel of the first syllable in the BP stem. This shift in the place of the affixed mora from the rightmost syllable to the leftmost syllable is due to a presence of the prefixes mV- or ʔa- attached to the BP stem. The BP stem contains two H syllables with CVV structure. It is important to reaffirm the fact that this extra mora, regardless of the BP stem shape that attracts it, does not contradict output-output moraic correspondence and root consonantal identity.

(32) *HH tetramoraic shape of BP with / u a / and consonant gemination*

Root	Singular word	Broken plural	Gloss
x d m	(xa:.di)m	(xud.da:)m	‘servants’
z w r	(za:.ji)r	(zuw.wa:)r	‘visitors’
t <sup>ɬ</sup> l b	(ta:.li)b	(tul.la:)b	‘students’
k t b	(ka:.ti)b	(kut.ta:)b	‘writers’
t ɖʒ r	(ta:.ɖʒi)r	(tudʒ.ɖʒa:)r	‘traders’
ʃ m l	(ʃa:.mi)l	(ʃum.ma:)l	‘workers’
r w d	(ra:.ji)d	(ruw.wa:)d	‘majors’
ø w r	(øa:.ji)r	(øuw.wa:)r	‘revolutionists’
m l k	(ma:.li)k	(mul.la:)k	‘owners’
ħ k m	(ħa:.ki)m	(ħuk.ka:)m	‘rulers’
r k b	(ra:.ki)b	(ruk.ka:)b	‘passengers’
ʃ ʃ r	(ʃa:.ʃi)r	(ʃuʃ.ʃa:)r	‘poets’
ħ r s	(ħa:.ri)s	(ħur.ra:)s	‘watches’
ħ ɖʒ	(ha:.ɖʒi)ɖʒ	(ħudʒ.ɖʒa:)ɖʒ	‘pilgrims’
ð <sup>ɬ</sup> b t <sup>ɬ</sup>	(ð <sup>ɬ</sup> a:.bi)t <sup>ɬ</sup>	(ð <sup>ɬ</sup> ub.ba:)t <sup>ɬ</sup>	‘officers’

t f tʰ	(tuf.fa:ħ)-ah	(tuf.fa:)ħ	‘apples’
r m n	(rum.ma:.n)-ah	(rum.ma:)n	‘pomegranates’

Another interesting set of tetramoraic BP stems that work differently. It has a distinct feature of second consonant (in roots) gemination. This gemination (doubling) provides another piece of evidence supporting the claim of Al-Ghizzy (2006) about Najdi as a C-dialect that allows medial geminates. ‘It is a custom for medial geminates to have the first consonant of the geminates as the coda of the first syllable, and the second consonant as the onset of the second syllable’ Al-Ghizzy (2006:18). No affixes take part in the BP formation of this set. The tetramoraic BP stem is derived by trimoraic SG stem. The extra mora that appears in the BP stem of (32) does not lengthen a vowel but geminates the second root consonant. First H syllable of the BP stem witnesses the emergence of CVC structure due to the consonant gemination process. Final two BP words in (32) undergo no stem modification. This enabled them to have identical moras with their SG stems. As a result, final two words do not need an extra mora. The suffix -ah in the final two SG nominals indicates a singular feminine.

(33) *HH tetramoraic shape of BP with /i a / melody and a suffix -n*

Root	Singular word	Broken plural	Gloss
ɣ z l	(ɣa.za:)l	(ɣiz.la:)-n	‘gazelles’
m sʰ r	(ma.sʰa:)r	(misʰ.ra:)-n	‘intestines’
ɣ r b	(ɣu.ra:)b	(ɣir.ba:)-n	‘ravens’
ʃ m d	(ʃa.mu:)d	(ʃim.da:)-n	‘columns’
ħ dʒ	(hi.dʒa:)dʒ	(hidʒ.dʒa:)-n	‘eye brows’
dʒ n ħ	(dʒa.na:)ħ	(dʒin.ħa:)-n	‘wings’
ðʰ l ʃ	(ðʰi.la:)ʃ	(ðʰil.ʃa:)-n	‘mountains’

Tetramoraic BP stems above witness annexation of a suffix -n that means plural. It shows the second emergence of H with syllable structure (CVC) in the first syllable of BP stems. No consonant gemination occurs even with the structure CVC. The consonant gemination we see in ‘eye brows’ is due to a biliteral root. A trimoraic SG stem derives a tetramoraic BP stem. The extra mora marks the prevalent BP in Najdi and lengthens the vowel in the syllable adjacent to the suffix -n (rightmost syllable). This additional mora in HH stem shape of BP with a suffix -n does not contradict the theory of O-O moraic correspondence that requires BP stems to contain equal moras with their SG stems or exhibits an extra mora in the BP stem. In addition, the extra mora respects the OT constraint governing BP formation MAX-<sub>OO</sub> ( $\mu$ , BP, SG). This constraint allows moraic identity, any addition of moras but objects to deletion of moras. In other words, the BP stem can have equal or an extra mora compared with the SG stem but it cannot have fewer moras than the SG stem. The proposal of O-O moraic correspondence and identity in root consonants is a valid one in explaining the process of BP formation in Najdi BP with suffixes attached to the BP stem. This is true for the rest of the data on different BP stem shapes.

(34) *LLL trimoraic shape of BP with / i a / melody, prefix / ʔa- /, suffix / -h /*

Root	Singular word	Broken plural	Gloss
r b tʰ	(rba:)tʰ	ʔa-(r.bi.tʰa)-h	‘ties’
ʃ r ʕ	(ʃra:)ʕ	ʔa-(ʃ.ri.ʕa)-h	‘sails’
ħ z m	(ħza:)m	ʔa-(ħ.zi.ma)-h	‘belts’
g m ʃ	(gma:)ʃ	ʔa-(g.mi.ʃa)-h	‘textiles’
ʃ r tʰ	(ʃri:)tʰ	ʔa-(ʃ.ri.tʰa)-h	‘cassettes’
s ʔ l	(sʔa:)l	ʔa-(s.ʔi.la)-h	‘questions’
dʒ w b	(dʒwa:)b	ʔa-(dʒ.wi.ba)-h	‘answers’
g n ʕ	(gna:)ʕ	ʔa-(g.ni.ʕa)-h	‘masks’

ɣ tʰ j	(ɣa.tʰa)	ʔa-(ɣ.tʰi.ja)-h	‘covers’
d w j	(du.wa)	ʔa-(d.wi.ja)-h	‘medication’
s l ɸ	(sla:)ɸ	ʔa-(s.li.ɸa)-h	‘weapons’
l s n	(lsa:)n	ʔa-(l.si.na)-h	‘tongues’
d m ɣ	(dma:)ɣ	ʔa-(d.mi.ɣa)-h	‘minds’
z m n	(zma:)n	ʔa-(z.mi.na)-h	‘times’

The set above uncovers an interesting trimoraic, tri-syllabic BP stems. BP stems in (34) contain a prefix ʔa- and a suffix -h attached to the stem. These affixes contribute no moras at all since they are not part of SG and BP stems. SG stems contain two moras that transfer to BP stems and an extra mora is inserted in a third syllable. It is interesting that the extra mora does not go to the second syllable that can accommodate another mora but it initiates a third syllable. Furthermore, the extra mora is still in the rightmost syllable consistent with other extra moras in the data. Complex onsets show up in SG stems except the words for ‘medication’ and ‘covers’. Final root consonants disappear in the two words that lack complex onsets and have the syllable structure CV.CV. All other SG stems in (34) are monosyllabic with the structure CCVV. This set introduces a new BP shape that requires an additional mora namely LLL. Crucially, it does not violate MAX-oo ( $\mu$ , BP, SG) nor does it contradict the proposal of O-O moraic correspondence.

(35) *LLL trimoraic shape of broken plural with / u a / melody*

Root	Singular word	Broken plural	Gloss
ʃ l m	(ʃa.li)m	(ʃu.la.ma)	‘scholars’
x b r	(xa.bi:)r	(xu.ba.ra)	‘experts’
w dʒ h	(wa.dʒi:)h	(wu.dʒa.ha)	‘notables’
z ʃ m	(za.ʃi:)m	(zu.ʃa.ma)	‘leaders’
w s tʰ	(wa.si:)tʰ	(wu.sa.tʰa)	‘mediators’
r ʔ s	(ra.ʔi:)s	(ru.ʔa.sa)	‘presidents’

r g b	(ra.gi:)b	(ru.ga.ba)	‘sergeants’
w k l	(wa.ki:)l	(wu.ka.la)	‘agents’
z m l	(za.mi:)l	(zu.ma.la)	‘colleagues’
s f r	(sa.fi:)r	(su.fa.ra)	‘ambassadors’
w z r	(wa.zi:)r	(wu.za.ra)	‘ministers’
h k m	(ha.ki:)m	(hu.ka.ma)	‘the wise’
b x l	(ba.xi:)l	(bu.xa.la)	‘the miserly’

This BP shape is another trimoraic, tri-syllabic one but it lacks affixes. The vocalism here is a back vowel / u / followed by a low front one / a /. Each trimoraic SG Stem copies its three moras to the BP stem that ends up trimoraic as well. Absence of affixes in this set of BP stems may be the cause behind moraic identity. It is a less common BP in Najdi. Syllable structures of SG stems alternate between CV.CVV and CVV.CV with the former being the common one. This trimoraic BP stem shape can be grouped with (H) and the rare (LH) that does not undergo stem modification in (29) in terms of moraic identity (equal moras in both SG, BP stems).

(36) *LL bimoraic shape of BP with / u a / vocalism and no affixes*

Root	Singular word	Broken Plural	Gloss
k w r	(ku:.r)-ah	(ku.wa)r	‘balls’
h dʒ	(hudʒ.dʒ)-ah	(hu.dʒa)dʒ	‘arguments’
ʕ l b	(ʕil.b)-ah	(ʕu.la)b	‘cans’
s <sup>ʕ</sup> w r	(s <sup>ʕ</sup> u:.r)-ah	(s <sup>ʕ</sup> u.wa)r	‘images’
ɣ r f	(ɣur.f)-ah	(ɣu.ra)f	‘rooms’
ʕ l	(ʕil.l)-ah	(ʕu.la)l	‘causes’
dʒ m l	(dʒum.l)-ah	(dʒu.ma)l	‘sentences’
f l	(fil.l)-ah	(fu.la)l	‘villas’
t <sup>ʕ</sup> w s	(t <sup>ʕ</sup> a:.s)-ah	(t <sup>ʕ</sup> u.wa)s	‘bowels’
d w l	(do:.l)-ah	(du.wa)l	‘countries’

ʃ l	(ʃil.l)-ah	(ʃu.la)l	‘groups’
ʃ w k	(ʃo:.k)-ah	(ʃu.wa)k	‘forks’

BP stems in (36) show no affixes and (u a) vowel qualities. Moraic identity is evident in this bimoraic shape of BP stem shape as well. Bimoraic SG stems derive bimoraic BP stem following O-O moraic correspondence proposal. There is a feminine suffix -ah attached to SG stems. However, this suffix does not contribute its single mora due to its position being off the stem. Syllable structure of SG stems is CVC or CVV. The latter is linked to a glide / w / as a second root consonant.

(37) *LL bimoraic shape with / a i / or / i a / melody and no affixes*

Root	Singular word	Broken plural	Gloss
t m r	(tam.r)-ah	(ta.mi)r	‘dates’
ʃ n b	(ʃi.na.b)-ah	(ʃi.na)b	‘grapes’
n m l	(nam.l)-ah	(na.mi)l	‘ants’
dʒ z m	(dʒaz.m)-ah	(dʒi.za)m	‘shoes’
dʒ z r	(dʒi.za.r)-ah	(dʒi.za)r	‘carrots’
ʃ dʒ r	(ʃa.dʒa.r)-ah	(ʃi.dʒa)r	‘bushes’
dʒ m r	(dʒam.r)-ah	(dʒa.mi)r	‘embers’
x tʰ	(xitʰ.tʰ)-ah	(xi.tʰa)tʰ	‘plans’

Another set of bimoraic, disyllabic BP stems that are derived from bimoraic BP stems. This LL shape of BP stems differs from the one in (36) in vocalism. The similarity lies in moraic identity and the suffix -ah. SG syllable structures in this set are CVC and CV.CV. Notice the last word ‘plans’ of biliteral root that undergoes consonant gemination but still keeps its number of moras in both SG and BP stems.

(38) *LL bimoraic shape of BP with single vocalism / a / or / u /.*

Root	Singular word	Broken plural	Gloss
n x l	(nax.l)-ah	(na.xa)l	‘palm trees’
n ħ l	(naħ.l)-ah	(na.ħa)l	‘bees’
f ħ m	(faħ.m)-ah	(fa.ħa)m	‘coal’
s ħ b	(sa.ħa.b)-ah	(su.ħu)b	‘clouds’
s f n	(si.fi.n)-ah	(su.fu)n	‘ships’
ʕ dʒ m	(ʕadʒ.m)-ah	(ʕa.dʒa)m	‘seeds’

Final set of BP stems with a LL shape shows a single vowel quality / a / or / u / copied over two syllables. No affixes play a role in the BP formation of this set. Moraic identity is evident in SG and BP stems. Each bimoraic SG stem derives a bimoraic BP stem in this set. The suffix -ah contains a single mora only (remember WEAKEDGE) but we do not count it as it is off the stem. SG stems have two different syllable structures CV.CV or CVC.

(39) *LHL shape of BP with / a i / vocalism and no affixes. I subgroup*

Root	Singular word	Broken Plural	Gloss
ð <sup>s</sup> r b	(ð <sup>s</sup> a.ri:.b)-ah	(ð <sup>s</sup> a.ra:..ji)b	‘taxes’
ɣ n m	(ɣa.ni:.m)-ah	(ɣa.na:..ji)m	‘profits’
ʕ z m	(ʕa.zi:.m)-ah	(ʕa.za:..ji)m	‘invitations’
f n l	(fa.ni:.l)-ah	(fa.na:..ji)l	‘T shirts’
ʕ m r	(ʕa.ma:.r)-ah	(ʕa.ma:..ji)r	‘buildings’
g b l	(gi.bi:.l)-ah	(ga.ba:..ji)l	‘tribes’
x r t <sup>s</sup>	(xa.ri:.t <sup>s</sup> )-ah	(xa.ra:..ji)t <sup>s</sup>	‘maps’
ʕ dʒ z	(ʕa.dʒu:.z)-ah	(ʕa.dʒa:..ji)z	‘elderly’
n t dʒ	(na.ti:.dʒ)-ah	(na.ta:..ji)dʒ	‘results’
ħ d g	(ħa.di:.g)-ah	(ħa.da:..ji)g	‘parks’
d r ʃ	(di.ri:.ʃ)-ah	(da.ra:..ji)ʃ	‘windows’
dʒ r d	(dʒi.ri:.d)-ah	(dʒa.ra:..ji)d	‘newspapers’

ʕ w l	(ʕa:.ji.l)-ah	(ʕa.wa:.ji)l	‘families’
tʕ l ʕ	(tʕa.li:.ʕ)-ah	(tʕa.la:.ji)ʕ	‘baby feasts’
b ɔʕ ʕ	(bi.ɔʕa:.ʕ)-ah	(ba.ɔʕa:.ji)ʕ	‘commodities’
g m	(gu.ma:.m)-ah	(gu.ma:.ji)m	‘rubbish piles’
k t b	(ka.ti:.b)-ah	(ka.ta:.ji)b	‘brigades’
n s m	(na.si:.m)-ah	(ni.sa:.ji)m	‘breezes’
tʕ b ʕ	(tʕa.bi:.ʕ)-ah	(tʕa.ba:.ji)ʕ	‘habits’
g sʕ d	(ga.sʕi:.d)-ah	(gi.sʕa:.ji)d	‘poems’
ʕ dʒ b	(ʕa.dʒi:.b)-ah	(ʕa.dʒa:.ji)b	‘wonders’
f tʕ r	(fa.tʕi:.r)-ah	(fa.tʕa:.ji)r	‘pies’
g l d	(gi.la:.d)-ah	(ga.la:.ji)d	‘necklaces’
g ʕ d	(ga:.ʕi.d)-ah	(ga.wa:.ʕi)d	‘rules’
g n b l	(gun.ba.l)-ah	(ga.na:.bi)l	‘bombs’

LHL introduces the second tri-syllabic BP stem shape. The trimoraic SG stem in (39) derives the tetramoraic BP stem. The extra mora in the BP stem marks the BP nominal and initiates a third syllable, as the second syllable is full of moras. It does not lengthen any vowel in this BP stem shape because it usually does that if the rightmost syllable is monomoraic (has a single mora only). In Arabic, a syllable must not have more than two moras in its rhyme. This is expressed in the Optimality theory by a constraint of  $*3\mu$ . This affixed mora in LHL is still in the rightmost syllable of the BP stem (its normal position). The suffix -ah is attached after all SG stems in (39) but it contributes no moras at all. SG stems share two syllable structures namely CV.CVV or CVV.CV with trilateral roots. LHL shape of BP stem does not contradict the O-O moraic correspondence and root consonantal identity proposal. The reason is that we have an extra mora in the BP stem compared with the SG stem and root consonants are identical and have the same order in both SG and BP stems. We insert either a glide /j/ in the onset of the third syllable or a glide /w/ in the onset of the second syllable to fill empty

onsets. These glides are not part of root consonants that need to be identical in SG, BP stems. Four consonantal roots like the final word for ‘bombs’ block glide epenthesis (addition) due to an extra consonant that is ready to fill empty onsets.

(40) *LHL shape of BP with / a i / vocalism and no affixes, II subgroup*

Root	Singular word	Broken plural	Gloss
ʕ g r b	(ʕag.ra)b	(ʕa.ga:.ri)b	‘scorpions’
x n dʒ r	(xan.dʒa)r	(xa.na:.dʒi)r	‘daggers’
d f t r	(daf.ta)r	(da.fa:.ti)r	‘notebooks’
s l m	(sul.la)m	(sa.la:.li)m	‘ladders’
ʕ m l	(ʕa:.mi)l	(ʕa.wa:.mi)l	‘factors’
x t m	(xa:.ti)m	(xa.wa:.ti)m	‘rings’
? d m	(?a:.dmi)	(?a.wa:.di)m	‘humans’
h m ʃ	(ha:.mi)ʃ	(ha.wa:.mi)ʃ	‘margins’
k t m	(ka:.ti)m	(ka.wa:.ti)m	‘mufflers’

Second subgroup of BP with LHL witnesses an absence of the suffix -ah in SG nominals. Glides (w, j) disappear in BP stems with tetraliteral roots due to an extra letter that is ready to fill empty onsets. Similarly, trimoraic SG stems derive tetramoraic BP stems. The extra mora in the BP stem initiates a third syllable, as the second syllable is full of mora. No vowel lengthening coincides with that BP mora.

(41) *LHH Pentamoraic shape of BP with / a i / or / i a / vocalism*

Root	Singular word	Broken plural	Gloss
s <sup>ʕ</sup> n d g	(s <sup>ʕ</sup> in.du:)g	(s <sup>ʕ</sup> a.na:.di:)g	‘boxes’
t <sup>ʕ</sup> r t <sup>ʕ</sup> ʕ	(t <sup>ʕ</sup> ir.t <sup>ʕ</sup> e:ʕ)-ah	(t <sup>ʕ</sup> a.ra:.t <sup>ʕ</sup> i:)ʕ	‘fireworks’
f n dʒ l	(fin.dʒa:)l	(fa.na:.dʒi:)l	‘coffee cups’
b r m l	(bir.mi:)l	(ba.ra:.mi:)l	‘barrels’
d r b l	(dir.bi:)l	(da.ra:.bi:)l	‘magnifier’
r dʒ l	(ridʒ.dʒa:)l	(ri.dʒa:.dʒi:)l	‘men’

b t̥ n	(bat̥.t̥a:.ni.j)-ah	(bi.t̥a:.t̥i:)n	‘blankets’
d k n	(dik.ka:)n	(di.ka:.ki:)n	‘shops’
s k n	(sik.ki:)n	(si.ka:.ki:)n	‘knives’
ʃ r b	(ʃar.ra:)b	(ʃa.ra:.ri:)b	‘socks’
ʃ r j	(ʃir.ja:)n	(ʃa.ra:ji:)n	‘blood vessels’

LHH is the third tri-syllabic BP stem shape after LLL and LHL. The BP stem is derived from a SG stem with four moras. Affixes disappear in this pentamoraic BP shape. We notice a copying of the second consonant in trilateral root words twice in the BP stem to fill empty onsets. This is a new method that substitutes glide epenthesis. Consonant gemination is present in SG nominals with trilateral roots. BP stems in LHH shape have an extra mora, which lengthens the vowel in the rightmost syllable. The word for ‘blanket’ survives the need for an additional mora in BP stem but it ends up with equal moras in BP, SG stems. SG nominals in (41) share the syllable structure CVC. CVV. LHH stem shape adheres to O-O moraic correspondence and root consonantal identity in the process of BP formation. This adherence is clear in the extra mora and identical root consonants in SG, BP stems

(42) *LHH pentamoraic shape of BP with / u a i / melody*

Root	Singular word	Broken plural	Gloss
ʃ k ʃ	(ʃa:.ku:)ʃ	(ʃu.wa:.ki:)ʃ	‘hammers’
ɖʒ s	(ɖʒa:.su:)s	(ɖʒu.wa:.si:)s	‘spies’
k b s	(ka:.bu:)s	(ku.wa:.bi:)s	‘nightmares’
s̥ t̥ r	(s̥a:.t̥u:)r	(s̥a.wa:.t̥i:)r	‘choppers’
t̥ w s	(t̥a:.wu:)s	(t̥u.wa:.wi:)s	‘peacocks’
g r	(ga:.ru:.r)-ah	(gu.wa:.ri:)r	‘bottles’
ɖʒ m s	(ɖʒa:.mu:)s	(ɖʒu.wa:.mi:)s	‘buffaloes’
t̥ b r	(t̥a:.bu:)r	(t̥u.wa:.bi:)r	‘queues’
n f r	(na:fu:.r)-ah	(nu.wa:.fi:)r	‘fountains’
g m s	(ga:.mu:)s	(gu.wa:.mi:)s	‘dictionaries’

n m s	(na:mu:)s	(nu.wa:mi:)s	‘laws’
s l f	(sa:li:f)-ah	(su.wa:li:)f	‘conversations’
f n s	(fa:nu:)s	(fu.wa:ni:)s	‘lanterns’
m w l	(maw.wa:l)	(mu.wa:wi:l)	‘melodies’
h dʒ s	(ha:dʒu:)s	(hu.wa:dʒi:)s	‘ideas’
b l ʕ	(ba:lu:ʕ)-ah	(bu.wa:li:)ʕ	‘sewers’

Final set of data above shows another pentamoraic BPs with a dominance of glide /w/ epenthesis in the second syllable to fill the onset. This glide / w / does not violate root consonantal identity because it is not a root consonant. In addition, No role of affixes in this set of LHH stem shape. The syllable structure in H syllables of the BP stem is (CVV). Tetramoraic SG stems derive pentamoraic BP stems. The extra mora is added to the third syllable in LHH shape to lengthen its vowel and mark it as a BP nominal in Najdi. The affixed mora  $\mu$  is inserted consistently in the **rightmost** syllable. It only shifts to lengthen the vowel in the leftmost syllable in the BP stem if there is a prefix attached to the BP stem.

(43) Summary of broken plural stem shapes:

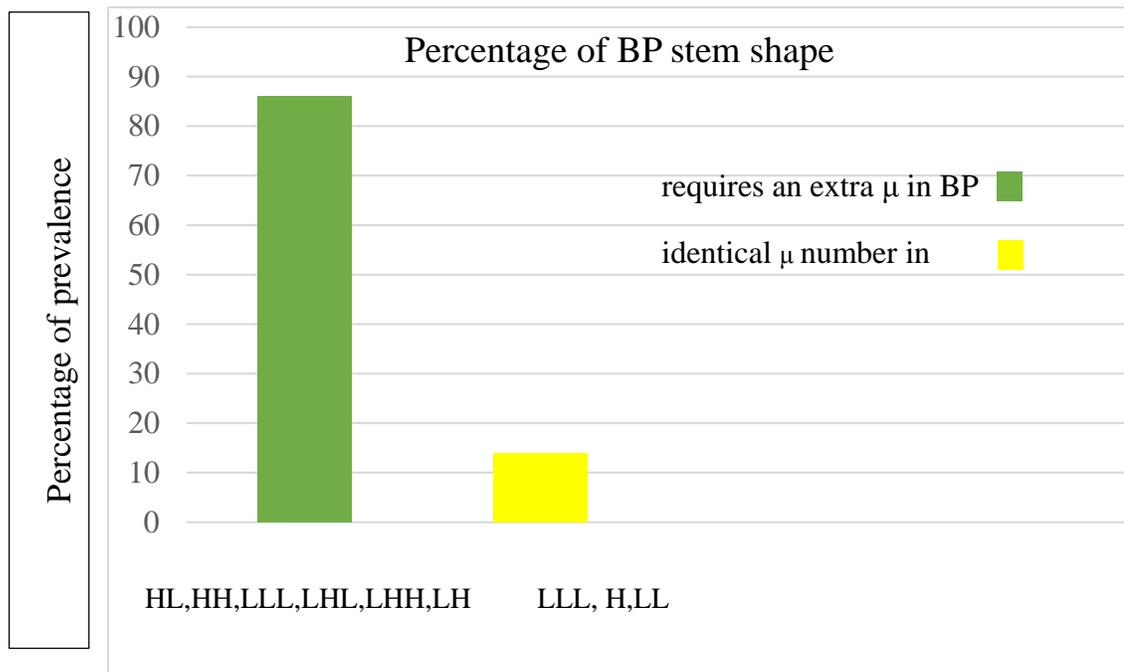
Bimoraic	Trimoraic	Tetramoraic	Pentamoraic
H, LL	HL, LH, LLL	HH, LHL	LHH

Any broken plural of nouns, adjectives in Najdi (if well-formed) cannot escape falling under these four stem shapes in moraic distribution. This finding squeezes the large number of thirty-one (the number is slightly different in different sources) BP patterns proposed in literature namely Maxos (1995), Wright (1971). It is worth pointing out here that the total number of BP words in the data is 345. This number is not distributed equally as BP shapes differ in their capacity to generate words. The entire data supports the proposal of output-output moraic correspondence from the SG stem to the BP stem as well as root consonantal

identity. There is not a single example in Najdi BP that shows more than one extra mora (the affixed mora that mark common BP) or fewer moras in the BP stem compared with the SG stem. Furthermore, there is not an example of a BP stem that misses a root consonant from its counterpart SG stem. This agrees with what I stated earlier in the abstract that a BP stem in Najdi must have an equal number of moras derived from its singular or an extra mora in the BP stem that marks the common BP.

30

(44) *Percentage of BP that mandate exact number or an extra number of  $\mu$*



Almost (85%) of the data collected on Najdi broken plural requires an additional mora inserted in BP stem. Data on Najdi BP also reveals a low percentage (15%) on moraic identity in both SG and BP stems. It must be clear by now that both moraic distributions in a stem-to-stem mapping follow O-O moraic correspondence. What does the percentage above indicate clearly? It tells us that there is a common type of broken plural in Najdi. This type of BP always contains

an extra mora [μ] in its stem. Common BP shares three major categories in its stem. It must have a lengthened vowel or a geminated consonant. Vowel lengthening happens normally in the rightmost syllable of the BP stem shapes like LH, LHH. This vowel lengthening changes to the leftmost syllable if there is a prefix attached to the BP stem in shapes like HL, HH. The extra mora also geminates (doubles) the second root consonant in the BP stem shape of HH. In contrast, less common BP that contains identical moras in SG and BP stems, shares no affixes attached the BP stem as in (H, LL, LLL). It also has no vowel lengthening or consonant gemination.

(45) Morphology of broken plural:

The use of the word morphology here is related to bound morphemes annexed to BP stem. Najdi seems to be highly inflected with affixes based on the data collected and presented in this study. Prefixes that indicate a collective noun like (ma-, ʔa-) and suffixes such as (-n,-h) take part in forming the BP nominal along with moraic correspondence and root consonantal identity. Not all BP stems take both prefixes and suffixes attached to the stem. Tri-syllabic stem shapes like (LHL, LHH) as well as bimoraic stem shapes like (H, LL) take no affixes attached to the stem. We have no stem shapes attracting infixes to the middle of their words according to the data. Trimoraic (LLL, LH) and tetramoraic (HH) BP stems take both prefixes and suffixes. Affixes in the broken plural do not contribute moras to the stem even if they can stand alone as a good syllable (has onset and rhyme). The reason is that the BP stem consists of root consonants regardless of their number as well as vocalism that together convey a meaning. These affixes are not part of this stem structure. The example below clarifies this notion:

(46) *HH tetramoraic stem shape of broken plural:*

Root	singular	broken plural	Gloss
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s m r          mi-(s.ma:)r          mi-(sa:.mi:)r          nails

Here the prefix mi- attracts first root consonant to fill the coda in its syllable. This gives us a mora in the first syllable of SG nominal. The second syllable is obviously bimoraic due to a long vowel. To derive broken plural in such cases, we correspond the moras from the SG stem to the BP stem even if the BP word contains the same prefix. The affixed mora that shows up in the BP stem marks it as a BP nominal and lengthens the vowel in the leftmost syllable (adjacent to the prefix mi-). This example shows that the prefix influences the place of the affixed mora but not the function of it.

## CHAPTER 4: ANALYSIS

Prince and Smolensky (1993) devised the Optimality Theory (OT) that contains a set of well-formedness constraints. The grammar of a language is built on hierarchically ranked OT constraints. These constraints when respected and minimally violated (for ranked low ranked ones) help determine the optimal output from a given input. OT constraints share the features of violability, universality and ranking. They are preferably respected but they allow a minimal violation. Universality indicates that OT constraints work for every language and ranking refers to the degree of domination (importance) in a specific language. Constraints are divided into markedness and faithfulness constraints. They both help analyze the BP output in Najdi Arabic.

(47)  $MAX_{OO}(\mu, BP, SG)$ : For every mora in the singular output, there is a correspondent mora in the BP output. No moras  $\mu$  are deleted, Al Aghbari (2012). This constraint is an undominated one. It must be respected in optimal Najdi BPs.

(48)  $DEP_{OO}(\mu, BP, SG)$ : For every mora in the BP output, there is a correspondent mora in the SG output. No moras  $\mu$  are added, Al Aghbari (2012). This constraint is violable and low ranked in Najdi.

(49) \* $COMPLEXONS$ : A syllable must not have more than one consonant. This constraint is violable and low ranked in Najdi, Prince, Smolensky (1993).

(50) \* $3\mu$ : No trimoraic syllables. Kager (1999)

(51)  $ONSET$ : Every syllable must have an onset, Prince, Smolensky (1993).

(52)  $IDENT_{OO}(C)$ : for every consonant in the SG output, there is an identical consonant in the BP output, Benua (1997). This constraint is an undominated one in Najdi BP and I will not consider candidates that violate it in the tableaux next page.

(53) *Less common broken plural (equal moras in both SG and BP stems)*

(xe:)l ‘horse’	MAX <sub>OO</sub> (μ, BP, SG)	ONSET	*COMPLEXONS	DEP <sub>OO</sub> (μ, BP, SG)
☞ a. (xju:)l			*	
b. (xju)l	*!			
c. (xu.u)l		*!		

A simple example of a less common BP nominal is ‘horse’ in Najdi. Dotted lines between MAX<sub>OO</sub>(μ, BP, SG) and ONSET indicate that these constraints are unranked. Candidate (a) wins because it respects the undominated constraints MAX<sub>OO</sub>(μ, BP, SG) and ONSET. It violates \*COMPLEXONS (means no onset start with CC) but that does not matter because it is a lower ranked and violable constraint. Candidate (b) loses thanks to its violation of MAX<sub>OO</sub>(μ, BP, SG) constraint. The exclamation mark that accompanies the violation signal (\*) in candidate (b) indicates the failing point of reaching optimality and lack of relevance of any other constraint ranked under MAX<sub>OO</sub>(μ, BP, SG). Candidate (c) respects MAX<sub>OO</sub>(μ, BP, SG) but loses the competition over the optimal BP candidate since it violates another undominated constraint of ONSET. Najdi Arabic requires every syllable to start with an onset.

(54) *Common BP with an extra mora lengthening the rightmost syllable*

(ʔa.sa)d ‘lion’ +μ BP	MAX <sub>OO</sub> (μ, BP, SG)	ONSET	*3μ	DEP <sub>OO</sub> (μ, BP, SG)
☞ a. (ʔu.su:)d				
b. (ʔsa)d	*!			
c. (ʔu:s)d			*!	
d. (ʔu.su.u)d		*!		

The word for ‘lion’ in Najdi is a good example of a BP that inserts an extra mora to the BP stem. It has two moras in the SG stem but three in the BP stem. The constraint  $*3\mu$  prevents any syllable with three moras in its rhyme.  $DEP_{OO}(\mu, BP, SG)$  is the lowest ranked OT constraint in Najdi. It can be violated and the candidate wins the competition. Candidate (a) wins the competition over the optimal BP of the word ‘lion’ since it respects the undominated constraints of  $MAX_{OO}(\mu, BP, SG)$ ,  $ONSET$ ,  $*3\mu$ . Candidate (b) is the worst one as it violates the undominated constraint of  $MAX_{OO}(\mu, BP, SG)$ , which bans deletion of moras coming to BP stem from the SG stem. The singular has two moras in its stem whereas candidate (b) shows just one mora. Once the undominated constraint is violated, no discussion of lower ranked constraints whatsoever. Candidate (c) respects  $MAX_{OO}(\mu, BP, SG)$  but it violates  $*3\mu$  and due to this violation, it loses the competition over the optimal BP candidate. Najdi Arabic is a dialect that parses a maximum of two moras in each syllable. Candidate (d) respects  $MAX_{OO}(\mu, BP, SG)$ , but loses the competition since it violates the undominated constraint of  $ONSET$ .

(55) *Common BP with a consonant gemination (an extra mora in the BP stem)*

(xa:.di)m ‘servant’+ $\mu$ BP	$MAX_{OO}(\mu, BP, SG)$	$ONSET$	$*3\mu$	$DEP_{OO}(\mu, BP, SG)$
a. (xa:d.di)m			*!	
b. (xud.da:)m				
c. (xa.di)m	*!			
d. (xud.a:)m		*!		

The BP stem of ‘servant’ in Najdi witnesses medial consonant gemination. This process is done by an extra mora along with other moras derived from the SG stem. Likewise,  $MAX_{OO}(\mu, BP, SG)$  is undominated in BP forms of consonant

gemination as well as all other types of BP forms in Najdi. DEP<sub>OO</sub> is the lowest ranked, violable constraint. Candidate (a) respects MAX<sub>OO</sub> ( $\mu$ , BP, SG), ONSET but loses the competition over the optimal BP candidate because it violates \*3 $\mu$  in its first syllable. Candidate (b) is the optimal one since it respects MAX<sub>OO</sub> ( $\mu$ , BP, SG), ONSET and \*3 $\mu$  constraints. The violation of DEP<sub>OO</sub> is unimportant as this constraint is ranked very low in Najdi and the optimality does not mean zero violation but a minimal one. Candidate (c) loses competition over optimality to be a BP thanks to its serious violation of the undominated constraint MAX<sub>OO</sub> ( $\mu$ , BP, SG). It violated this constraint through deletion of a mora derived from the SG stem. Trimoraic SG stem turns into a bimoraic BP stem demonstrates this mora deletion. Once MAX<sub>OO</sub> ( $\mu$ , BP, SG) as undominated constraint is violated, there is no point in looking at other constraints irrespective of their ranking. Candidate (d) loses despite its respect of MAX<sub>OO</sub> ( $\mu$ , BP, SG) because it violates ONSET through a syllable that starts with a vowel.

(56) *Broken plural with a suffix /-n/ (an extra mora in the BP stem)*

(ya.za:)l 'gazelle' + $\mu$ BP	MAX <sub>OO</sub> ( $\mu$ , BP, SG)	ONSET	*3 $\mu$	DEP <sub>OO</sub> ( $\mu$ , BP, SG)
a. (ya.za)l	*!			
b. (yi:z.la)n			*!	
☞ c. (yiz.la:)n				
d. (yiz.a:)l		*!		

Candidate (a) loses because it violates MAX<sub>OO</sub> ( $\mu$ , BP, SG) and no more chance for it to compete over optimality when the undominated constraint is violated. This violation lies in the missing mora that disappeared from a trimoraic SG stem to a

bimoraic BP stem. Candidate (b) is also a loser since it violates  $*3\mu$ . The violation of No three moras occurs in its first super heavy syllable. The violation of DEP ( $\mu$ , BP, SG) lies in inserting a mora to a trimoraic BP to build a tetramoraic BP. The latter constraint is ranked very low. Consequently, it does not prevent the optimality of a candidate. Candidate (c) wins the competition over optimal BP stem thanks to its respect for  $\text{MAX}_{OO}(\mu, \text{BP}, \text{SG})$ ,  $*3\mu$ , and ONSET and a minimal violation of the lowest ranked constraint  $\text{DEP}_{OO}(\mu, \text{BP}, \text{SG})$ . Candidate (d) also respects  $\text{MAX}_{OO}(\mu, \text{BP}, \text{SG})$  but loses competition since there is a critical violation of another undominated constraint of ONSET. The violation of ONSET lies in the second syllable that starts with a vowel.

To sum up, this part concentrates on the analysis of Najdi BP within the framework of Optimality Theory. It explains how common BP that requires an extra mora and less common BP that requires identical moras, in SG and BP stems, function through violable OT constraints. The proposal of output-output moraic correspondence first put forth by McCarthy (2000) on deriving BP stem with equal or an additional mora copied from SG stem is a valid and correct one based on this OT analysis.

## CHAPTER 5: DISCUSSION

The key finding in this research although related to Najdi provides an alternative account to the BP. McCarthy and Prince (1990a) derive BP nominals from root consonants that are mapped on an iambic template of (LH) in Classical Arabic. In their paper, there are trochaic counterexamples but they insist on the iambicity of the BP. Their claim cannot be applied to explain Najdi BP thanks to stem shapes like HH, H, LLL, and LL that does not follow the template (LH). However, O-O moraic correspondence proposal first put forth by McCarthy (2000) have no counterexamples in the entire data on Najdi. The proposal that explains Najdi BP correctly can be generalized to other dialects like Classical Arabic, modern standard Arabic, and Muscat Arabic. Data in McCarthy and Prince (1990a) have either a moraic identity or an extra mora in BP stems. Similarly, data in Shaker and Rashid (2014), and Al Aghbari (2012) follow the proposal used to explain Najdi BP. The vast majority of examples that are presented in M&P (1990a) just take an affixed mora in the BP consistent with my proposal of O-O moraic correspondence.

(57)	Root	Singular	Plural	Gloss
	j n d b	(jun.du)b	(ja.naa.di)b	locust
	n f s	(naf)s	nu.fuus	soul

The two examples above, quoted from McCarthy & Prince (1990a:218), show an extra mora in the BP stem that is absent in the singular. Exceptions to this rule of an affixed mora in Classical Arabic must follow moraic identity (as shown below).

(58)	Singular	Plural	Gloss
	(jahmari)f	(jahaami)r	‘lazy old woman’
	(safarja)l	(safaari)j	‘quince’
	(namuuða)j	(namaaði)j	‘model’

Quoted with a slight change of adding parentheses from M & P (1990a:267).

The examples of (58) show equal moras in both singular and plural stems.

Biliteral (two consonants) and tetraliteral (four consonants) roots in Najdi are interesting to revisit in the discussion. Biliteral roots mandate a process of consonant gemination of the second consonant. This happens to compensate the absence of a third consonant. Tetraliteral roots block the process of glide epenthesis that occurs sometimes with trilateral roots in tri-syllabic BP stems. It blocks glide epenthesis because the root has an extra consonant that can easily fill the onset of the second or third syllables. SG stems with biliteral roots do not violate MAX<sub>OO</sub> ( $\mu$ , BP, SG) in LL and H BP stem shapes despite consonant gemination. The SG stem with a biliteral root requires an extra mora in the BP stem shapes LHL, LHH as well. The process of medial consonant gemination that adds a mora to BP stem takes place with trilateral roots only not biliteral or tetraliteral ones. It is worth pointing out here that both biliteral, tetraliteral roots constitute a very tiny percent of Arabic roots, which are trilateral with a huge margin. Consequently, respect or violation of MAX-<sub>OO</sub> ( $\mu$ , BP, SG) in such a tiny percentage of roots is not going to support or refute the theory of output-output moraic correspondence and root consonantal identity in the broken plural formation.

In this paper, I have proved that the broken plural stem is derived from the singular stem through output-output correspondence of moras and root consonantal identity. The OT analysis shows that the well-formed (optimal) BP always respects MAX<sub>OO</sub> ( $\mu$ , BP, SG). What is next step that researchers on the broken plural should focus on? The answer is the variation in vowel qualities between the singular and the BP stems. There seems to be phonological constraints governing this shift in vocalism. I will leave the answer to what causes such a change in vocalism for future research.

## CHAPTER 6: CONCLUSION

To conclude, this paper addresses broken plural in a Saudi dialect called Najdi. Broken plural is an irregular way of pluralizing nouns, adjectives. It works through output-output moraic correspondence and root consonantal identity from the singular stem to the broken plural stem. Common broken plural requires an affixed mora in the BP stem. The affixed mora lengthens the vowel in the rightmost syllable of the BP stem or geminates the second root consonant. Vowel lengthening changes from the rightmost syllable to the syllable adjacent to affixes when they are attached to the BP stem. Less common broken plural requires moraic identity in the singular and the BP stem. Identical moras in both SG and BP stems is obvious in bimoraic (H, LL), and trimoraic (LLL) shapes that take no affixes attached to BP stem. OT helps explain broken plural via faithfulness and markedness constraints.  $\text{MAX}_{\text{OO}}(\mu, \text{BP}, \text{SG})$  is an undominated constraint that is always respected in all of Najdi broken plural.  $\text{DEP}_{\text{OO}}(\mu, \text{BP}, \text{SG})$  is a violable and very low ranked constraint that allows for the affixed mora in the BP stem.

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