On empty vowels in Turkish

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1. Introduction

This paper investigates the distribution of the Turkish *schwa* and claims that its restricted surface occurrence constitutes the key to the nature of vowel harmony in this language.

The Turkish vowel inventory consists of the vowels: i, ü, ı, u, e, ö, a, o; all freely combining in roots and derived words. In other words, Turkish roots are not necessarily limited to either front or back vowels, but rather allow for the combination of the two. However, there is one striking exception; the high unrounded back vowel [ı] (schwa) does not seem to participate in this general pattern, in that it only combines with [a] and itself. The Turkish vocabulary has no roots combining [ı] with any other vowel.[1] We may find roots containing sequences such as [a-ı] and [ı-ı], but we will never find *[i-ı], *[e-ı], *[ü-ı], etc.

In this paper, I will offer an explanation for the deviant distribution of [ı] and show how the result of this discussion contributes to the understanding of Turkish vowel harmony in general. I want to demonstrate that harmony is not an independent phenomenon but rather the surface result of a specific *repair strategy* in order to improve unspecified vowels. My principal claim is that many assimilation and harmony processes should be regarded as the byproduct of filling up insufficiently specified and/or unspecified segments.

Across languages we find that specified consonants and vowels are able to spread their feature content to neighboring elements, while elements lacking any specifications cannot do so. Conversely, empty nodes are highly open to specification, inflicting all kinds of repair strategies like assimilation, spreading, and so on (cf. Humbert's (1995)[2]). For example, in Winnebago the epenthetic vowel triggers the complete leftward spreading of the vowel to its right: *hosh.wazha* ==> *hosh**a**wazha* 'you are ill', *wak.ríp.rás* ==> *wak**i**ríp**a**rás* 'flat bug', etc.(Halle and Vergnaud (1987), Steriade (1990), Alderete (1995a), van Oostendorp GLOW (1998)). Another example is Dorsal

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[1] I assume that this holds for the entire language, save for some loanwords and a few unsystematic exceptions.

[2] Humbert distinguishes between *spreading* and *snatching*. The more familiar term spreading applies to operations initiated by the spreading element, where it does not matter whether the target already has specifications. The term snatching, on the other hand, is used to express repair operations, as is the case when a segment lacks obligatory place specifications. In this case, typically the defective target element is the initiator of the operation, rather than the `spreading' features.

and Labial Assimilation in Barrow Inupiaq, which only affects the unspecified variant of [i], leaving its specified counterpart unaffected.

The organization of this paper is as follows: first I will argue why Turkish harmony cannot be accounted for in terms of *blocking in non-derived environments*. Thereafter, in section 3, I briefly address Barrow Inupiaq Assimilation and show how it follows from the need to fill up empty vowels. In section 4, I will discuss the central claim of this paper, stating that the dislike for schwa vowels is the principal trigger underlying harmonic behavior. In section 5, I will turn the discussion to Turkish harmony and offer an OT-outline along the lines of the *filling up emptiness* hypothesis. Typically, the triggers of harmony do not undergo harmony themselves, while, conversely, the non-triggers do undergo harmony. I will show how this approach not only accounts for harmony itself, but also for the many so-called exceptions to harmony in a fully harmonic system such as Turkish. Section 6 summarizes the conclusions.

2. The derived environment analysis

The occurrence of a great number of disharmonic roots led Clements & Sezer (1982) to the conclusion that harmony is no longer active in Turkish roots. Indeed, even those who assume that harmony is fully productive have to deal with countless disharmonic roots. The following list, containing Turkish examples, represents some of the ‘exceptions’ to the general statements on vowel harmony; it contains roots in which front and back vowels co-occur.

(1) *Turkish disharmonic roots*

a/i	hangi	‘which’	lisans	‘university degree’
a/e	kalem	‘pen’	hesap	‘bank account’
o/i	kalori	‘calorie’	fiskos	‘gossip’
o/e	konser	‘concert’	petrol	‘petrol’
u/i	billur	‘crystal’	muzip	‘mischievous’
u/e	suret	‘copy’	memur	‘official

These examples put forward an explanation in terms of blocking harmony in non-derived environments (cf. Bennink (1992), Polgárdi (1998)), since such an approach would formally account for Clements and Sezer’s claim that harmony does no longer apply in roots, but only across morpheme boundaries, that is, to *derived environments*.

However, in a number of cases harmony does not apply across morpheme boundaries either. This is demonstrated by the examples below (obtained from Kirchner (1993)):

(2). /-*Iyor*/ /-*Edur*/[3]

gel-iyor-um	'I am coming'	gid-edur-sun	'let him keep going'
ko_-uyor-um	'I am running'	ko_-adur-sun	'let him keep running'
gül-üyor-um	'I am laughing'	gül-edur-sun	'let him keep laughing'
bak-ıyor-um	'I am looking	bak-adur-sun	'let him keep looking'
/istan/		*/vari/*	
mol-istan-ı	'Mongolia'	asker-vari	'soldier-like'
arab-istan-ı	'Arabia'		
ermen-istan-ı	'Armenia'		

Only the first vowel in -*Iyor* and -*Edur* harmonizes, but the second vowel remains immune to harmony, as the whole of -*istan* and -*vari*. Notice that the suffixes following the invariant suffixes harmonize with the rightmost vowel of the suffix.

Although, the existence of many disharmonic roots hints at an account in terms of blocking in non-derived environment, such an approach would not explain the disharmonic suffixes. However, there is a more profound reason to reject a *non-derived environment* analysis.

Recall that roots only contain vowel combinations taken from the set [i, e, a, o, u] and to a lesser extent [ö] and [ü], but none of them combines with the high unrounded back vowel [ı]. The latter only combines with [a] and itself. Consider the vowel matrix below, representing the possible vowel combinations in bisyllabic Turkish words ('_' and '_' stand for possible and impossible combinations, respectively).

(3) *Possible vowel combinations in bisyllabic roots*

	i	ü	ı	u	e	Ö	a	o
i	_	_	_	_	_	_	_	_
ü	_	_	_	_	_	_	_	_
ı	_	_	_	_	_	_	_	_
u	_	_	_	_	_	_	_	_
e	_	_	_	_	_	_	_	_
ö	_	_	_	_	_	_	_	_
a	_	_	_	_	_	_	_	_
o	_	_	_	_	_	_	_	_

[3] [illegible]

This matrix clearly shows that combinations involving [ı], are only possible if the preceding or following vowel is either [ı] itself or [a].

I claim that the entire absence of [ı] in disharmonic roots can be explained, if it is assumed that [ı], without exception harmonizes with the preceding vowel, regardless of whether it is located in a root or in a suffix. Notice however, that such an analysis is incompatible with the notion of *derived environment*. An analysis in the derived environment framework would indeed predict harmony across morpheme boundaries, but crucially block [ı]-harmonization in non-derived roots. The latter, that is the blocking effect, is exactly what we do not want to happen.

Let us assume that in principle there are no restrictions on inputs. This means that any form can be input to the grammar, not only roots containing specified vowels from the set [i, e, a, o, u, ö, ü], but also unspecified or partially specified elements such as [I] and [ı]. Consider the (partly hypothetical) inputs below:

(4)	*Disharmonic*		*Harmonic*		*Epenthetic.*[4]	
	hamsi	\`anchovies'	ısır	\`bite'	(*hükIm) hüküm	\`judgement'
	kudret	\`power'	ayır	\`sets aside'	(*metIn) metin	\`text'
	(*unıt)		unur	\`forget'	(*sabIr) sabır	\`patience'
	(*otır)		otur	\`sit'		
	(*süpır)		süpür ‘sweeps’			

The point is that all these combinations are allowed to surface, except for the sequences combining a vowel from the set [i, e, a, o, u, ö, ü] and [ı] (cf. **unıt, *otır, *hükIm*).

In a rule based model of phonology we can account for the nonoccurrence of **unıt, *otır, *hükIm*, etc. by means of a rule spreading the place features of the first vowel to the second. However, such a spreading rule can only apply if it is not *blocked* by a derived environment condition.

Let us close this discussion with the following conclusions. While harmony is almost entirely regular across roots and suffixes, disharmony within roots is quite extensive. This would suggest an analysis of harmony in terms of a derived environment rule, be it that such a solution completely passes over the observation that the unrounded back vowel [ı] behaves exhaustively harmoniously, both in roots and suffixes. This state of affairs confronts us with the following paradox; in order to account for disharmony we need to block harmony in non-derived roots, on the other hand, the exhaustively harmonious behavior of [ı] rather argues against such a blocking device.

In the next section, the discussion turns to Barrow Inupiaq. I will argue that the assimilation processes in this language can be straightforwardly accounted for, if we

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[4] Notice that vowel insertion (epenthetic /I/) and subsequent harmonization of the inserted vowel does not need to be problematic for a derived environment condition, since insertion may create a derived

assume a strong ban against unspecified vocalic elements at surface representations.

3. Barrow Inupiaq

Barrow Inupiaq,[5] earlier discussed by Archangeli and Pulleyblank (1994), has three types of interactions between vowels and consonants, i.e. Dorsal Assimilation, Labial Assimilation and Coronal palatalization. The two assimilation rules spread respectively dorsal and labial features from certain consonants to a preceding vowel, while palatalization works rather the other way round, in that it spreads the feature coronal from a vowel to a following consonant. On the surface Barrow Inupiaq has three distinct vowels [i, u, a], each one involved in the processes just mentioned.

First, we will take a look at Dorsal and Labial Assimilation. In (4), the velar consonant [k], the uvular consonant [q] and the low vowel [a] trigger Dorsal assimilation: however the rule only affects the stem vowel [i] in (1a), causing it to alternate with [a]. The assimilation rule seems to have no effect on the stems in (4b). Compare the following examples:

(5)		*Dorsal Assimilation*				
		stem	*-k* 'dual'	*-q* 'nominalizer'	-a '3s possessive'	
	a.	kamik	kamma+k	kamma+q	kama+a	'boot'
		ini	inna+k	inna+q	ina+a	'place'
		qupi	quppa+k	quppa+q	qupa+a	'to cleave'
	b.	nigi	niggi+k	niggi+q	nig+a	'eat'
		isiq	issi+k	issi+q	isi+a	'be smoky'

Labial Assimilation demonstrates exactly the same asymmetric behavior between both instances of [i]. The rule only turns the [i] in stems such as *kamik* (6b) into [u] when it is followed by the relativizer *–m*. It seems to have no effect on the final root vowels in (6a).

(6)		*Labial Assimilation*		
		stem	*-m* 'relativizer'	
	a.	qayaq	qayya+m	'kayak'
		ulu	ulu+m	'woman's knife'
		amiq	ammi+m	'skin'
	b.	kamik	kammu+m	'boot'
		aiviq	aivgu+m	'walrus'
		tupiq	tupqu+m	'tent'

environment. However, there is no reason to assume that all occurrences of [ı] in the input are epenthetic.

The twofold phonological behavior of [i] becomes even more apparent if we take a look at Coronal Palatalization, a process palatalizing the coronals [t, n, l] if they follow a particular subset of morphemes containing the vowel [i]. This process contains the following rules:

(7) *Coronal Palatalization*

t => s
n => ñ
l λ

Looking at the examples in (8a) below, we see that the suffix consonants following the vowels [a, u, i] do not palatalize, while in (8b) the same consonants have been subjected to palatalization.

(8) *Coronal Palatalization*

	stem	*-tuq* '3s int'	*-lla* 'be able'	*-niaq* 'future'	
a.	iga	iga+tuq	iga+lla	iga+niaq	'cook'
	sisu	sisu+tuq	sisu+lla	sisu+niaq	'slide'
	kamik	kamik+tuq	kamik+lla	kamik+niaq	'boot'
	ini	ini+tuq	ini+lla	ini+niaq	'place'
b.	nigi	nigi+suq	nigi+λλa	nigi+ñiaq	'eat'
	isiq	isiq+suq	isiq+λλa	isig+ñiaq	'smoky'

The correlation between the behavior of [i] in the assimilation examples (5 and 6) and the stems that trigger Coronal palatalization is that the palatalizing [i]'s do not undergo Dorsal an Labial Assimilation, while conversely stems undergoing Dorsal Assimilation do not trigger Coronal Palatalization. For example, the final [i] of *kamik* undergoes Dorsal Assimilation: kammak, but does not trigger Coronal Palatalization*: kamikniaq (*kamikñiaq*).

The systematic dual behavior of surface [i] led Archangeli and Pulleyblank (1992) to the conclusion that in Barrow Inupiaq four vowels should be distinguished underlyingly, despite the surface appearance of only [a, u, i]. Assuming that Barrow Inupiaq has the features [coronal], [labial] and [low] and that features are not allowed to combine, the following four underlying combinations are possible:

(9) U*nderlying representations of Barrow Inupiaq vowels* [6]

	i_1	u	a	i_2
[coronal]	·			
[labial]		·		
[low]			·	

[6] [illegible]

Starting from these underlying representations, we are able to give a straightforward explanation for the twofold behavior of on the one hand {$i_{1,}$ u, a} and on the other hand {i_2. In the case of Coronal Palatalization, [coronal] spreads from /i_1/ to the proper consonants [t, n, l]. The rule can only be triggered by /i_1/ since only this vowel is specified for [coronal]: /a/ and /u/ are not front, while /i_2/ has no specifications at all. Second, in the case of Dorsal and Labial Assimilation the features [low] and [labial], respectively, spread from certain consonants and the vowel /a/. Only /i_2/ can be subjected to assimilation, since the other vowels are already specified.[7] Remember that if a potential vowel target already contains [coronal], [labial] or [low], it remains unaffected by assimilation since features cannot combine in Barrow Inupiaq.

In a constraint based framework such as Optimality Theory (Prince and Smolensky (1993)) we can account for the different behavior of Barrow Inupiaq vowels by saying that it does not allow for *schwa* vowels, to the effect that it bans unspecified vowels in surface representations. This can be formally expressed by the following constraint (cf. van Oostendorp (1995)):

(10) PROJECT (N^0, *V*): N^0 is a head dominating a vocalic node. It demands that the vocalic node is specified.

If adequately ranged, this constraint prevents unspecified vowels from appearing in surface structures. However, it will not do this at any expense. I assume that in Barrow Unipiaq the projection constraint is preferably satisfied by spreading available structure, rather than by insertion. In order to do this, I will adopt a theory, pursued in Beckman (1995) for Shona [high]-harmony. She assumes that phonological processes can be motivated as a means of minimizing structural markedness. Reducing the amount of feature structure can be seen as a way of avoiding violations of featural markedness constraints such as *[labial], *[dorsal], etc. This type of constraints has the effect that the presence and/or insertion of features constitute a violation against itself. Hence, inserting features incurs extra violations, while spreading does not.

In Barrow Inupiaq features are not allowed to combine; this can be expressed by a set of constraints against the co-occurrence of features, such as *[low, labial], *[low, coronal], *[coronal, labial], etc. With the help of these constraints the 4 vowels of Barrow Inupiaq can be selected from the 8 combinatorial possibilities.[8]

Furthermore, assimilation should be in accordance with the theory of faithfulness proposed in McCarthy and Prince (1995). Faithfulness of input to output is embodied in a set of constraints on correspondent elements, which in the case of the present study

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[7]Where /i_2/ is not subjected to any of the two assimilation rules, it surfaces as [i]. This last result can be obtained by default insertion of [coronal].

[8] Given the free combination of the features [coronal], [labial] and [low] we get 2^3 (=8) logical

involves correspondent *place nodes*. The proposed constraints employ the basic faithfulness constraints of McCarthy and Prince, but their application is refined to a certain node in the feature hierarchy, viz. the Place Node. Hence, the constraints given below make special reference to this node.[9]

(11) PLACE NODE-MAX (PLACE-MAX)
Every place node in the input has a correspondent place node in the output.

(12) PLACE NODE-DEPENDENCE (PLACE-DEP)
Every place node in the output has a corresponding place node in the input.

(13) PLACE NODE-IDENTITY[F] (PLACE-IDENT[F])
Correspondent place nodes must be identical for [F]

The effect of PLACE-MAX and PLACE-IDENT[F] is that corresponding place nodes are identically specified. However, a place node introduced in the mapping from the input to the output has no input correspondent, so the insertion of such a node will constitute a violation of low ranked PLACE–DEP, but not of PLACE-MAX.

I will now return to Barrow Inupiaq and demonstrate how these constraints interact in order to account for the assimilation processes in this language. The features [low] and [labial] are involved in Dorsal and Labial Assimilation, respectively. If these features are already present at the input, they will spread in order to satisfy PROJECT(N^0, *V*), thus minimizing violation of *[low] and *[labial]. I assume that in case spreading of the nearby structure is not possible, the projection constraint will be satisfied by insertion of [coronal]. I assume that [coronal] is the smallest violation against insertion.

The table below considers Labial Assimilation; the final root vowel contains no specifications, while the relativizer suffix /-m/ introduces the feature [labial].

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[9] The modification to these constraints targets the specific segmental domain, i.e. the Place node, to which they should apply (see also Alderete (1995b), who proposes refinements of the basic faithfulness constraints by making them sensible to metrically prominent positions).

[lab]
|
(14) input: kammI+m ‘boot’

Candidates	*[lab]	PROJECT(N^0, *V*)	PL-DEP
a. [lab] | kamm I + m	*	*!	
b. [lab] [lab] | | kamm i + m	* *!		*
c. [lab] ☛ / | kamm u + m	*		*

PLACE-MAX and PLACE-IDENT[F] are irrelevant since the final root vowel of the input is not specified for place. Therefore, none of the three candidates violates faithfulness to the input, but the candidate in (14a) is ruled out by PROJECT(N^0, *V*) because it has more violations of this constraint than its competitor in (14c). The candidate in (14b) obeys the projection constraint but is already ruled out by the higher ranked markedness constraint *[lab].

The input of the next form has a specified final root vowel. In other words, the example belongs to the type of roots not subjected to Labial Assimilation (represented by (6a) above).

[cor] [lab]
| |
(15) input: ammi + m ‘skin’

Candidates	PL-IDENT[F]	*[lab]	PROJECT(N^0, *V*)	PL-DEP
a. [cor] [lab] ☛ | | ammi + m		* *		
b. [cor] [lab] | / | ammi + m	*	* *		
c. [lab] / | ammi + m	*	*		

The first candidate is fully faithful to the input, while its competitors in (15b) and (15c) violate PLACE-IDENT[F]. Hence, the optimal form is (15a), in which labial assimilation is blocked by place identity.

To summarize: the idea underlying these assimilation processes is that Barrow Inupiaq does not allow for unspecified vowel nodes to surface, expressed by PROJECT(N^0, *V*). To satisfy this constraint neighboring features spread to defective nodes, rather than inserting new material. According to this view assimilation is just a possible repair strategy preventing avoiding empty vowels from surfacing.

4. The Non-Emptiness Hypothesis

The analysis of Barrow Inupiaq paves the way for the following hypothesis; assimilation (and also harmony as I will argue later on) should be regarded as a remedy that leads to the satisfaction of PROJECT(N^0, *V*). In the remainder of this paper I will refer to this claim as the Non-Emptiness Hypothesis (NEH).

The NEH predicts a close relation between the disallowance for schwa on the one hand, and harmonic behavior on the other hand. This correlation can easily be attested in harmony languages such as Hungarian and Finnish. These languages show a strong dislike for placeless vowels. Also the reverse is true; non-harmonic languages like Dutch, German and English allow for schwa. The ideal situation would be that in harmony systems, empty place nodes were entirely excluded.

Unfortunately, however, the relation between `no schwa' and harmony, on the one hand and schwa and no harmony on the other hand is not as straightforward as we would like it to be. For instance, Turkish allows unspecified place nodes to surface in case spreading from surrounding place nodes is not possible (cf. *kızın* `girl', *paranın* `money' etc.). Therefore, despite the powerful ban against empty vowels, such vowels cannot always be abandoned, even in systems that are harmonious throughout. On the other hand, a language like Spanish does not allow for schwa, but it is not a harmony language either. The chart in (16) clearly illustrates the loose Schwa/Harmony correlation:

(16)

	HARMONY	SCHWA
Dutch	NO	YES
Turkish	YES	YES
Spanish	NO	NO
Hungarian	YES	NO

For Dutch and Hungarian there seems a clear relation between the allowance for schwa and the absence (or presence) of harmonic behavior. However, with respect to Turkish the chart in (16) rather suggests that *harmony* and *schwa* are completely independent phenomena. Yet, I will adhere to the NEH and argue that there is an integral link between emptiness and harmony. The problem is that a rigid YES/NO model such as the representation in (16), is unable to express gradations within the Schwa/Harmony correlation. Such a parameter design can only bluntly express the presence versus absence of certain relations. This is the reason, why I will propose to embed the NEH in a constraint-based model of phonology like *Optimality Theory (OT)* (Prince and Smolensky (1993a), McCarthy and Prince (1995)). In such a framework, claims, or rather constraints, are not absolute. As for this, it is less rigid, than a parameter-like framework. In OT, constraints can be violated in order to obey higher ranked constraints. For example, PROJECT(N^0, *V*), the OT implement of the ban on schwa can be violated if this satisfies a higher ranked constraint such as, *[coronal], *[labial], etc. The relativity of universal constraints is one of the major advantages of OT.

5. Turkish Vowel Harmony

The view on harmony presented in this paper is based on the NEH formally expressed by the by now well-known constraint PROJECT (N^0, *V*). This constraint in tandem with the featural markedness constraints such as *[coronal], *[labial], *[high], enforces spreading of features to adjacent unspecified nodes.

The Turkish harmony system can now be accounted for, if we start from the following underlying representation of vowels:

(17) *Underlying representation Turkish vowels*

	i	ü	I	u	e	ö	E	o	a
[high]	_	_	_	_	_	_	_	_	
[low]					_	_	_	_	_
[coronal]	_	_			_	_			
[labial]		_		_		_		_	

Given that /I/ is the empty vowel predicts that this vowel *par excellence* triggers spreading of surrounding features, thus providing for the harmonic effect. The other candidate vowel with expected harmonic behavior is /E/, since it also lacks the place specifications [coronal] and [labial].[10]

Furthermore, mid vowels are specified [high, low], rather than being unspecified for these features[11]. I assume that freedom of the base allows for any type of input structure and it rather falls to the language specific ranking of constraints to allow for or disallow certain feature combinations. There is no such thing as 'universal ranking'

[10] Also /a/ would be a possible candidate, triggering harmonic behavior, but since this is not the case in Turkish I will say that [low] cannot combine with [coronal] and/or [low].
[11] The co-occurrence of these features may not be possible in an articulatory feature model, but entirely

which inevitably puts *[high, low] at the top. I believe that Turkish can best be analyzed, if mid vowels are specified [high, low].[12]

5.1 Coronal harmony

Coronal harmony palatalizes a vowel if it follows a coronal vowel. Consider the following examples:

(18)			*nom.sg*	*gen.sg*	*nom.pl*	*gen.pl*
	a.	'house'	ev	ev-in	ev-ler	ev-ler-in
		'rope '	ip	ip-in	ip-ler	ip-ler-in
	b.	'girl'	kız	kız-ın	kız-lar	kız-lar-ın
		'money'	para	para-nın	para-lar	para-lar-ın

The genitive suffix /*-In/* and the plural suffix */lEr/* harmonize with the preceding root vowel. If it is [coronal], the following suffix vowel will also be [coronal] (cf. (18a)). If the preceding vowel is unspecified, the suffix vowel will also remain unspecified (cf. (18b)).

In OT we can account for the coronal alternations in the examples in (18) by ordering the constraints against insertion of [coronal] prior to the projection constraint. The tableau below illustrate this with the help of *ip+In* `rope + gen. sing'. (For reasons of simplicity, I have left out the height specifications):

[cor]
|
(19) input: /ip+In/

[12]Also vowel reduction in Russian constitutes an argument in favor of specifying mid vowels [high, low]. In Russian, mid vowels reduce to high vowels, for example: *e* ==> *i*. If reduction indeed means diminishing the amount of features, such process is neatly explained if [high, low] reduces to [high], rather than zero specifications becoming [high].

Candidates	PL-MAX	IDENT[F]	*[cor]	PROJECT(N^0, *V*)	PL-DEP
. [cor] | a. /ip+In/			*	*!	
[cor] [cor] | | b. ip+in			* *!		*
c. Ip+In	*!	*		* *	
[cor] ☛ | \\ d. ip+in			*		*

PLACE-MAX and PLACE-IDENT[F] are only relevant in order to prevent deletion of [coronal] (cf. (19c). As far as the other candidates are concerned the two constraints play no role because the suffix vowel has no place node, so that there is no question of violating place node correspondence. The optimal candidate is the one in (19d); it obeys PROJECT(N^0, *V*), while it causes no extra violation of *[coronal].

Notice that the opposite ranking of constraints would also select (19d) as the best candidate, suggesting that the order of constraints is not important. However, this conclusion is not correct. Surface forms such as *kız* 'girl', *ılık* 'tepid', etc. support the proposed ranking. The vowels in these words are unspecified for place, so they are liable candidates for feature fill. However, due to the ranking: *[coronal] >> PROJECT (N^0, *V*), these vowels cannot be specified. The evaluation of *kız* versus *kiz* will demonstrate this:

(20) input: /kIz/

Candidates	*[cor]	PROJECT(N^0, *V*)
☛ a. kız		*
[cor] | b. kiz	*!	

The opposite ordering, would incorrectly predict **kiz* and **ilik*, instead of *kız* and *ılık*.

5.2 Labial harmony

Roundness or labial harmony is restricted to only high vowels. That is, [labial] only spreads to vowels, which are uniquely [high]. Vowels specified [high, low], or solely [low] are not subjected to [labial] spread. Compare the difference between the genitive singular and the nominal plural in the words below:

(21)

	nom.sg	*gen.sg*	*nom.pl*
‘rose’	gül	gül-ün	gül-ler
‘stamp’	pul	pul-un	pul-lar
‘village’	köy	köy-ün	köy-ler
‘end’	son	son-un	son-lar

The genitive singular suffix -*In* is uniquely [high] so it activates [coronal] and [labial] harmony. This in contrast to the plural suffix -*lEr*, which is specified [high, low]. Being not uniquely [high], it only triggers [coronal] harmony.[13] The tableau in (22) below illustrates labial harmony as it applies to genitive singular suffix /-In/.

(22) input: [lab]
|
/pul+In/

candidates	PL-MAX	IDENT[F]	*[lab]	PROJECT(N^0, *V*)	PL-DEP
[lab] | a. pul+ In			*	*!	
[lab] [lab] | | b. pul + un			* *!		*
c. pIl + In	*!	*		* *	
[lab] ☛ | \\ d. pul + un			*		*

The optimal candidate is (22d), because it obeys PROJECT(N^0, *V*), while it incurs fewer violations of *[labial] than its competitor in (22b). Again, PLACE-MAX and PLACE-IDENT[F] are only relevant in order to prevent [coronal] deletion. They play no role with respect to the empty suffix vowel since there is no place node correspondence between input and output.

5.3 Disharmony

Returning to disharmony, the examples below show violations against frontness/backness harmony. Typically, harmonic features do not spread to adjacent vocalic nodes unspecified for that particular feature.

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[13] It is beyond the scope of this article to discuss all the details, but in order to prevent mid vowels from

(23) *Disharmonic roots*

a/i	hangi	‘which’	lisans	‘university degree’
a/e	kalem	‘pen’	hesap	‘bank account’
o/i	kalori	‘calorie’	fiskos	‘gossip’
o/e	konser	‘concert’	petrol	‘petrol’
u/i	billur	‘crystal’	muzip	‘mischievous’
u/e	suret	‘copy’	memur	‘official’

In the OT framework, disharmony can be analyzed in terms of input-output faithfulness. Therefore, I assume that Place Node-Max and Place Node-Identity[F] are responsible for the persistence of place nodes and the material that is linked to it. In order to have effect, these constraints should dominate the projection constraint and the markedness constraints against feature insertion (*[coronal] and *[labial]). Consider the tableau below.

(24)

```
               [cor]   [lab]
                  |      |
input:          /fiskos/
```

Candidates	Pl-Max	Ident[F]	*[cor]	*[lab]	Project(N^0, *V*)
[cor] [lab] ☛ | | a. fiskos			*	*	
[cor] [lab] | \\\| b. fiskös		*!	*	*	
c. c. fIskos	*! *!	* *			* *

The first candidate is fully faithful to the input, while it also obeys Project(N^0, *V*). The second candidate violates identity by spreading [coronal] to the second vowel, changing /o/ into [ö]. For reasons of space, the tableau omits similar identity violations such as spreading [lab] to the preceding vowel, giving [ü – o], spreading of [cor] while at once deleting [lab], etc. The third candidate is ruled out since it is absolutely unfaithful to the input

To summarize the discussion; harmony can only apply if the input contains a vowel which is unspecified for place. If, on the other hand, the input contains specified place nodes, these nodes will be respected by input output faithfulness. This means that every place node in the input has its correspondent in the output and the features linked to them remain unchanged. The first part of the conclusion accounts for harmony, while the second part accounts for disharmony.

6. Conclusion

In this paper, a theory of harmony and assimilation has been developed which claims that these processes are not independent notions but rather derive from a strong ban on *schwa.* Languages not allowing for empty elements employ all kinds of strategies in order to prevent unspecified vowels from surface representations. This idea has been illustrated with the help of Barrow Inupiaq assimilation and further developed in order to account for Turkish harmony.

The odd distribution of the Turkish default vowel constitutes the key to the proposed analysis. It not only explains the underlying nature of harmony but also has the advantage that no reference needs to be made to roots and/or suffixes (for contrary views see Clements and Sezer (1982)). Harmony applies equally to all domains.

Finally, discussing the NEH showed that this principal claim should be embedded in a constraint-based model of phonology like *Optimality Theory (OT)* (Prince and Smolensky (1993a), McCarthy and Prince (1995)). In such a framework, claims or constraints are not absolute. As for this, it is less rigid than a parameter-like framework.

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