The phonology of Iranian-Balochi dialects : description and analysis

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Chapter (4)

Phonological Processes in Iranian-Balochi Dialects

This chapter will disscuss the phonological processes in IBDs. These phonological phenomena are metathesis (both local and long distance consonant metathesis), local assimilation (such as voicing assimilation, nasal place assimilation and complete assimilation), hiatus resolution, final consonant devoicing, dissimilation and final coda deletion. Moreover, I will discuss another interesting topic in the phonological system of Balochi dialects; "loan phonology": how the nativization of loanwords occurs in Balochi dialects for example consonant and vowel adaptations and gemination and degemination in adapting loanwords.

This chapter is organized as follows. Section 4.1 will focus on the metathesis in IBDs; the different types of metathesis will be introduced. In section 4.2, I will explore the identity of assimilation in IBDs. Section 4.3 will focus on hiatus resolution in IBDs. Final consonant devoicing and dissimilation will be studied in section 4.4 and section 4.5 respectively. Section 4.6 discusses loanword adaption, and finally section 4.7 shows final consonant deletion in IBDs. The second part of each section deals with the relevant optimality analysis of each phonological phenomenon.

4.1 IBDs Metathesis

Metathesis refers to a reordering of segments (Buckley 2011). This subsection outlines the data that fall under this description and theoretical viewpoint on their analysis, namely OT.

Metathesis is a common process in Balochi (Korn2005).To organize this section, I group the data according to their metathesis type. As data (1) show, two types of metathesis are found in IBDs: group (I) are those which are known as liquid metathesis and group (II) that are sibilant metathesis (the reordered segments are underlined).

(1) IBDs metathesis

(I) IBDs liquid metathesis

a.i	*ʔæsru*	→ [ʔæsr]	→	[hærs][ʔærs]	'tear'
a.ii	*væ<u>fr</u>æ*	→ [væfr]	→	[bæ<u>rp</u>]	'snow'

(II) IBDs sibilant metathesis

a.i	*tʃæ<u>sb</u>*	→ [tʃæ<u>ps</u>]			'glue'

a.ii	*ʔæsb*	→	[hæps][ʔæps]	'horse'
a.iii	*disk*	→	[diks]	'disk'
a.iv	*mæzg*	→	[mægz]	'brain'

Indeed, the data in (I) describe the historical sound changes or diachronic metathesis (Hock 1985:534). In Old Persian, loss of the final vowel leads to coda clusters with rising sonority which is against the sonority sequencing principle; indeed in this case, metathesis is a strategy to repair the coda cluster with rising sonority, so the more sonorous segment, here /r/, is reordered by the less sonorous segment. In example I (a.ii) /f/ is replaced by /p/, since in the consonant inventory of IBD as table (30) in section 3 shows, there is no labiodental fricative. Besides, in [sobh]→[sohb] 'morning', the labial stop is reversed by a glottal fricative, it can be described as in examples (1), as stops are less sonorant than fricatives then there is rising sonority in coda cluster and metathesis repairs this ill-formed cluster.

While data (II) show synchronic metathesis, indeed sibilant consonants here /s/ and /ʃ/ reverse order with an adjacent stop consonant, this phenomenon is cross-linguistically common and known as auditory metathesis:

"The temporal decoupling of the noise of a fricative from the surrounding signal, can lead to a sibilant and an adjacent stop being interpreted as occurring in the opposite of the original order." (Buckley 2011:1382)

So Balochi metathesis places the stop consonant in a more perceptible position, adjacent to the preceding vowel, while the sibilant remains perceptible without an adjacent vowel.

Indeed, both types of Balochi metathesis in (1) are examples of local metathesis. In local metathesis two adjacent segments are reordered and in our case, as illustrated in (1), we have CC metathesis.

There is one more type of local CC metathesis in Sarhaddi Balochi as in (2).

(2) *boʃqaːb* → [boχʃɑːb]

In (2) the coronal fricative is reversed by a non-coronal adjacent fricative. It can be an example of CC metathesis depending on place of articulation. A general preference for apical, here /ʃ/, to follow non-apical, here /χ/, has been observed in other languages like in Greek (Buckley 2011).

(3) represents metathesis as a transformation which is suggested by Chomsky and Halle (1968). Indeed they describe metathesis as a common phonological process and allow transformation that effect metathesis (Buckley 2011):

(3) IBDs metathesis as a transformation

Structural description						tʃ	æ	s	b
Structural change	1	2	3	4	→	1	2	4	3

In sum, there are three types of CC local metathesis in IBDs: (1) liquid metathesis which is an example of diachronic metathesis, (2) sibilant CC local metathesis, and finally (c) CC local metathesis relies on place of articulation. In next section the OT analysis of IBDs metathesis will be given.

Furthermore, there is an example of long-distance assimilation in Sarawani Balochi as in (4):

(4) Long- distance metathesis
tænuːr → [tæruːn] 'oven'

This type of metathesis is known as perceptual metathesis (Blevins &Garrett2004:128). Their view is that perceptual metathesis indeed reflects the perceptual difficulty of localizing the origin of a phonetic cue with long-distance effects. So data (4) is an example of long-distance liquid metathesis like in South Italian dialects of Greek (Blevins &Garrett 2004:130). Thus, postvocalic non-initial liquid *r* has been transposed into initial syllable position.

4.1.1 IBDs metathesis in optimality theory

In OT, the segmental correspondence constraint which presents the linear ordering of the input segments is shown in (5):

(5) LINEARITY-IO
The output reflects the precedence structure of the input, and vice versa.
(Kager1999)

This constraint is militating against metathesis, because in metathesis, sequence reordering occurs. Thus in our constraints rankings for metathesis, this constraint should be lower ranked.

Now I return to the analysis of metathesis in IBDs and constraint rankings for all three types of metathesis that are explained so far. Three examples are considered in my analysis of each type: [ʔærs], [hæps] and [boχʃɑːb]. Two more faithfulness constraints namely MAX-IO and DEP-IO are also involved in our analysis.

The first type of IBDs diachronic metathesis as in [ʔæsr]→[ʔærs] occurs as the strategy to repair the rising sonority in the coda cluster. The relevant constraint sonority sequencing principle as introduced in last section is SSP. So, ranking (6) deals with metathesis in data (1).

(6) Constraint ranking for IBDs liquid metathesis
SSP, MAX-IO, DEP-IO >> LINEARITY-IO

Above ranking shows that the optimal candidate should satisfy the sonority sequencing principle as it is higher ranked and no segment should not deleted or inserted. The following tableau represents ranking (6).

(7) *ʔæsr* [ʔærs] 'tear'

Input: /ʔæsr/	SSP	MAX-IO	DEP-IO	LINEARITY-IO
a.☞ ʔærs				*
b. ʔæsr	*W			L
c. ʔæs		*W		L
d. ʔæser			*W	L

In tableau (7), the optimal candidate is (a), it satisfies all higher ranked constraints by violating the lower ranked constraint LINEARITY-IO which is not fatal violation. Candidates (b), (c) and (d) are eliminated, since they satisfy lower ranked constraint LINEARITY by violating higher ranked constraints: rising sonority in coda cluster in candidate (b) is against the SSP, deleting the second component of the coda cluster violates the MAX-IO and inserting a vowel in coda cluster is against the DEP-IO faithfulness constraint.

The second type of IBDs metathesis is local CC metathesis in sibilants as in [tʃæsp] → [hæps]. The perception has a great role in this type of IBDs metathesis. The stop consonant is more perceptible when it is adjacent to the preceding vowel indeed. So the sequence of sonorant and stop in coda position seems to be phonotactically not well-formed in Balochi, the following constraint supports this claim:

(8) *SC] σ
The sequence of sibilant and stop is not allowed in word-final position.

The other relevant constraint for input [tʃæsb] is VOP:

(9) VOP
No voiced obstruent

VOP constraint militates against the voiced obstruent. In IBDs voiced labial is replaced by voiceless labial in coda position. In addition to MAX-IO and DEP-IO, it is especially relevant here to include the constraint IDENT-IO to prevent changes to the features targeted by the phonotactic constraint. Now consider the following ranking for the sibilant IBDs metathesis:

(10) Constraint ranking for IBDs sibilants metathesis
*SC] σ , VOP, DEP-IO , MAX-IO >> IDENT-IO>> LINEARITY

The following tableau displays above ranking for input [ʔæsb].

(11) *ʔæsb* [ʔæps] 'horse'

Input:/ʔæsb/	*SC]σ	VOP	DEP-IO	MAX-IO	IDENT-IO	LINEARITY_IO
a.☞ ʔæps					*	*
b. ʔæsp	*W				*	L
c. ʔæs				*W	L	L
d. ʔæsep			*W		*	L
e. ʔæsb	*W	*W			L	L
f. ʔæbs		*W			L	*

As is shown in tableau (11), all candidates have at least a violation. Violations in candidate (a) are not fatal, since this candidate satisfies the higher ranked constraints, but it is not faithful to IDENT-IO. In candidate (b) and (e), there is no metathesis, so they violate the higher ranked constraint *SC] □ fatally. Candidate (c) is eliminated as well; however it has only one violation, but this is fatal. Candidates (d) and (f) are also losers.

The last type of metathesis in IBDs is CC metathesis depending on the place of articulation as in [boχʃɑːb]. The constraint encoding this type of metathesis in IBDs must penalize an apical + non-apical sequence; call it *ʃχ, as in the consonant inventory of Sarhaddi Balochi there is no /q/, but /χ/ is observed in the pronunciation of loanwords instead, so constraint *q prevents the occurrence of this consonants in the optimal output. Ranking (12) deals with this type of metathesis in IBDs and tableau (13) represent the following ranking.

(12) Constraints ranking for IBDs CC metathesis depends on place of articulation

*ʃχ, MAX-IO, DEP-IO, IDENT-IO >> LINEARITY-IO

(13) *boʃqaːb* [boχʃɑːb] ‘plate’

Input:/boʃqɑːb/	*ʃχ	*q	MAX-IO	DEP-IO	IDENT-IO	LINEARITY-IO
a.☞ boχʃɑːb					*	*
b. boʃχɑːb	*W				*	L
c. boʃqɑːb		*W			L	L
d. boqʃɑːb		*W			L	*
e. boʃeqɑːb				*W	L	L
f. boʃɑːb			*W		L	L

In tableau (13), candidate (a) is a winner, since it satisfies the higher ranked constraints. All other candidates have fatal violations, thus they are losers.

4.2 Local assimilation in IBDs

Local assimilation is defined as a phonological alternation in which two adjacent sounds become more similar. It is opposite to dissimilation, an alternation in which two similar sounds become more different. Local assimilation is contrasted with long- distance assimilation in which two non-adjacent string influence on one another (C. Zsiga 2011).

The most common types of IBDs local assimilation are exemplified below.

4.2.1 Voicing assimilation in IBDs

When obstruent consonants become adjacent to other obstruent consonants or sonorants, they often come to agree in voice. Data (14) illustrate the examples in which the voiceless obstruents become voiced adjacent to voiced segment.

(14) Voicing assimilation in IBDs

a.i	*hæftdæh*	[hæbdæh]	‘seventeen’
a.ii	zæbt	[zæpt]	‘recorder’
a.iii	*dæst nomaːz*	[dæz nomɑːz]	‘ablution’
a.iv	*sofre*	[sobræ]	‘table cloth’
a.v	*tiʃnæg*	[toʒnæ]	‘thirsty’
a.vi	*qofl*	[kobl]	‘locker’
a.vii	*fekr*	[pegr]	‘though’
a.vii	*ʔaːsmaːn*	[ʔɑːzmɑːn]	‘sky’
a.ix	*ʔosmaːn*	[ʔozmɑːn]	‘Osman’
b.i	*ɣæfæs*	[kæbæs]	‘cage’
b.ii	piʃiː	[beʒʒok]	‘cat’

In all of the above examples, the assimilation is anticipatory: consonants anticipate the voicing of the right most obstruent or sonorant in the cluster. It is worth to mention that consonant /f/ is replaced by /p/ in Balochi so in (a. iv and a. vii) in fact first /f/ is replaced by /p/ and then voiceless obstruent consonant /p/ assimilates to the following voiced consonant. In (a. ii) final /t/ is deleted and sibilant fricative /s/ becomes voiced when it precedes nasal consonant. I will return to IBDs deletion in the next two sub-sections. Besides, in (b.i, b.ii) the voiceless fricative becomes voiced in intervocalic position, indeed in (b.i) at first step [f] is replaced by [p] and then becomes voiced in intervocalic position as [b].e

4.2.2. Nasal Place assimilation in IBDs

Nasal assimilation in place of articulation to a following consonant is very common type of assimilation of place of articulation cross-linguistically (C. Zsiga 2011). In IBDs, there are several examples which show nasal place of articulation as in (15).

(15) Nasal place assimilation in IBDs

a.i	*mængeliːk*	[mæ̃ŋgeliːk]	'bracelet
a.ii	*hænguːr*	[hæŋguːr]	'grape'
a.iii	*ṭueng*	[ṭʰueŋg]	'knee'
a.iv	*pællink*	[pʰællĩŋk]	'plaints'
a.v	*saːlonk*	[sɑːlõŋk]	'bride groom'
a.vi	*leσiːnk*	[leσĩːŋk]	'itching'

Examples as in (15a) already have been discussed and analyzed in section 2.2. allophonic variation in IBDs. In all examples, the coronal nasal assimilates to the place of articulation of the adjacent velar obstruent no matter whether it is voiced or voiceless.

4.2.3. Complete assimilation

When two adjacent sounds become identical it is known as complete assimilation. In Sarhaddi Balochi, complete assimilation is common in clusters involving /m/ as in data (16a.i-a.iii); this phonological process leads to a fake or derived geminate as discussed in the previous chapter.

(16) Assimilation of /b/ to /m/ in Sarhaddi Balochi

a.i	*ʃæmbæt*	[ʃæmmæ]	'Saturday'
a.ii	*pæmbæg*	[pæmmæ]	'cotton'
a.iii	*tæmbaːku*	[tæmmok]	'Tobacco'
a.iv	*næzdik*	[næzzik]	'close, not far'

In nearly every case discussed above, assimilation in consonant clusters tends to be anticipatory; the right most consonant dominates the whole cluster, except in (16).

4.2.4 IBDs assimilation in optimality theory

In a constraint-based theory like OT, the local assimilation is represented by the markedness constraint namely AGREE which states that two adjacent segments must agree with the specific feature (Lombardi 1999). However, this markedness constraint interacts with the IDENT-IO faithfulness constraint which requires being faithful to underlying features. The list of constraints that are needed in analyzing voicing assimilation as in data (12) and complete assimilation as in data (16) is as follows:

(17) Constraints on local assimilation in IBDs

(I) Voicing assimilation

a. AGREE
Obstruent/sonorant clusters should agree in voicing

b. IDENT (Laryngeal)
Correspondent segments in input and output have identical values for [voicing].

c. IDENT- ONSET (Laryngeal)
Consonants in [pre-sonorant position] should be faithful to underlying laryngeal specification.
(Lombardi 1999)

d. MAX-C
‘No consonant deletion’

(II) Complete assimilation

a. AGREE
Sonorant/ obstruent clusters should agree in nasality.

b. IDENT (Nasality)/ SO
Sonorant/ obstruent clusters should agree in nasality.

c. IDENT (Oral)
Correspondent segments in input and output have identical values for [-nasal].

d. MAX-IO
'No consonant deletion

As it is shown in (18), the agreement constraint and the positional faithfulness constraint are higher ranked so the result is that the coda will assimilate in voicing to the onset. The tableau (19) represents the evaluation for input /sobræ/.

(18) AGREE, IDENT-ONSET (Lar), MAX-C >> IDENT (Lar)

(19) *sofre* [sobræ] 'table cloth'

Input:/sofre/	AGREE	IDENT-ONSET(Lar)	MAX-IO	IDENT(Lar)
a.☞ sobræ				*
b. sopræ	*W	*W		L
c. sofre	*W	*W		L
d. soræ			*W	L

As tableau (19) demonstrates the optimal candidates is candidate (a) because it satisfies the higher ranked constraints since two consonants in the word-medial cluster assimilate in voicing, and it has a non-fatal violation as well. However, all other candidates satisfy the lower ranked IDENT (Lar) faithfulness constraints, but they all violate the outranked constraints such as AGREE. Thus they are losers.

The constraint ranking for complete assimilation is as (19) and tableau (20) displays the relevant ranking.

(20) Constraint ranking for IBDs the complete assimilations
AGREE, IDENT (Nasality) /V-C, MAX-C >> IDENT (*nasal)

(21) *Pæmbæ* [pæmmæ] 'cotton'

Input:/pæmbæ/	AGREE	IDENT(Nasality)/ SO	MAX-C	IDENT (-nasal)
a.☞ pæmmæ				*
b. pæmbæ	*W	*W		L
c. pæbbæ	*W	*W		L
d. pæmæ			*W	L

In tableau (21), candidate (a) is a winner as it satisfies all outranked constrains. Candidate (d) satisfies the higher ranked constraint, namely AGREE, but it is eliminated since it has a fatal violation. Both candidates (b) and (c) are losers as they violate all higher ranked constraints.

4.3 Hiatus resolution in IBDs

The sequence of adjacent vowels belonging to separate syllables (not in diphthongs) is known as vowel hiatus. In IBDs, tautosyllabic vowel sequences cannot occur. So, consonant epenthesis is employed as hiatus resolution as illustrated in the following examples (the consonant epenthesis is between hyphens).

(22) Consonant epenthesis in IBDs

(I) Phoneme /j/

a.i [distæ - j -ɑːn]
See. Present participle- consonant epenthesis- verbal ending. 1SG
‘I have seen’

a.ii [ʃiwɑː - j - æ dist]
Shiwa- consonant epenthesis - Oblique See. Simple past. 3SG
‘(S)he saw Shiwa.’

a.iii [ʔæjiː - j -æ gopt]
Personal pronoun, 3SG- consonant epenthesis- Oblique tell. Simple past, 3SG.
‘(S)he told him/her’

a.iv [truː - j- et]
Aunt- consonant epenthesis – possessive pronoun. 2SG
‘Your aunt’

a.v [se- j –om]
Three- consonant epenthesis- ordinal number marker

(II) Phoneme /ʔ/

b.i [hoʃmaze - ʔ -ent]
Delicious- consonant epenthesis- To be. 3PL
‘They are delicious.’

b.ii [ges-ɑː- ʔ - on]
Home- adverb marker- consonant epenthesis- To be. 1SG
‘I am home.’

b.iii [næ- ʔ -ent]
Not- consonant epenthesis- To be. 3PL
‘They are not.’

b.iv [do- ʔ - om]
Two- consonant epenthesis- ordinal number marker
‘Second’

As all examples in (22) demonstrate that two consonants namely /j/ and/ʔ/ can function epenthetically as hiatus interrupters in IBDs:

(i) A semivowel /j/ as in (22a). In all these examples, one of the V_1 or V_2 is a front vowel which is harmonic with semivowel /j/. This form is common pattern indeed.

(ii) A glottal stop ([ʔ]) as in data (22b), this form of consonant epenthesis is a common in Sarawani Balochi dialect.

4.3.1 IBDs hiatus resolution in optimality theory

Analysis of hiatus resolution patterns within OT needs a constraint that militates against the tautosyllabic adjacent vowel sequence; that constraint is labeled as 'NOHIATUS' by Casali (2011). On the other hand, there are number of constraints that will be violated by hiatus resolution. For example anti-deletion faithfulness constraint MAX-IO will be violated if one of the adjacent vowels are deleted, or if two adjacent vowels make a diphthong it is against the NODIPHTH (Casali 2011). Moreover, as the data in (22) demonstrate, only certain consonants are observed to function epenthetically as hiatus interrupters. Indeed, certain places of articulations are universally more marked than others. Lombardi (2002:2) assumes that the glottal stop has a pharyngeal specification and suggests the rightmost position for glottal stops in Smolensky's (1993) place of articulation markedness (POA) scale as in (23):

(23) *Lab, *Dor >> *Cor >> *Phar

Based on (23), the glottal stop is the optimal epenthetic consonant, since it has the lowest ranked violation in this scale. However, in IBDs as discussed semivowel dorsal [j] also has hiatus resolution function, so in this case *Phar outranked *Dor then as in (23).

Now, consider the following rankings for data (22a) as in [distæjɑːn] and (22b) as in [næʔent] respectively.

(24) Constraints ranking for semivowel epenthesis [j] in IBDs
*HIATUS, MAX-V, *DIPH >> *Phar, DEP-IO >> *Dor

(25) Constraints ranking for glottal stop epenthesis [ʔ] in IBDs
*HIATUS, MAX-V, *DIPH >> *Dor, DEP-IO >> *Phar

Tableaux (26) and (27) represent the above ranking for the input [distæjɑːn] and [næʔent]. As it is shown, in both tableaux candidates (a) are optimal, since the epenthetic consonant interrupts vowel hiatus. Candidates (b) satisfy higher ranked constraints particularly outranked NOHIATUS, but they have fatal violations namely in (26) *Phar and in (27) *Dor. Besides in both tableaux candidates (c) and (d) are eliminated as they are faithful to DEP-IO, but violate higher ranked *HIATUS which militates against the tautosyllabic adjacent vowel sequences.

(26) *distæaːn* [distæjɑːn] 'I have seen'

Input: /distæɑːn/	*HIATUS	MAX-V	*DIPH	*Phar	DEP-IO	*Dor
a. ☞ distæ.j.ɑːn					*	*
b. distæ.ʔ.ɑːn				*W	*	L
c. diste.n		*W			L	L
d. distæɑ.n			*W		L	L

(27) *næ ent* [næʔent] 'They are not'

Input: /næent/	*HIATUS	MAX-V	*DIPH	*Dor	DEP-IO	*Phar
a. ☞ næ.ʔ.ent					*	*
b. næ.j.ent				*W	*	L
c. ne.nt		*W			L	L
d. næe.nt			*W		L	L

4.4 Final consonant devoicing in IBDs

There is an optional devoicing of word-final stops in loanwords in Balochi (Korn 2005). That claim is supported by IBDs data as well. Furthermore, in several examples final affricates become voiceless as well. This phenomenon is more common in Sarawani and Lashari Balochi than in Sarhaddi Balochi, since Sarhaddi is more influenced by Persian. Consider the following examples:

(28) Final devoicing in IBDs

a.i	*giːdʒ*	[giːtʃ]	'confused'
a.ii	*pændʒ*	[pæntʃ]	'five'
a.iii	*tæng*	[tænk]	'tight'
a.iv	*siːb*	[sɪp]	'apple'
a.v	*ʔaːzaːd*	[ʔɑːzɑːt]	'free'
a.vi	*spiːd*	[spiət]	'white'
a.vii	*speːd*	[speʈʈ]	'speed'
a.ix	*tʃæsb*	[tʃæps]	'glue'
a.x	*sæbæd*	[sæbæt]	'basket'
a.xi	*medaːd*	[medɑːt]	'pencil'

4.4.1 IBDs final consonant devoicing in optimality theory

In OT, the markedness constraint which bans the occurrence of the voiced obstruents in syllable coda position is given in (29).

(29) *VOICED-CODA
Obstruent must not be voiced in coda position.
(Kager 1999)

Indeed constraint (29) is against the typical faithfulness constraint IDENT-IO (Voice) which requires input -output feature preserving.

The relevant constraint ranking for data (28) is given in (30). As it is shown, the markedness constraint *VOICED-CODA outranked the other faithfulness constrains.

(30) *VOICED-CODA, MAX-V >> IDENT-IO (Voice)

The following tableau represents the candidates' evaluation for input *sæbæd*.

(31) *sæbæd* [sæbæt] 'basket'

Input:/sæbæd/	*VOICED-CODA	MAX-V	IDENT-IO (Voice)
a.☞ sæbæt			*
b. sæbæd	*W		L
d. sæbæ		*W	L

In tableau (31), the optimal candidate is (a). It satisfies higher ranked constraints, but both candidates (b) and (c) have fatal violations, so they are losers.

4.5 Dissimilation in IBDs

Dissimilation refers to a situation in which a segment becomes less similar to a nearby segment (Bye 2011). Some cases of dissimilation are also found in IBDs as shown in (32):

(32) IBDs dissimulations

a.i	*kæftær*	[kæpdær]	'pigeon'
a.ii	*væɣt*	[wæhd]	'time'
a.iii	*kundʒid*	[kuntʃit]	'sesame'
a.iv	*kæbrestaːn*	[kæprestɑːn]	'cemetery'

In all above examples, voicing dissimilation occurs as an example of feature-changing. Voiced consonants become voiceless, however the adjacent consonant is voiced as in (a.i) and (a.ii), whereas, in (aiii) and (a.iv) it is vice versa. In autosegmental phonology (Goldsmith 1976), the analysis of the voicing dissimilation can be shown as the delinking of [-voice] after another [-voice] as in (33):

(33) consonant voicing

kæ f t ær → kæ p t ær → kæp d ær

[-voice] [-voice] [-voice][-voice] [-voice][+voice]

As illustrated in (33), two adjacent consonants are voiceless. The deletion of feature [-voice] in second segment can be explained by Obligatory Contour Principle 'OCP' (cf. Goldsmith 1976): "At the melodic level, adjacent identical elements are prohibited". The OCP was originally used in accounting for tonal phenomenon as in adjacency of high tones, but it is extended to include other features (Bye2011:1415). In the case of voicing dissimilation, indeed delinking the feature [-voice] after [-voice] is a repair strategy to avoid OCP.

4.5.1 IBDs dissimilation in optimality theory

In the framework of OT, the IBDs voicing dissimilation requires the OCP constraint as the higher ranked constraint and other famous faithfulness constraint as lower ranked constraints as in (34):

(34) OCP >> MAX-C, DEP-IO >> IDENT-IO (Voice)

Tableau (35) displays the evaluation for input /kæptær/. The winner candidate is (a), which satisfies all higher ranked constraints, but it is against the IDENT-IO (Voice) which is not fatal. Candidate (b) militates against the OCP constraints, so it is a loser. Both candidates (c) and (d) satisfy OCP, but they violate the other higher ranked faithfulness constraints by deleting a segment and inserting a vowel respectively, thus they are eliminated as well.

(35) *kæptær* [kæpdær] ‘Pigeon’

Input:/kæptær/	OCP	MAX-C	DEP-IO	IDENT-IO(Voice)
a.☞ kæpdær				*
b. kæptær	*W			L
c. kæpetær			*W	L
d. kæpær		*W		L

4.6 Loanword adaptations in IBDs

The Balochi lexicon is marked by extensive loanwords (Korn 2005). The adaptation of loans from Old, Middle and New Persian, Kurdish, Urdu, Indic and other Indo-Iranian languages as well as English, other Indo-European languages and Turkic have been only described (cf. Korn 2005), but no theoretical phonological analysis is provided on loanwords in Iranian Balochi dialects over the past years as far as the present author knows. So, in this section first the segmental adaptation of loanwords in IBDs will be investigated and then the relevant OT analysis will be given.

In general, speakers borrow words from other languages to fill the gap in their own lexical inventory. Calabrese and Leo Itzels (2009) consider two different scenarios for nativization of loanwords based on available literature on loanword phonology. (1) nativization- through-production: when word borrowing occurred by a bilingual speaker that fills a gap in the recipient (L1) language by taking the word from other language that he knows namely the donor language (L2). In that case it is assumed that the underlying representation of borrowing word is stored in the L2 long-term memory storage for lexical items and the surface representation of the borroid word follows the grammatical rules of L1. (2) nativization- through-perception: when the speaker fills a gap in his language by borrowing the word from other languages that he knows a little or not at all. It is indeed a loanword.

In the present study I will only focus on loanwords generated in nativization-through- production, since almost all IBDs speakers are bilinguals; they know Persian as a formal and educational language in Iran as well as Balochi as their mother tongue.

4.6.1 Consonants adaptation

As has been already shown in IBDs consonant inventory, there is no labio-dental and velar or uvular fricative in IBDs (except in the pronunciation of educated speakers), thus in this section, I examine how the non-Balochi words with fricatives (/f, v, χ, ɣ/) are adapted into IBDs.

(I) [f] and [v] adaptation in IBDs

The data in (35) illustrate the IBDs adaptation of two phonemes [f] and [v] which are replaced by [p] and [w] respectively. In addition there are two examples in Sarhaddi Balochi in which /v/ appears as /b/ as in 36(ci, cii).

(36)

	Non-Balochi words	IBDs adapted forms	
a.i	*felfel*	[pelpel]	‘pepper’
a.ii	*faːl*	[pɑːl]	‘omen’
a.iii	*film*	[pilm]	‘film’
a.iv	*futbaːl*	[putbɑːl]	‘football’
a.v	*telefon*	[telepon]	‘telephone’
a.vi	*fekr*	[pegr]	‘thought’
b.i	/væɣt/	[wæht]	‘time’
b.ii	/væhʃi/	[wæhʃi]	‘wild’
b.iii	/livɑːn/	[liwɑːn]	‘glass’
c.i	/vɑsəleːn/	[bɑːsliːn]	‘vaseline’
c.ii	/teləvizhən/	[telibzon]	‘television’

(II) [ɣ] and [χ] adaptation in IBDs

Data (37) examines the substitution of phoneme /χ/ in IBDs. Indeed there is a dialect variation in adaptation of loanwords with phoneme /χ/. In Sarawani and Lashari Balochi dialects it is mostly replaced by /h/ and in a few examples by /k/, but in the Sarhaddi Balochi dialects there are examples in which the original form of loanwords is preserved. Thus it can show that the influence of Persian on Sarhaddi Balochi is more than the other two dialects, since it is located closer to Zahedan (center of Sistan and Balochestan Province).

(37)

	Non-Balochi words	Sarawani/Lashari adapted forms	Sarhaddi adapted forms	
a.i	*χuːn*	[huːn]	[huən] [huen]	‘blood’
a.ii	*χaːs*	[hɑːs]	[hɑːs]	‘special’
a.iii	*naːχon*	[nɑːhon] [pintʃ]	[nɑːhon]	‘nail’
a.iv	*χaːm*	[hɑːm]	[hɑːm]	‘raw’
a.v	*χuːg*	[huːk]	[huːk]	‘pig’
a.vi	*χaːk*	[hɑːk]	[hɑːk]	‘dust’
a.vii	*χær*	[hær]	[hær]	‘donkey’
a.viii	*miːχ*	[mɪːh]	[miəh] [mieh]	‘nail’
b.i	*tæχt*	[tæht]	[tæχt]	‘bed’

b.ii	*χeʃt*	[heʃt]	[χeʃt]	‘brick’
b.iii	*χæjjat*	[hæjɑːt]	[χæjɑːt]	‘tailor’
b.iv	*χers*	[hers]	[χers]	‘bear’
b.v	*χijabaːn*	[hæjɑbɑːn]	[χæjɑbɑːn]	‘street’
b.vi	*χaːmuːʃ*	[hɑːmuːʃ]	[hɑːmuəʃ] [χɑːmueʃ]	‘off’
c.i	*χærguʃ*	[hærgoʃk]	[kærgoʃk] [kærgoʃk]	‘rabbit’
c.ii	*χroːs*	[kruːs]	[kruəs] [krues]	‘cock’

In data 37(a), all three dialects apply the same strategy to adapt the phoneme /χ/: it is replaced by /h, and indeed it is the commonest substitution. In 37(b), Sarawani and Lashari Balochi keep replacing /χ/ by /h/, but in Sarhaddi Balochi the original form of loanwords is almost preserved. For instance in (b.v) and (b.vi), only vowel adaptation occurred but not uvular substitution. Finally in data 37(c) phoneme /χ/ appears as /k/.

Data (38) illustrates that in some examples phoneme /ɣ/ is replaced /g/ and in most other cases it is pronounced as /k/. Also in two Sarhaddi Balochi examples, /ɣ/ is replaced by /χ/. Besides, as it is shown in (d.i) /ɣ/ is replaced by /h/ in Sarawani and Lashari dialects.

(38)	Non-Balochi words		SB/LB adapted forms	SB adapted forms	
	a.i	*kælaːɣ*	[kælɑːg]	[kælɑːg]	‘crow’
	a.ii	*kaːɣæz*	[kɑːgæd]	[kɑːgæd	‘paper’
	a.iii	*daːɣ*	[dɑːg]	[dɑːg]	‘hot’
	a.iv	*baːɣ*	[bɑːg]	[bɑːg]	‘garden’
	a.v	*porteɣaːl*	[portægɑːl]	[portægɑːl]	‘orange’
	a.vi	*ɣolaːm*	[golɑːm]	[golɑːm]	‘waiter’
	b.i	*ʔeʃɣ*	[ʔeʃk]	[ʔeʃk]	‘love’
	b.ii	*ʔaːʃeɣ*	[ʔɑːʃek]	[ʔɑːʃek]	‘lover’
	b.iii	*ʔæɣl*	[ʔækl]	[ʔækl]	‘wisdom’
	b.iv	*ɣæbr*	[kæbr]	[kæbr]	‘grave’
	b.v	*ɣorʔaːn*	[korʔɑːn]	[korʔɑːn]	‘Koran’
	b.vi	*ɣaːʃoɣ*	[kɑːʃok]	[ɣɑːʃok]	‘spoon’
	c.i	*ræɣs*	[nɑːtʃ]	[ræχs]	‘dance’
	c.ii	*ʃoluɣ*	[ʃolok]	[ʃoloχ]	‘crowded’
	d.i	væɣt	[wæht]	[wæχ]	‘time’

4.6.2 Vowel adaptation in IBDs

In addition to the cases discussed in 4.6.2, the following vowel quality changes occur in loanwords:

(I) Diphthongization

The bimoraic high front vowel /iː/ is replaced by /ie/ in Sarhaddi Balochi and /iə/ in Lashari Balochi as in following data:

(39)

	Non-Balochi words	Sarhaddi adapted forms	Lashari adapted forms	
a.i	*miːz*	[miez]	[miəz]	'table'
a.ii	*niːm*	[niem]	[niəm]	'half'
a.iii	*diːg*	[dieg]	[diəg]	'pot'
a.iv	*miːχ*	[mieh]	[miəh]	'pin'
a.v	*piːtʃ*	[pietʃ]	[piətʃ]	'twist'
a.vi	*kiːf*	[kiep]	[kiəp]	'bag'
a.vii	*siːr*	[sier]	[siər]	'full'

Moreover, the bimoraic back vowel /uː/ appears as diphthong /ue/ in Sarhaddi Balochi and /uə/ in Lashari Balochi as in data (40).

(40)

	Non –Balochi words	Sarhaddi adapted forms	Lashari adapted forms	
a.i	*χuːn*	[huen]	[huən]	'blood'
a.ii	*puːst*	[puest]	[puəst]	'skin'
a.iii	*tuːp*	[tuep]	[tuəp]	'ball'
a.iv	*ʃuːr*	[ʃuer]	[ʃuər]	'salty'
a.v	*ruːd*	[rued]	[ruəd]	'river'
a.vi	*muːr*	[muer]	[muər]	'ant'

Furthermore, the long back vowel /oː/ is replaced by diphthong /ou/ in Sarawani Balochi as in following data:

(41)

	Non-Balochi words	Sarawani adapted forms	
a.i	*hoːz*	[houz]	'pool'
a.ii	*foːn*	[poːn]	'telephone'
a.iii	*moːt*	[mout]	'death'

(II) Vowel laxness in Sarawani Balochi adapted forms

In Sarawani Balochi loan adaptations, the bimoraic high tense front vowel /iː/ and bimoraic high tense back vowel /uː/ are replaced by monomoraic lax vowel /ɪ/ and /ʊ/ respectively as in the following data:

(42)	Non-Balochi words		Sarawani adapted forms	
	a.i	*diːg*	[dɪg]	‘pot’
	a.ii	*diːr*	[dɪr]	‘late’
	a.iii	*kiːf*	[kɪp]	‘bag’
	a.iv	*biːχ*	[biːh]	‘root’
	b.i	*guːr*	[gʊr]	‘grave’
	b.ii	*ʃuːr*	[ʃʊr]	‘salty’
	b.iii	*duːɣ*	[dʊg]	‘soft drink’
	b.iv	*tuːr*	[tʊr]	‘net’

(III) Final vowel lowering

In the IBDs data, word-final mid front vowel appears as front low vowel as in (43):

(43)	Non-Balochi words		IBDs adapted forms	
	a.i	*mædrese*	[mædresæ]	‘school’
	a.ii	*sofre*	[sobræ]	‘table cloth’
	a.iii	*naːme*	[nɑːmæ]	‘letter’
	a.iv	*faːteme*	[pɑːtomæ]	‘Fateme’

In sum, for dealing with an accurate analysis of segment adaptation in IBDs, diachronic investigations and explanations are needed. Since the loanwords are indeed integrated loanwords in IBDs, it means they have entered the lexicon of Balochi. Moreover, only diachronic interpretation makes it clear that how those speakers, who originally introduced the loans, applied adaptations (Calabrese 2009: 66). Whereas the present study is based on synchronic phonological knowledge of the IBDs, the more diachronic study will be left for the future researches. The OT analysis of segments adaptation in IBDs will be given in next section.

4.6.3 Loanwords gemination and degemination in IBDs

A in the case of word-final gemination in original Balochi words (see 3.2), there are also number of cases of gemination in loanwords (Korn 2005:271), both sonorant and obstruent consonants can be geminated in word-final position as is shown in following examples:

(44)	Non-Balochi words	IBDs adaptation forms	
a.i	*læb*	[læbb]	‘bride-price’
a.ii	*buːt*	[buʈʈ]	‘boot
a.iii	*kæm*	[kæmm]	‘little’
a.iv	*mætʃ*	[mæʈʈ]	‘match’

While gemination is common in Balochi, there is also number of loans degemintion in Sarhaddi and Lashari Balochi as in (45).

(45)	Non-Balochi words	Sarhaddi/ Lashari adaptation forms	
a.i	*χæjjat*	[hæjɑːt]	‘tailor’
a.ii	*ʔævvæl*	[ʔæwæl]	‘first’
a.iii	*dovvom*	[doʔom] (Sarhaddi)	‘second
		[dojom] (Lashari)	‘second’
a.iv	*sevvom*	[seʔom] (Sarhaddi)	‘third’
		[sejom] (Lashari)	‘third’

As the in data (45) demonstrate, the glide geminate in intervocalic position is not allowed in Sarhaddi and Lashari Balochi, whereas it is permitted in Sarawani Balochi. Example (a.i) can be an example of compensatory lengthening; the short back vowel/ɑ/ becomes long to preserve the syllable weight. However, in the other three examples there is no vowel lengthening.

4.6.4 IBDs loans adaptation in optimality theory

In order to establish the set of rankings for IBDs adaptation of fricatives as in data (36)-(38), the relevant constraints are listed in (46).

(46) List of markedness constraints for IBDs fricatives and coronal stops adaptation

a.i *[f]
/f/ is not allowed in Balochi adaptation forms.

a.ii *[v]
/v/ is not allowed in Balochi adaptation forms.

a.iii *[χ]
/χ/ is not allowed in Balochi adaptation forms.

a.iv [ɣ]*
/ɣ/ is not allowed in Balochi adaptation forms.

Besides all of the above constraints listed in (45), the famous faithfulness constraints MAX-C and IDENT-IO are required in our OT analysis of consonant adaptations in IBDs. The following rankings deal with IBDs adaptation of fricatives and coronal stops. The markedness constraint outranks all faithfulness constraints to block the optimal candidate without segment adaptations.

(47) Constraint rankings for consonant adaptations in IBDs
a.i [f]*, MAX-C >> IDENT- IO [f]
a.ii [v]*, MAX-C >> IDENT- IO [v]
a.iii [ɣ] *, MAX-C >> IDENT- IO [ɣ]
a.v [χ]*, MAX-C >> IDENT-IO [χ]

The following tableaux represent the rankings in (47). In all tableaux the optimal candidate is (a), since it satisfies all higher ranked constraints, while other candidates have at least one fatal violation. So tableaux (48)-(51) evaluate the optimal candidate for the following inputs:

/fekr/, /væqt/, /ɣɑːʃoɣ/, and /χær/.

(48) IBDs production of word *fekr*

Input: /fekr/	*[f]	MAX-C	IDENT-IO [f]
a.☞ pekr			*
b. fekr	W*		L
c. ekr		*W	*

(49) IBDs production of word *væɣt*

Input:/væqt/	* [v]	*[q]	IDENT-IO (v)	IDENT-IO [q]
a.☞ wæht			*	*
b. væqt	*W	*W	L	L
c. væht	*W		L	*
d. wæqt		*W	L	*

(50) IBDs production of word *ɣa:ʃoɣ*

Input: /ɣɑ:ʃoɣ/	* [ɣ]	MAX-C	IDENT-IO [ɣ]
a.☞ kɑ:ʃok			*
b. ɣɑ:ʃoɣ	*W		L
c. kɑ:ʃ		**W	*

(51) IBDs production of word *χær*

Input:/χær/	*[χ]	MAX-C	IDENT-IO [χ]
a.☞ hær			*
b. χær	*W		L
c. ær		*W	*

The second part of segment adaptation in IBDs deals with vowel adaptations, as illustrated in the data in (39) and (41), in Sarhaddi Balochi and Lashari Balochi dialects front vowel /iː/ and back vowel /uː/ appear as /ie/, /iə/ and /ue/, /uə/ respectively. Thus the number of input and output moras is preserved. The constraints needed to make an OT analysis for this phenomenon are as follows:

(52) List of constrains dealing with diphthongization in Sarhaddi Balochi and Lashari Balochi

a.i *[iː]
/iː/ is not allowed in Balochi adaptation forms

a.ii *[uː]
/uː/ is not allowed in Balochi adaptation forms.

a.iii MAX-µ -IO
Input moras have output correspondence.

Besides, faithfulness constraint IDENT-IO is required in our ranking as in (53).

(53) Constraint rankings for Sarhaddi and Lashari diphthongization

a.i [iː]*, MAX-µ-IO >> IDENT-IO [iː]

a.ii [uː]*, MAX-µ-IO >> IDENT-IO [uː]

Tableaux (54) and (55) represent the above rankings for input /diːg/ and /ʃuːr/.

(54) Sarhaddi Balochi production of word *diːg*

Input:/ diːg/	[iː]*	MAX-µ-IO	IDENT-IO[iː]
a.☞ dieg			*
b. diːg	*W		L
c. dig		*W	*

Moreover, vowel laxness in Sarawani Balochi is observed in loans adaptations as in the data (42). Faithfulness constraint IDENT- IO and other relevant constraints which are listed in (55) deal with this process.

(55) List of constraints for vowel laxness in Sarawani Balochi loans adaptation

a.i *[+tense]
Tense vowels are not allowed in Sarawani Balochi adapted forms.

a.i * [iː]
/iː/ is not allowed in Sarawani Balochi adaptation forms.

a.ii * [uː]
/uː/ is not allowed in Sarawani Balochi adaptation forms.

a.iii MAX- µ-IO
Input moras have output correspondence.

The resulting rankings for constraints in (55), is illustrated in (56):

(56) Constraint rankings for vowel laxing in Sarawani Balochi

a.i * [iː], *[+tense] >> MAX-µ- IO, IDENT-IO [iː]

a.ii *[uː], *[+tense] >> MAX-µ- IO, IDENT- IO [uː]

Tableaux (57) and (58) evaluate the rankings for input /ʃiːr/ and /guːr/. The winner candidate in both tableaux is candidate (a), it satisfies the outranking constraints, but violates the lower ranked constants which are not fatal; however, two other candidates violate higher ranked constraints, so they are eliminated.

(57) Sarawani Balochi production of word *diːg*

Input:/diːg/	*[iː]	*[+tense]	MAX-µ-IO	IDENT-IO[iː]
a.☞ dɪg			*	*
b. diːg	*W	*W	L	L
c. dig		*W	*	L

(58) Sarawani Balochi production of word *guːr*

Input:/guːr/	*[uː]	*[+tense]	MAX-µ-IO	IDENT-IO[uː]
a.☞ gʊr			*	*
b. guːr	*W	*W	L	L
c. gur		*W	*	L

Final vowel lowering is the other phonological process in loans adaptations in IBDs. As data (43) demonstrates, the final mid-front vowel in an open syllable appears as closed front vowel in IBDs adaptation forms; in other words, final tense vowel in an open syllable seems to be not allowed in three Balochi dialects.

The contextual markedness constraint which militates against the occurring /e/ in word final position is *e#]w. It outranks a context–free faithfulness constraint IDENT-IO (tense).

The resulting ranking of these three constraints is:

(59) *#e]$_{w\,,}$ MAX-V >>IDENT-IO (tense)

(60) IBDs production of word *mædrese*

Input: /mædrese/	*e#]$_w$	MAX- V	IDENT-IO (tense)
a. ☞ mædresæ			*
b. mædrese	*W		L
c. mædres		*W	L

In tableau (60), candidate (a) is a winner candidate. It satisfies higher ranked constraints *e#]w and MAX-V. Candidate (b) is a loser since it militates against the higher ranked constraint. Candidate (c) satisfies *e#]w, but it has a fatal violation, so it is eliminated as well.

I will now perform an OT analysis of two phonological processes namely gemination and degemination in loanwords. The following constraints are needed:

(61) List of constraints for word-final consonant geminate in IBDs adapted forms

a.i *C#]$_w$
No short consonant in word-final position in Balochi adapted forms.

a.ii *GEM
'No geminates'
(Rose2000)

a.iii FAITHμ
No mora deletion or insertion'
(Davis 2003)

The relevant constraint ranking for input *kæm* is given in (62).

(62) $*C\#]_w$ >> FAITHμ >> *GEM

Tableau (63) represents the above ranking, and it shows the optimal candidate is (a). It satisfies the outranking constraint, but violates the lower ranked constraints which are not counted as fatal violations in this case. Candidate (b) and (c) both militate against the higher ranked constraint which is against short consonant in coda position namely $*C\#]_w$, so they are eliminated.

(63) IBDs production of word *kæm*

Input:/kæm/	$*C\#]_w$	FAITH-μ	*GEM
a. ☞ kæmm		*	*
b. kæm	*W	L	L
d. kæ:m	*W	*W	L

The context-free markedness constraint *GEMGLIDE deals with the degemination in loanword adaptation processes in IBDs. Indeed, it outranks other relevant constraints as in (63) for input *ʔævvæl*.

(64) *GEMGLIDE, *[V] >> FAITHμ, MAX-IO, IDENT-IO [V]

Tableau (65) evaluates the optimal candidate for input *ʔævvæl*, and candidate (a) is a winner, as it degeminates the intervocalic long consonant and also the labiodental fricative consonant is replaced by the glide, so both higher ranked constraints *GEMGLIDE and *[v] are satisfied. Candidate (b), violates the anti-glide geminate constraint *GEMGLIDE, so it is eliminated. Candidate (c) and (d) preserve the labiodental fricative which militates against the higher ranked constraint *[v]; thus they are losers as well.

(65) IBDs production of the word *ʔævvæl*

Input:/ʔævvæl/	*GEMGLIDE	*[v]	FAITHμ	MAX- C	IDENT-IO [v]
a.☞ ʔæwæl			*	*	*
b. ʔæwwæl	*W		L	L	**
c. ʔævvæl		**W	L	L	L
d. ʔævæl		*W	*	*	L

4.7 Final consonant deletion in IBDs

In IBDs, the final coronal stop that appears as the last member of word-final consonant clusters can be deleted optionally. It means that a word such as *baːleʃt* can be pronounced as [bɑːleʃ] or [bɑːleʃt]. Final [t, d] deletion is a common phonological process in American English dialects as studied by Labov et al. (1968), Guy (1980), Patrick (1991), Coetzee (2004) and others.

Coetzee (2004) considers three factors that influence the [t, d] deletion. (a) The following context. If [t, d] is followed by a consonant, it is more likely to delete than followed by a vowel or pause. (b) The preceding context. If preceding segments similar to [t, d], then [t, d] more likely to be deleted. (c) The grammatical category. [t, d] as part of the stem is more likely to be deleted than be part of the suffix. The first two factors are indeed phonological and the third one is the morphological factor indeed.

Harris (2011) considers final cluster simplification in languages in which final consonant clusters are not allowed as an example of the operation of constraints NOCOMPLEXCODA. However, this does not work in IBDs, since complex onsets and codas are allowed in Balochi (cf. section 2, present research).

Now, let us consider the following examples which illustrate the distribution of final [t] and [d] as in (66) and (67) respectively.

(66) The distribution of final [t] in IBDs

a.i	*soht*	[soht]	‘(s)he burned’
a.ii	*hæpt*	[hæpt]	‘seven’
a.iii	*næpt*	[næpt]	‘petroleum’
a.iv	*dʒopt*	[dʒopt]	‘pair’
b.i	*roʃt*	[roʃ]	‘growth’
b.ii	*dæst*	[dæs]	‘hand’
b.iii	*raːst*	[rɑːs]	‘right’
b.iv	*hæʃt*	[hæʃ]	‘eight’
b.v	*gueʃt*	[gueʃ]	‘meat’
b.vi	*puəst*	[puəs]	‘skin’
c.i	*hændest*	[hændes]	‘(s)he laughed’
c.ii	*waːrt*	[wɑːr]	‘(s)he ate’
c.iii	*proʃt*	[proʃ]	‘(s)he broke’
d.i	*mætʃænt*	[mætʃæn]	‘Do not shake!’
d.ii	*kelent*	[kelen]	‘pike’
d.iii	*dʒænt*	[dʒæn]	‘(s)he hits’
d.iv	*priənt*	[priən]	‘(s)he
d.v	*waːrtæn t*	[wɑːrtæn]	‘They ate’

d.vi	*wa:ptænt*	[wɑ:ptæn]	'They slept'

(67) The distribution of final [d] in IBDs

a.ii	*ʃord*	[ʃor]	'watery'
a.ii	*zærd*	[zær]	'yellow'
a.iii	*dærd*	[dær]	'pain'
a.iv	*χord*	[hor]	'small'
b.i	*dozd*	[doz]	'thief'
b.ii	*mozd*	[moz]	'salary'
b.iii	*tond*	[ton]	'fast'
b.iv	*trond*	[tron]	'fast'
b.v	*ʒænd*	[ʒæn]	'tired'
b.vi	*send*	[sen]	'age'

Data (66) and (67) illustrate the distribution of [t] and [d] in the word final position. As the data 66(a) display, [t] is kept in the final position when it is preceded by a bilabial or glottal obstruent, whereas in 66(b), (c), and (d), final [t] is deleted, since it is preceded by a coronal sonorant as in 67(d) or coronal obstruent as in 66(b). Moreover, data show that final [d] deletion occurs when the preceding segment is coronal sonorant as in 67(a) or coronel obstruent as in 67(b).

So the order between different preceding contexts in terms of [t, d] deletion can be represented as the following graph:

(68)

		Less deletion
[-cor, -son]	[h]	↓
[-cor, -son, -cont]	[p]	
[+cor]	[r]	
[+cor, -cont]	[n]	
[+cor, -son]	[s, z, ʃ]	
[+cor, -son, -cont]	[t, d]	More deletion

What we can conclude from the above graph is that the occurrence of two segments that agree in place of articulation is more avoided than the occurrence of two sounds that agree in sonority.

Furthermore, the above examples show that final [t] deletion occurs both in root as in 66 (a, b) and suffix as in 66 (c, d), but it seems final [d] deletion only occurs in root and not suffixes.

Now, the following examples show the effect of the following context on final [t, d] deletion.

(69)

a.i *dæst-aːn* [dæssɑːn] 'hands'
hand- plural marker
a.ii *hæʃt daːnæg* [hæʒ dɑːnæg] 'eight pieces'
eight-piece
a.iii *mæst-in-mærd* [mæssin mært] 'drunk man'
drunk- EZAFE- man
b.i *hord-in- kæt* [hordin kæt] 'small room'
small-EZAFE- room
b.ii *dozd- aːn* [dozzɑːn] 'thieves'
thief- Plural marker

In 68 (a.i-a.iii), final [t] deletion occures. While in 68(a.i) and (a.iii), final [t] precedes a vowel, in 68 (a.ii) it is folloid by a consonant, thus it makes no difference whether a vowel or a consonant follows the final [t], its deletion depends only on the preceding context as it is just explained. However, it seems that final [d] deletion depends on the following context, in 68(b.i) there is no final [d] deletion, since it is followed by a vowel and not a consonant like in 68(b.ii).

4.7.1 IBDs final [t, d] deletion in OT

In this section, I develop the optimality theoretical analysis of final [t, d] deletion. Since this phenomenon deals with deletion, the relevant famous faithfulness constraint MAX-C is involved in our analysis, besides the markedness constraint which is violated by non-deletion, namely OCP is needed as well (Coetzee, 2004).

As it has been already explained, the preceding context has a role in final [t, d] deletion. Based on this factor, the relevant rankings are given in (70).

(70) Consonant rankings for final [t, d] deletion based on preceding context
a.i *[+cor][+cor], *[+ cor]t # >> DEP-V >> MAX-C
a.ii *[+cor][+cor], *[+cor]d# >> DEP-V >> MAX-C
a.iii MAX-C, DEP- V >> *[-son][-son], *[-son]t#

Tableaux (71), (72), and (73) represent the above rankings for input dæst, dozd and hæpt respectively.

The optimal candidate in tableaux (71) and (72) is candidate (a), as it satisfies both higher ranked markedness constraints, though it violates the faithfulness constraint MAX-C which is not fatal. Candidate (c) in the both tableaux violates the outranking constraints, so it is eliminated. Candidate (d) satisfies the higher ranked constraints, but it has a fatal violation, thus it is a loser as well.

(71) *dæst* [dæs] 'hand'

Input:/ dæst/	*[+cor][cor],	*[+ cor]t #	DEP-V	MAX-C
a.☞ dæs				*
b. dæst	*W	*W		L
c. dæset			*W	L

(72) *dozd* [doz] 'thief'

Input:/dozd/	*[+cor][+cor]	*[+cor]d#	DEP-V	MAX-C
a.☞ doz				*
b. dozd	*W	*W		L
c. dozed			*W	L

(73) *hæpt* [hæpt] 'seven'

Input:/hæpt/	MAX-C	DEP-V	*[-son][-son]	*[-son]t#
a.☞ hæpt			*	*
b. hæp	*W		L	L
c. hæpet	L	*W	L	L

In tableau (73), candidate (a) is a winner; as it satisfies outranking constraints. Candidates (b) and (c) are both losers, since they have a fatal violation.