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position, e.g. /vodʒ.dan/ 'conscience→ [voʒ.dan]. This process occurs through two rules, voicing and spirantization, where the second rule, spirantization, counterfeeds the first one. In other words, the first rule applies too late to create environment for the second rule, i.e. counterfeeding.

Parallel OT, as an OT model, is capable of analyzing feeding, as a transparent rule interaction due to input-output mapping. Intermediate stages are not necessary to map input onto output. However, this OT model is unable to account for opacity when dealing with counterfeeding order in the same dialect. It is apparent that the spirantization of voiced alveopalatal affricate /dʒ/ in the postvocalic position demands intermediate stages, compared to the spirantization of /G/. The incursion of ranking constraints in Parallel OT as well as Correspondence Theory does not show counterfeeding interaction. Furthermore, when using Sympathy Theory, having different sympathy constraints in each opaque process, results in the proliferation of sympathy constraints. Consequently, Stratal OT is revealed to be the OT model that is most capable of dealing with opacity with reference to counterfeeding order in Sabzevari.

Acknowledgment

The researcher is very grateful to the Research Center in the Faculty of Arts at King Saud University for funding this research.

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As shown in stratum 1 in (23), candidate (b) has been distinguished as optimal since it is compatible with the *V-AFFRICATE, MAX-IO, and *FORTITION constraints. These constraints, on the other hand, are subject to violations by candidates (a), (c), and (d). Candidate (a) violates the *V-AFFRICATE constraint, even though this candidate is the most faithful output to the input/vod$_3$.dan/, whereas the violation of the same constraint is avoided by candidates (c) and (d) but these candidates are prevented from being optimal because candidate (c) violates the *FORTITION constraint and candidate (d) violates the MAX-IO constraint. The candidates of the input /va$_3$.dan/ undergo evaluation in stratum 2.

Stratum 2: *V-VOICED UVULAR STOP>>SYLLCON>>*V-AFFRICATE>>MAX-IO>>SSP>> *VOICED UVULAR STOP-V>>*FORTITION>>*GEM>>*[VOICED FRICATIVE] [VOICED STOP]>>DEP-IO>>*SPIRANTIZATION

/vo$_3$.dan /	*V-VOICED UVULAR STOP	SYLLCON	*V-AFFRICATE	MAX-IO	SSP	*VOICED UVULAR STOP-V	*FORTITION	*GEM	*[VOICED FRICATIVE] [VOICED STOP]	DEP-IO	*SPIRANTIZATION
vo$_3$.dan									*		
vo.dan				*!							
vo$_3$. $_3$an								*!			*

In stratum 2 in (24), candidate (a) which is the most faithful output to the input /vo$_3$.dan / has become optimal since it satisfies the MAX-IO and *GEM constraints. Candidate (b) is not selected as optimal due to its violation of MAX-IO. Candidate (c) fails to be optimal due to violation of the *GEM constraint.

To sum up, Stratal, as an OT model, has been revealed as an OT approach that is capable of accounting for opacity with reference to counterfeeding order in Sabzevari. In other words, transparent interaction rules can be analysed using OT models including Classic OT, Correspondence Theory, and Sympathy Theory. However, Classic OT and Correspondence Theory are unable to address opacity. Sympathy Theory could solve the problem of opacity but it still has a problematic issue regarding different sympathy constraints in each level when dealing with opaque rules; this results in proliferation of sympathy constraints according to Kiparsky (2000) and Rakhieh (2009).

5. Conclusion

Spirantization in Sabzevari targets a voiced uvular stop /G/ in the postvocalic position before a voiceless obstruent. This process occurs in a feeding order. The first rule is to devoice /G/ due to the adjacent voiceless obstruent since there is no voice uvular stop in Sabzevari where spirantization could happen. As a result, there is no choice but to devoiced a voiced uvular stop in order to apply spirantization, e.g. */saGf/* 'ceiling'→ devoicing rule *saqf* → spirantization [saχf]. Spirantization also targets a voiced alveo-palatal affricate in the intervocalic

Stratum 2: *V-VOICED UVULAR STOP>>SYLLCON>>*V-AFFRICATE>>MAX-IO>>SSP>> *VOICED UVULAR STOP-V>>*FORTITION>>*GEM>>*[VOICED FRICATIVE] [VOICED STOP]>>DEP-IO>>*SPIRANTIZATION

/va$_3$d /	***V-VOICED UVULAR STOP**	**SYLLCON**	***V-AFFRICATE**	**MAX-IO**	**SSP**	***VOICED UVULAR STOP-V**	***FORTITION**	***GEM**	***[VOICED FRICATIVE] [VOICED STOP]**	**DEP-IO**	***SPIRANTIZATION**
va$_3$d									*		
vad				*!							
va$_{33}$								*!			*

In stratum 2 in (22), candidate (a) is determined as the optimal output of the input /va$_3$d/ since it has no violations of the MAX-IO and *GEM constraints, compared to candidates (b) and (c). Candidate (b) fails to be optimal due to the violation of the MAX-IO constraint while candidate (c) conforms to the MAX-IO constraint but cannot be optimal because it violates the *GEM constraint. The sets of constraints in stratum 1 and 2 are used in the next tableaux to deal with counterfeeding order with reference to the input /vod$_3$.dan/ 'conscience'.

Stratum1: *V-VOICED UVULAR STOP>>SYLLCON>>*V-AFFRICATE>>MAX-IO>>SSP>> *VOICED UVULAR STOP-V>>*FORTITION>>*[VOICED FRICATIVE] [VOICED STOP]>>DEP-IO>> *SPIRANTIZATION>>*GEM

/vod$_3$.dan/	***V-VOICED UVULAR STOP**	**SYLLCON**	***V-AFFRICATE**	**MAX-IO**	**SSP**	***VOICED UVULAR STOP-V**	***FORTITION**	***[VOICED FRICATIVE] [VOICED STOP]**	**DEP-IO**	***SPIRANTIZATION**	***GEM**
a. vod$_3$.dan			*!								
b. va$_3$.dan								*		*	
c. vad.dan							*!				*
d. vo.dan				*!							

Stratal OT (Kager 1999: 283)

Input

↓

Stratum 1 *Gen*$_1$ *Eval*$_1$

↓

Stratum n *Gen*$_n$ *Eval*$_n$

↓

Output

In the representation above, the output of stratum 1 serves as the input of the following stratum. The next tableaux account for counterfeeding order using Stratal OT.

Stratum1: *V-VOICED UVULAR STOP>>SYLLCON>>*V-AFFRICATE>>MAX-IO>>SSP>> *VOICED UVULAR STOP-V>>*FORTITION>>*[VOICED FRICATIVE] [VOICED STOP]>>DEP-IO>> *SPIRANTIZATION>>*GEM

/vaʒd/	*V-VOICED UVULAR STOP	SYLLCON	*V-AFFRICATE	MAX-IO	SSP	*VOICED UVULAR STOP-V	*FORTITION	*[VOICED FRICATIVE] [VOICED STOP]	DEP-IO	*SPIRANTIZATION	*GEM
vaʒd			*!								
vaʒd								*		*	
vadd							*!				*
vad				*!							

In stratum 1 in (21), candidate (b) is identified as the optimal output of the input /vaʒd/ 'joy' because it conforms to the *V-AFFRICATE, MAX-IO, and *FORTITION constraints. Candidates (a), (c), and (d) are prohibited from being optimal due to the violations of the constraints that are, on the other hand, satisfied by candidate (b). A postvocalic affricate [dʒ] in candidate (a) leads to the violation of the *V-AFFRICATE constraint, whereas the violation of the same constraint is avoided by candidate (c) through the fortition of the postvocalic affricate [dʒ] which consequently results in the violation of the *FORTITION constraint. Candidate (d) complies with the *V-AFFRICATE and *FORTITION constraints by the deletion of the postvocalic affricate [dʒ]. However, this type of deletion fails to escape from violation of the MAX-IO constraint. The optimal candidate (b) will be shown in the next stratum 2 as the input and its candidates are evaluated in the same stratum.

*** V-VOICED UVULAR STOP>> SYLLCON>>*V-AFFRICATE>>MAX-IO>>SSP>>*VOICED UVULAR STOP-V>>DEP-IO>>*COMPLEX$_{COD}$ >>SPIRANTIZATION>>*GEM**

/vaʒd /	***V-VOICED UVULAR STOP**	**SYLLCON**	***V-AFFRICATE**	**MAX-IO**	**SSP**	***VOICED UVULAR STOP-V**	***FORTITION**	***[VOICED FRICATIVE] [VOICED STOP]**	**DEP-IO**	***SPIRANTIZATION**	***GEM**
vaʒd								*!			
vad				*!							
vaʒʒ										*	*

Tableau (19) shows the inability of Parallel OT to manage phonological opacity since the wrong candidate (c) has been determined as optimal while the optimization of candidate (a), as the desired output, is precluded by the violation of the *[VOICED FRICATIVE] [VOICED STOP] constraint.

The inability of Parallel OT to handle phonological opacity is agreed by several scholars including Idsardi (1997, 2000), Kager (1999), McCarthy (1999), and Kiparsky (2000, 2003). "As OT is currently understood, though, constraint ranking and violation cannot explain all instances of opacity. Unless further refinements are introduced, OT cannot contend successfully with any non-surface-apparent generalizations nor with a residue of non-surface-true generalizations" (McCarthy 1999:2).

Correspondence Theory, as an output-output faithfulness model, has been criticized by McCarthy (1999) and Kiparsky (2000, 2003). According to McCarthy (1999), this model does not provide a complete solution to the opacity problem. Therefore, it is not useful to adhere to this model in order to account for counterfeeding in Sabzevari.

Sympathy Theory was introduced by McCarthy (1999) as an OT model which could be utilized to solve the problem of opacity. This model has encountered objections from some scholars including Idsardi (1997), Kiparsky (2000), Ito and Mester (2003). For instance, Kiparsky (2000) observes that this model is not appropriate to analyse the opaque interaction of stress and vowel epenthesis in Palestinian Arabic. By using this model, each different opaque process requires a different sympathy constraint which yields a propagation of sympathy constraints (Kiparsky 2000).

In contrast to previous OT models, Stratal OT is devoted to tackling the problems of opacity which have not been solved by Classic OT, Correspondence, or Sympathy Theory, according to Kiparsky (1997a,1997b,2000,2003), Bermúdez-Otero (1999, 2008), McCarthy (1999), and Staroverov (2014). In other words, the Stratal model in OT is considered to be an ad hoc solution to the problems stemming from opaque rules. In this model, according to Kager (1999), the input is directly mapped onto the output. Kager (1999) states that stages between input and output have different sets of OT constraints; there is no unified set of OT constraints. The representation below shows how Stratal OT works.

(transparent rule interactions) since they lead to surface-true generalization and do not require reference to intermediate steps between input and output, compared to *counterfeeding* and *counterbleeding*. In other words, intermediate steps between the input and the output are superfluous when dealing with transparent rule interactions, whereas these steps are required in opaque interactions.

Parallel OT is used to deal with the case of counterfeeding order in (13). Accordingly, the candidates of the input /va□d/ 'joy' undergo analysis in the next tableau:

*** V-VOICED UVULAR STOP>> SYLLCON>>*V-AFFRICATE>>MAX-IO>>SSP>> *VOICED UVULAR STOP-V>>DEP-IO>>*COMPLEX$_{COD}$ >>SPIRANTIZATION>>*GEM**

/vad$_3$d/	***V-VOICED UVULAR STOP**	**SYLLCON**	***V-AFFRICATE**	**MAX-IO**	**SSP**	***VOICED UVULAR STOP-V**	***FORTITION**	***[VOICED FRICATIVE] [VOICED STOP]**	**DEP-IO**	***SPIRANTIZATION**	***GEM**
vad$_3$d			*!								
vad$_3$d								*		*	
vadd							*!				*
vad				*!							

Tableau (18) determines candidate (b) as optimal since it has no violations of the *V-AFFRICATE, MAX-IO, or *FORTITION constraints. The *V-AFFRICATE constraint is subject to violation by candidate (a). As a result, this candidate is prevented from being optimal. The same constraint, on the other hand, is satisfied by candidates (c) and (d). Candidate (c) avoids the violation of the *V-AFFRICATE constraint through a regressive assimilation which targets the postvocalic affricate [d$_3$]. However, this type of assimilation results in the violation of the *FORTITION constraint. Therefore, this candidate fails to be optimal. Candidate (d) sees the deletion of postvocalic affricate [d$_3$] in order to conform to the *V-AFFRICATE and *FORTITION constraints. Unfortunately, this candidate does not comply with the MAX-IO constraint against any type of deletion. For this reason, this candidate cannot achieve optimization.

Tableau (18) shows that Parallel OT can account for the first rule in the counterfeeding order in (13). The same set of constraints is used to account for the second rule in the same counterfeeding order by evaluating the candidates of the input /va$_3$d/.

constraints are subject to violation by candidates (a), (b), (c), and (e). For instance, candidate (a) and (c) violate the *V-VOICED UVULAR STOP. Consequently, these candidates are eliminated from being optimal. The constraint ,*V-VOICED UVULAR STOP, however, is satisfied by candidate (b) through the devoicing of [G] which is, in turn, violates the SSP constraint due to the second member of the final consonant cluster [f] being more sonorous than the member closest to the nucleus [q]. Therefore, sonority rises again in the coda position. Likewise, candidate (e) avoids the violation of the *V-VOICED UVULAR STOP constraint through the deletion of [G] which consequently results in the violation of the MAX-IO constraint. The same set of constraints is used to analyse the candidates of the input /taG.sir/ 'guilty' in the next tableau:

*** V-VOICED UVULAR STOP>> SYLLCON>>*V-AFFRICATE>>MAX-IO>>SSP>> *VOICED UVULAR STOP-V>>DEP-IO>>*COMPLEX$_{COD}$ >>SPIRANTIZATION>>*GEM**

/taG.sir/	***V-VOICED UVULAR STOP**	**SYLLCON**	***V-AFFRICATE**	**MAX-IO**	**SSP**	***VOICED UVULAR STOP-V**	***FORTITION**	***[VOICED FRICATIVE] [VOICED STOP]**	**DEP-IO**	***SPIRANTIZATION**	***GEM**
taG.sir	*!										
taG.Gir	*!										*
taq.sir		*!					*				
d. taχ.sir										*	
e. ta.sir				*!							

Candidate (d) is distinguished in tableau (14) as the optimal output because it avoids the violations of *V-VOICED UVULAR STOP, MAX-IO, and SYLLCON constraints, compared to the rest of the candidates. Candidates (a) and (b) violate the *V-VOICED UVULAR STOP constraint. Therefore, these candidates fail to be optimal. The violation of the same constraint is avoided by candidate (c) through the devoicing of [G]. However, the violation of the SYLLCON constraint prevents candidate (c) from being assigned as the optimal output since the sonority in this candidate consequently rises across the syllable boundary; the coda of non-final syllable [q] is less sonorous than the onset of the following syllable [s]. Candidate (e) fails to avoid the violation of the MAX-IO constraint. For this reason, it cannot be determined as optimal.

According to tableaux (16) and (17), Parallel OT can effortlessly account for feeding, as a transparent rule interaction, because feeding interaction yields surface-true generalization. Therefore, the intermediate derivational stage is unnecessary. This statement is supported by McCarthy (2007:103) and Rakhieh (2009:24) who agree on Parallel OT being able to deal with *feeding* and *bleeding* interactions

OT constraints:

a. DEP-IO (McCarthy & Prince 1995):
Every segment of S_2 has a correspondent in S_1 (S_2 is "dependent on" S_1).

b. *FORTITION
This constraint is against changing segments from a fricative to stop, an approximant to a fricative, or a voiced to a voiceless sound.

c. *GEM (Boudlal, 2001)
Geminates are not prohibited.

d. MAX-IO (McCarthy & Prince 1995):
Every segment of S_1 has a correspondent in S_2.

e. SONORITY SEQUENCING PRINCIPLE (SSP) (Roca 1994):
The sonority profile of the syllable must slope outwards from the peak.

f. *SPIRANTIZATION
Stops and affricates should not be changed to fricatives (fricativization).

g. Syllable Contact (SYLLCON) (Bat El, 1996:302)
The onset of a syllable must be less sonorous than the last segment in the immediately preceding syllable, and the greater the slope in sonority the better.

h. *V-AFFRICATE
Post-vocalic affricates are prohibited.

i. *[VOICED FRICATIVE] [VOICED STOP]
A fricative should not be followed by a voiced stop.

j. *VOICED UVULAR STOP-V
A voiced uvular stop is prohibited in the onset.

k. *V-VOICED UVULAR STOP
A voiced uvular stop is prohibited in the post-vocalic position.

The candidates of the input /saGf/ 'ceiling' are evaluated in the following tableau:

*** V-VOICED UVULAR STOP>>SYLLCON>>*V-AFFRICATE>>MAX-IO>>SSP>>*VOICED UVULAR STOP-V>>*FORTITION>>*[VOICED FRICATIVE] [VOICED STOP]>>DEP-IO>> *SPIRANTIZATION>>*GEM**

/SaGf/	*V-VOICED UVULAR STOP	SYLLCON	*V-AFFRICATE	MAX-IO	SSP	*VOICED UVULAR STOP-V	*FORTITION	*[VOICED FRICATIVE] [VOICED STOP]	DEP-IO	*SPIRANTIZATION	*GEM
saGf	*!										
saqf					*!		*				
saGG	*!										*
d. saχf										*	
e. saf				*!							

Tableau (16) identifies candidate (d) as the optimal output of the input /saGf/ since it satisfies highly-ranked constraints including *V-VOICED UVULAR STOP, MAX-IO, and SSP. these

$$\begin{pmatrix} +\text{voice} \\ +\text{delay release} \\ -\text{continuant} \\ +\text{consonant} \\ -\text{sonorant} \end{pmatrix} \rightarrow \begin{pmatrix} +\text{voice} \\ -\text{delay release} \\ +\text{continuant} \\ +\text{consonant} \\ -\text{sonorant} \end{pmatrix} \;/\; \text{Nucleus}\ \_\_\_\_\_\_$$

The second rule, spirantization, counterfeedss the first rule, voicing, in order to achieve the surface form. For instance, the output [vaʒd] of the input /vaʒd/ 'joy' is derived by the second rule, spirantization, which counterfeeds voicing, as the first rule. Consider the counterfeeding order:

Counterfeeding Order in Sabzevari

Underlying	a. /vaʒd/ 'joy'	b. /vodʒ.dan/ 'conscience'
Voicing rule:	-	-
Spirantization Rule:	vaʒd	voʒ.dan
Surface	[vaʒd]	[voʒ.dan]

Here, unlike the feeding order in (10), the second rule, spirantization, counterfeeding the first rule, voicing, applied too late to create environment for the second rule. Counterfeeding in (13) is considered to be one of the opaque rule interactions while feeding in (10) is a transparent rule interaction. According to Kiparsky (1973:79), phonological opacity originates from *counterfeeding* and *counterbleeding* interactions, as shown in (14):

Opacity definition (Kiparsky 1973:79)

A phonological Rule *P* of the form *A→B*/ *C*______*D* is opaque if there are surface structures with any of the following characteristics:

a. instances of *A* in the environment *C*________*D*,
b. instances of *B* derived by *P* that occurs in the environments other than *C*_____*D*.

Within the definition of opacity in (14), the statement (14.a) refers to counter feeding, also known as *over application opacity* while (14.b) is attributed to counter bleeding, termed as *under application opacity*. According to Baković (2011), counter feeding and counter bleeding are inverses of transparent rule interactions, feeding and bleeding, where counter bleeding would be bleeding if the two rules B and A were ordered in the opposite way while counter feeding would feeding if the two rules B and A were in the opposite order (Baković 2011). The next section is devoted to analyse Phonological derivations yielded by spirantization in Sabzevari using OT.

4. The Analysis of Spirantization and Derivations in Sabzevari Using OT.

Parallel OT can effortlessly deal with the case of feeding in (10) because the input can be mapped onto the output without adhering to intermediate steps between the input and output.(1) To demonstrate, the candidates of the input /saGf/ 'ceiling' undergo analysis of Parallel OT in the next tableau using the constraints below:

(1) Rakhieh (2009:24) states that transparent rule interactions including *feeding* and *bleeding* can be dealt with using Parallel OT since the input can be mapped onto the output with no reference to intermediate steps between them, compared to opaque processes such as *counter feeding* and *counter bleeding*.

The changing of the voiced uvular stop /G/ to a voiceless uvular fricative [χ] is a two-step process. The first rule creates the environment where the second rule is applied i.e. feeding order. The first rule is the devoicing of /G/ when it is adjacent to a voiceless consonant. This rule is shown in (8) below:

Devoicing Rule:

$$\begin{pmatrix} +\text{voice} \\ +\text{pharyngeal} \\ -\text{continuant} \\ +\text{consonant} \\ -\text{sonorant} \end{pmatrix} \rightarrow \begin{pmatrix} -\text{voice} \\ +\text{pharyngeal} \\ -\text{continuant} \\ +\text{consonant} \\ -\text{sonorant} \end{pmatrix} / \underline{\qquad\qquad} \begin{pmatrix} -\text{voice} \\ +\text{consonant} \end{pmatrix}$$

The second rule, spirantization, is applied to devoiced consonants that follow a nucleus (vowel) as shown below:

Spirantization Rule:

$$\begin{pmatrix} -\text{voice} \\ +\text{pharyngeal} \\ -\text{continuant} \\ +\text{consonant} \\ -\text{sonorant} \end{pmatrix} \rightarrow \begin{pmatrix} -\text{voice} \\ +\text{pharyngeal} \\ +\text{continuant} \\ +\text{consonant} \\ -\text{sonorant} \end{pmatrix} / \text{ Nucleus}\underline{\qquad\qquad}$$

The first rule, devoicing, feeds into the occurrence of the second rule, spirantization. This derivation is explained in (10):

Feeding Order in Sabzevari

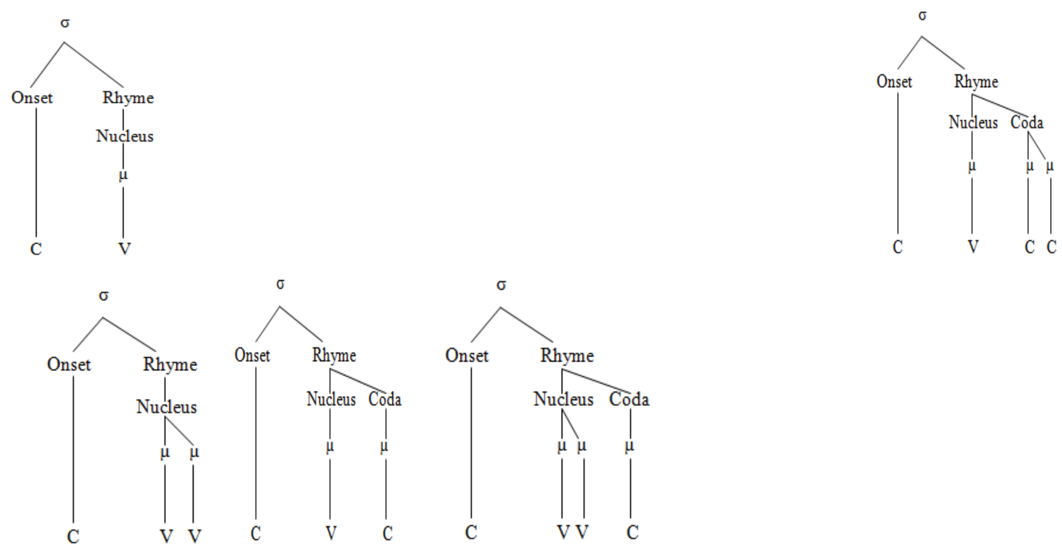
Underlying	/saGf/	'ceiling'
Devoicing Rule:	saqf	
Spirantization Rule	saχf	
Surface	[saχf]	

A voiced alveo-palatal affricate in Sabzevari is changed to a voiced alveo-palatal fricative through two processes, voicing and spirantization rules. This type of spirantization is also found in other languages including Tuscan Italian (Marotta (2008) and Yem (Gramoa 2012), as discussed in section 2. The voicing rule in Sabzevari is shown below:

$$\begin{pmatrix} -\text{voice} \\ +\text{delay release} \\ -\text{continuant} \\ +\text{consonant} \\ -\text{sonorant} \end{pmatrix} \rightarrow \begin{pmatrix} +\text{voice} \\ +\text{delay release} \\ -\text{continuant} \\ +\text{consonant} \\ -\text{sonorant} \end{pmatrix} / \underline{\qquad\qquad} \begin{pmatrix} +\text{voice} \\ +\text{consonant} \end{pmatrix}$$

The second rule, spirantization, targets a voiced alveo-palatal affricate that comes after a nucleus, as shown below:

a. CV b. CVV c. CVC d. CVVC e. CVCC

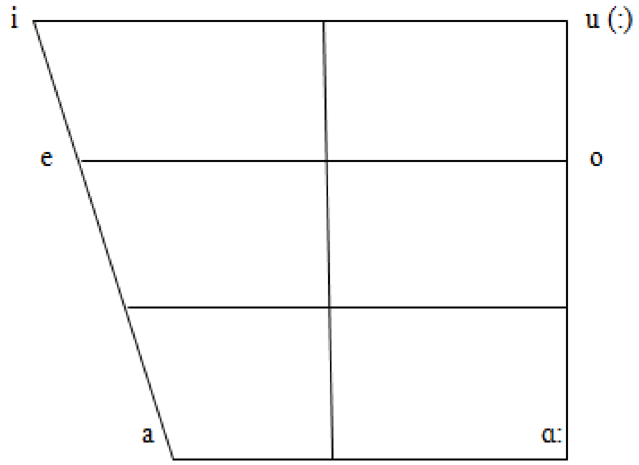


As shown in (6), onsets and nuclei are found in every syllable type in Sabzevari, unlike codas. A bi-consonant cluster is permitted in the coda position, while it is not tolerated in the onset position. With regard to the weight of syllables, moraicity (syllable weight unit) is counted from nuclei and codas but does not extend to onsets because they are weightless. For instance, there is one mora linked to a nucleus in the CV syllable. Therefore, this syllable is deemed light while the two moras found in the CVV and CVC syllable make them heavy syllables. The two moras in the CVC syllable are linked to a nucleus and a coda, while the long vowel in the CVV syllable fills two slots which are linked to two moras. The syllable types CVVC and CVCC are known as trimoriac syllables since they have three moras assigned to nuclei and codas. For instance, in the CVVC syllable, three moras are linked to a long vowel nucleus and a coda. The CVCC syllable has three moras linked to a single nucleus and a complex coda, i.e. a final consonant cluster. Now that Sabzevari syllable structure is clear, the next section addresses spirantization and phonological derivations in this dialect with reference to Parallel and Stratal OT.

3. Spirantization and Derivations in Sabzevari

As discussed in the literature review, spirantization is known as the process of fricativization of plosives mostly with reference to the works of Sheffer (1995), Temkin Martínez (2008), Gabbard (2010), Kaplan (2010),Garoma (2012), and Kambuziya and Mobaraki (2013). Kambuziya and Mobaraki (2013) conducted a study on Sabzevari dialect in which they state that fricativization in Sabzevari targets the voiced uvular stop /G/; this consonant is changed to a voiceless uvular fricative /χ/. Consider the following examples:

	Standard Persian	Sabzevari dialect	Meaning
a.	/naGʃe/	[naχʃe]	'map'
b.	/saGf/	[saχf]	'ceiling'
c.	/taGsir/	[taχsir]	'guilty'
d.	/naGʃ/	[naχʃ]	'figure'



Sabzevari has also seven diphthongs, /ay/,/ɑy/, /ey/, /oy/, /aw/, /uy/, and /ow/. These diphthongs are illustrated in the following examples:

(2)
a. /may/ 'wine'
b. /pey.van/ 'link'
c. /doy.yom/ 'second'
d. /kawʃ/ 'shoe'
e. /dem.pyi/ 'slipper'
f. /tow/ 'fever'
g. /mur.buy/ 'Morbouy (A desert plant with yellow flowers)

In conclusion, the total number of vowels in Sabzevari is 14; 5 short vowels and 2 long vowels plus 7 diphthongs. After demonstrating consonants and vowels in this dialect, the next section is devoted to syllable structure in Sabzevari.

3.3 Sabzevari Syllable Structure

Syllable structures in Sabzevari are divided into light, heavy, and superheavy. For instance, a light syllable is of the form CV while heavy syllables are of the forms CVC and CVV. Superheavy syllables are CVVC, CVCC, and CVVV. Accordingly, this dialect allows simple onsets as in Standard Persian (Elwell-Sutton 1976 and Hayes 1979). Simple and complex codas are optional in Savbzevari since there are some syllables that lack this constituent including CV, CVV, and CVVV. Nuclei either simple or complex are obligatory in Sabzevari syllable structures. Regarding the weight of syllables, the syllable CV is light because a nucleus is assigned with one mora (syllable weight unit). CVV is a heavy syllable since it has two moras linked to its nuclei. Likewise, two moras are linked to the nucleus and the coda of a CVC syllable. This shows that CVC and CVV are heavy because they are bimoraic, compared to CV as a monomoraic syllable. Superheavy syllables including CVVC, CVCC, and CVVV are trimoraic, i.e. having three moras. Consider the following representations:

sonorants. Obstruents are represented by stops, fricatives, and manners, whereas sonorants are nasals, till, lateral, and glide. Consider the following examples below:

Standard Persian	Sabzevari dialect	Meaning
/pune/	/pina/	'Pennyroyal'
/baha:r/	/boha:r/	'spring'
/tonba:n/	/tembo/	'pants'
/domal/	/dembal/	'abscess'
/keta:b/	/kota:b/	'book'
/goftam/	/koftom/	'I said'
/ʔa:taʃ/	/ʔalaʃ/	'fire'
/tʃarb/	/ tʃarob/	'fat'
/ dʒen/	/ dʒend/	'Jinn'
/vazn/	/vazen/	'weight'
/sevvom/	/sejjom/	'third'
/zohr/	/zoher/	'noon'
/henel/	/ ʃener/	'mantle'
/vadʒd/	/vaʒd/	'joy'
/χa:ne/	/χana/	'home'
/hame/	/hamma/	'all'
/magar/	/mege/	'unless'
/naqʃe/	/neχfa/	'map'
/donba:l/	/domba:l/	'trace'
/rande/	/randa/	'grate'
/jaʔni:/	/ja:ne/	'that is'
/raf.tam/	/be.raf.tum/	'I went'

After demonstrating the consonant inventory in this dialect, the next subsection presents the vowels found in Sabzevari.

3.2 Vowel Inventory in Sabzevari

The dialect has 5 short vowels, /i/, /e/, /a/, /o/, and /u/, and 2 long vowels, /u:/, and /ɑ:/ (Aldaghi & Tavakoli 2011). Consider the following examples:

a. /busi/ 'kissed
b. /bezɑ:t/ 'ill-natured'
c. / tʃu/ 'wood'
d. /ʒdo/ 'soul'
e. pahen/ 'wide'
f. /dombɑ:l/ 'trace'
g. /bu:m/ 'roof'

Long and short vowels in Sabzevari are shown in the vowel chart below:

(2013) agree that a voiced uvular stop /G/ that is adjacent to a voiceless stop is transmitted to a voiceless uvular fricative [χ] through two phonological rules, i.e. assimilation plus lenition. The tendency of assimilation is to change a voiced uvular stop /G/ to a voiced uvular stop [q]. Lenition which targets a voiceless uvular stop /q/ results in a voiceless uvular fricative [χ]. These processes are known as feeding order. With respect to Kambuziya and Mobaraki (2013), fricativization in Sabzevari can also be shown in the change from affricates to fricatives, e.g., /va d_3/→ [va$_3$d] 'Joy'. Marotta (2008) states that palatal affricates / d_3 / and /t*f*/ spirantize in the postvocalic position (intervocalic in traditional terminology) with reference to Tuscan Italian, e.g., /a,mi$d_3$fi/→[a□mi:fi] 'friends', /a d_3 t*f* nte/→[a□3έεεnte] 'agent'. Likewise, Gramoa (2012) notes that spirantization is applied to affricates that come before fricatives, e.g. /?ačeč-sa/→ [?ačessa] 'fourth'. Here, the consonant /č/ that is adjacent to a fricative /s/ undergoes a regressive assimilation. Therefore, the /č/ consonant spirantizes as [s] in the surface form. Up to now, researchers have not accounted for this phenomenon using Parallel or Stratal OT in order to analyse the stages or levels between the underlying form /G/ and the surface form [χ]. Therefore, this paper aims to shed light on these phonological processes.

2. Sabzevari Dialect

Sabzevari dialect is one of the varieties of Persian spoken in Sabzevar which is located in Northeast Iran, in Khorasan Razavi province. Sabzevar is bounded by the Joghatay Mountains on the north and Koomish on the south. Sabzevari dialect is spoken by most people in Sabzevar and neighboring villages, whereas varieties of Turkish and Kurmanjj are prevalent in more northern Villages (Aldaghi & Tavakoli 2011).

3.1 Consonant Inventory in Sabzevari

The 23 consonants of Sabzevari are gathered in the table below:

(1) Manner and place of articulation of consonants in Sabzevari

	bilabial	**labio-dental**	**dental**	**alveolar**	**post-alveolar**	**palatal**	**velar**	**uvular**	**pharyngeal**	**glottal**
Stops	p b		t d				k g	q		?
Fricative		f v		s z	ʃ 3			χ	ħ ?	h
Affricate					tʃ d_3					
Nasal	m			n						
Trill				r						
Lateral				l						
Glide						j				

In table (1), consonants in Sabzevari are organized according to their places and manners of articulation. The places of articulation are set horizontally while the manners of articulation are set vertically, depending on the degree of sonority and the degree of obstruction formed by articulators. For instance, with regard to manners of articulation, stops are the first group due to the degree of sonority as well as the obstruction; these consonants are the least sonorous and they form full blockage by articulators. A glide, on the other hand, is as a semivowel, is the most sonorous and neither forms full obstruction nor partial obstruction by articulators. In other words, articulators approach each other but they form no obstruction. Accordingly, with reference to the manners of articulation, it is possible to divide consonants into two groups: obstruents and

Introduction

Lenition (weakening), according to Trask (2000) and Lewis (2001), is any phonological change in which a strong segment becomes less consonant-like. This phonological change has various processes including voicing, devoicing, flapping, gliding, degemination, deaspiration, loss (deletion), and so on (Grenon 2005). Cross-linguistically, one of the widespread lenition processes which will be discussed in this study is known as ***spirantization***, i.e. fricativization. Spirantization has aroused the attention of scholars who focus on segmental phonology. Some of them argue that spirantization is a process which conducts the change of plosives to fricatives with no change to the place of articulation while others believe that this process is relevant to the change from plosives to glides regardless of place of articulation. Some studies suggest that spirantization is merely the change of affricates to fricatives which belong to the same place of articulation. These statements are discussed in detail in the next section.

This paper aims to investigate spirantization and phonological derivations in Sabzevari dialect using both Parallel and Stratal OT in order to decide which version of OT is capable of accounting for phonological derivations in this dialect. Furthermore, the second aim of this paper is to illuminate whether spirantization is restricted to the transmission from plosives to fricatives or whether it extends to approximants with reference to Sebzevari dialect. To achieve these aims, it is important to address the following questions: **"**To what extent is spirantization applied in Sabzevari dialect?**"** and **"**How can we account for phonological derivations resulting from spirantization using OT?**"**

In the next section, I will introduce some previous studies that have addressed spirantization cross-linguistically. Following that is a section providing background knowledge about the phonology of Sabzevari. The fourth section involves the analysis of spirantization and phonological derivations in light of Parallel and Stratal OT in order to determine which model is able to account for phonological derivations resulting from this process, i.e. transparent vs. opaque rule interactions. The final section, the conclusion, gives a summary of this paper and its findings.

1. Literature Review

The spirantization of obstruents has been considered by scholars including Sheffer (1995), Yu (1995), Kul (2007) Martínez-Celdrán (2008), Temkin Martínez (2008), Gabbard (2010), Kaplan (2010), Garoma (2012), and Kambuziya and Mobaraki (2013). Yu (1999) states that spirantization is merely transforming a stop consonant to a weak fricative or an approximant, e.g., /d/→ [ð] or /d/→ /l/. This suggests that spirantization is not restricted to the lenition of a stop to a weak fricative, rather it can involve changing plosives to approximants such as [l] or [w]. According to Kul (2007), spirantization functionally reduces a stop to a fricative or an approximant, e.g. *tee* /t̲i:/→ [f̲i:]. Despite the fact that the term *spirant* is a synonym of *fricative*, Martínez-Celdrán (2008) claims that the use of the term *spirant* for fricative is obsolete: The true meaning of *spirantization* is a process of weakening where a plosive merely turns into a spirant approximant rather than a fricative. According to Martínez-Celdrán (2008), there would be no weakening if a plosive turned into a fricative. His point of view is based on the idea that the traditional confusion between approximants and fricatives originates from the claim that spirantization is a change from a plosive to a fricative, while he believes that spirantization is a change from a plosive to an approximant.

Conversely, spirantization is cross-linguistically restricted to the transforming of plosives into fricatives, according to Sheffer (1995), Temkin Martínez (2008), Gabbard (2010), Kaplan (2010), Garoma (2012), and Kambuziya and Mobaraki (2013). Sheffer (1995) demonstrates some issues of spirantization in Hebrew and observes that this process is limited to stop consonants and their environments. For instance, the transformation of stop consonants to fricatives occurs when these consonants are in the prevocalic and postvocalic positions. Temkin Martínez (2008) presents spirantization in Modern Hebrew and notes that prevocalic and postvocalic stops undergo spirantization in this variety of Hebrew, e.g. /pizer/→ [**f̲**izer] 'scattered', /katab/→ [kata**v̲**] 'wrote'.

However, this process is not restricted to prevocalic and postvocalic position, but also targets voiced plosives in the intervocalic position. This statement is supported by Gabbard's (2010) work on the phonology of Somali, which states that plosives /b/,/d/,g/, and /q/ spirantize as fricatives [β],[ð],[y], and [8], e.g. /la:b/→ [la:βo] 'chest'. Gabbard's (2010) analysis of spirantization in Somali is supported by Kaplan (2010) whose study on intervocalic lenition notes that intervocalic stops undergo spirantization. In other words, intervocalic stops are transmitted to fricatives which have the same place of articulation, e.g., /VPV/→ [VfV], /VbV/→ [VβV]. Likewise, Graoma (2012) who has worked on the phonology of Yem states that spirantization is applied to non-fricative sounds in the intervocalic position to change them to fricatives, e.g. /karaba/→ [karaβa] 'blackness'.

On the other hand, Kambuziya and Mobaraki

الاحتكاكية في الأصوات الساكنة والاشتقاقات الفونولوجية في اللهجة السبزوارية الفارسية: الطبقية أو التوازي في النظرية التفاضلية

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الكلمات المفتاحية: اللهجة السبزوارية، الاحتكاكية، التوازي والطبقية في النظرية التفاضلية، معاكسة الاتصال.

ملخص البحث: تناقش هذه الدراسة العلاقة بين الاحتكاكية في الأصوات والاشتقاقات الفونولوجية في اللهجة السبزوارية والتي يُتحدث بها في إقليم سبزوار الواقع في شمال شرق إيران. هذه العلاقة تُحلَّل باستخدام نموذجين من نماذج النظرية التفاضلية؛ لمعرفة أيٍّ من هذين النموذجين قادر على تفسير الاشتقاقات الفونولوجية الناتجة عن الاحتكاكية في الأصوات في اللهجة السبزوارية الفارسية. لذلك كان الهدف من هذه الدراسة هو توضيح النموذج الأمثل من نماذج النظرية التفاضلية القادر على تحليل الاشتقاقات الفونولوجية، إمَّا التوازي أو الطبقية. وجُمِعت المعلومات لهذه الدراسة من مصادر عدة منها: بعض الكتب والمقالات والرسائل العلمية. وتتلخص هذه الدراسة في أنَّ الاحتكاكية في الأصوات في اللهجة السبزوارية تطبق على الصوت الساكن الحلقي الجهوري الذي /G/ المجاور للأصوات الساكنة المهموسة. بمعنى الاحتكاكية للصوت الساكن الحلقي الجهوري /G/ يحصل عن طريق القوانين الفونولوجية المتابعة كالتجريد من الجهورية والاحتكاكية. إذ يهيء قانون التجريد من الجهورية البيئة؛ لتطبيق قانون الاحتكاكية وهذا ما يُسمَّى بالاشتقاق الافتراضي. وهناك جانب آخر من الاحتكاكية والذي يضم تحويل الصوت الجهوري المركب /ʒ/ إلى الصوت الجهوري الاحتكاكي [d_3] من خلال قانون التجهير وقانون الاحتكاكية، إذ إنَّ القانون الثاني الاحتكاكية، يعمل على منع تطبيق القانون الأول، التجهير، وهذا ما يُسمَّى بمعاكسة الاتصال. ويعدُّ التوازي في النظرية التفاضلية ذا قدرة على تحليل الاشتقاق الافتراضي المتمثل بتحويل الصوت الساكن الجهوري إلى الصوت الحلقي المهموس [x]، ولكن ليس بقدرة التوازي في النظرية التفاضلية.

حل مشكلة الغموض (الكمدة)، والتي تتمثل في تحويل الصوت الجهوري؛ المركب / d_3 / إلى الصوت الجهوري الاحتكاكي [ʒ] لهذا السبب تعدُّ الطبقية في النظرية التفاضلية الحل الوحيد لتحليل هذا الغموض في اللهجة السبزوارية.

Journal of Arts, Vol. 30, January (1), pp1-18 , king Saudi University, Riyadh (2018 /1439H.)

Spirantization and Phonological Derivations in Sabzevari Persian: Parallelism or Stratalism in Optimality Theory

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(Received 11/12/1437H; Accepted for publication 1/6/1438H)

Keywords: Sabzevari dialect; Spirantization; Parallel and Stratal OT; feeding; counterfeeding.

Abstract: This study discusses the relationship between spirantization and phonological derivations in Sabzevari dialect, which is spoken in the Sabzevar area of Northeast Iran. This relationship is accounted for using Parallelism and Stratalism in Optimality Theory (OT) in order to determine which OT model can best address the phonological derivations found in spirantization in that dialect. Therefore, the purpose of this research is to illuminate whether Parallel OT is capable of the analysis of phonological derivations or alternatively whether Stratal OT can be used. The data of this study were taken from extant literature including books, theses, and articles. The data were undergone analysis using Optimality Theory, as a framework. Also, I referred to some videos on YouTube peculiar to this dialect and its speakers in order to verify the data that have been already gained from extant literature. This paper concludes that spirantization in Sabzevari dialect targets voiced uvular stop /G/ adjacent to voiceless obstruents; the spirantization of /G/ is accomplished by two phonological rules, devoicing and spirantization where the first rule, devoicing, is feeding the second rule, spirantization, i.e. feeding order. Another aspect of spirantization in this dialect includes the change of a voiced alveopalatal affricate /dʒ/ to a voiced alveopalatal fricative [ʒ] through two phonological rules, voicing and spirantization, where the second rule, spirantization, counterfeeds the first rule, voicing, i.e. counterfeeding order. While Parallel OT can effortlessly account for the feeding order shown in the spirantization of a voiced uvular stop /G/, this model fails to account for the counter feeding order shown in the spirantization of a voiced alveopalatal affricate / dʒ/, since counter feeding order requires reference to intermediate steps between the input and output. Therefore, Stratal OT is demonstrated as an ad hoc solution to the opacity problem in Sabzevari, i.e. counter feeding.