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An elementary approach to labial harmony in Turkic languages

Beata Moskal

Abstract This paper offers an account of the conditions under which labial harmony occurs in Turkic languages. I argue that labial harmony is deficient in the sense that additional requirements need to be met in order for it to occur. These are stated in terms of the *relation* between trigger and target, thus reducing the conditions for labial harmony to a single source. In particular, labial harmony is only observed in the configuration that trigger and target agree for some element ε or that they stand in an asymmetric relation. Given the framework adopted here, Radical cv Phonology (van der Hulst 2005), this results in a restrictive typology, which is tested against the variety of labial harmony conditions observed in Turkic languages.

Keywords Labial harmony · Turkic languages · Government Phonology · Typology

1 Introduction

Many Turkic languages display unrestricted palatal harmony.[1] Consider data from Turkish in (1): the plural suffix displays an alternation between surfacing with a front vowel and with a back vowel; in particular, in the left column, the vowel of the plural suffix is front, [l^jer], but in the right column it is back, [lar].

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[1] It should be noted that in most languages vowel harmony is not absolute in the sense that there are invariable suffixes of both harmonic classes. Furthermore, in this paper I focus on root-suffix alternations and largely ignore root-internal vowel harmony. Consonant-vowel interactions will not be discussed either.

(1) *Unrestricted palatal harmony*

ip-l^{j}er	'rope-PL'	kɨz-lar	'girl-PL'
yüz-l^{j}er	'face-PL'	pul-lar	'stamp-PL'
el^j-l^{j}er	'hand-PL'	sap-lar	'stalk-PL'
k^{j}öy-l^{j}er	'village-PL'	son-lar	'end-PL'

(Turkish; Clements & Sezer 1982)

The choice of plural allomorph is governed by the immediately preceding vowel: when the preceding vowel (trigger) is front, the suffix vowel (target) is front; when the trigger is back, the target is back.

In addition to palatal harmony, Turkic languages also often display labial harmony. However, this type of harmony displays a more restricted application.[2] For instance, in Yakut (2) and Kazakh (3) we see that low (target) vowels do not always undergo labial harmony. In Yakut, labial harmony is observed when both the trigger and the target vowel are low; in Kazakh, labial harmony is licensed by virtue of trigger and target both being front.

(2) *Labial harmony only when both trigger and target are low*

künnük-ter	(*künnük-tör)	'window-PL'
börö-lör		'wolf-PL'
kuul-lar	(*kuul-lor)	'sack-PL'
oγo-lor		'child-PL'

(Yakut; Krueger 1962)

(3) *Labial harmony only when both trigger and target are front*

üj-dö		'house-LOC'
köl-dö		'lake-LOC'
kul-da	(*kul-do)	'at the servant'
son-dan	(*son-don)	'rubble-ABL'

(Kazakh; Korn 1969)

Indeed, the topic of this paper is the investigation into the conditions that govern labial harmony. In the next section, I first introduce the framework of Government Phonology (Kaye, Lowenstamm & Vergnaud 1985), and then close with data from Kachin Khakass, which are problematic for the model sketched in the first part. In section three, Radical CV Phonology (van der Hulst 2005) is shown to naturally account for the problematic data. In the fourth section, I discuss a typology of labial harmony, which is based on the insight that labial harmony is licensed by the relation between trigger and target. The final section offers some closing remarks.

2 Standard Government Phonology

In Government Phonology (GP), the different behavior of different segments is built directly into the phonological representation of lexical items.[3] To be more precise, segments themselves are composed of smaller atoms, so-called

[2] I assume labial harmony to encompass both the labialization of high vowels as well as low vowels (as in Steriade 1981; Kaun 1994, 2005; Dresher 2009; Nevins 2010; among others).

elements.[4] Following Kaye (1993), vowels are composed of three unary elements: |A|, |I| and |U|, which can occur on their own, as in (4), or they can combine to form more complex structures, as in (5).

(4) $\begin{array}{ccc} /\mathrm{a}/ & /\mathrm{i}/ & /\mathrm{u}/ \\ \underline{\mathrm{A}} & \underline{\mathrm{I}} & \underline{\mathrm{U}} \end{array}$ (5) $\begin{array}{cc} /\mathrm{e}/ & /\mathrm{o}/ \\ \mathrm{A} & \mathrm{A} \\ \underline{\mathrm{I}} & \underline{\mathrm{U}} \end{array}$

Furthermore, they can be headed (indicated by underlining) or not, and there is maximally one headed element per segment; in other words, headedness is used contrastively, which leads to a lexical contrast between an unheaded |A| and a headed |$\underline{\mathrm{A}}$| (see also section 3). Vowel inventories of specific languages are subsets of the set of all possible vowels that could arise from combining elements.

2.1 Vowel harmony

Vowel harmony involves the licensing of an element, which, in effect, amounts to the element involved in alternations being (phonetically) interpreted (Denwood 2002). As such, trigger and target stand in a licensor and licensee relation, respectively.

Consider the representation of the Turkish plural suffix, which alternates between [lʲer] and [lar] (see (1)). It contains a low element |A| as well as a front element |I|. ('N' = nucleus)

(6) $\begin{array}{c} \text{-lAr} \\ \mathrm{N} \\ | \\ \mathrm{A} \\ \mathrm{I} \end{array}$

Crucially, though, whereas |A| in (6) is lexically licensed, |I| is *not* licensed lexically. As such, unless |I| is somehow licensed it will not be interpreted.

In roots that contain a front element |I|, N_1 lexically licenses |I| in N_1 and, *as such*, N_1 can also license |I| in N_2; this results in a front suffix:

(7) $\begin{array}{ccc} \text{ip} & \text{-} & \text{l}^{\text{j}}\text{er} \\ \mathrm{N} & \longrightarrow & \mathrm{N} \\ | & & | \\ \mathrm{N}_1 & & \mathrm{N}_2 \\ | & & | \\ & & \mathrm{A} \\ | & & | \\ \underline{\mathrm{I}} & & \underline{\mathrm{I}} \end{array}$

[3] For reasons of space, I present a highly simplified version of Government Phonology (for details see Kaye, Lowenstamm & Vergnaud 1985, 1990; Kaye 1993).

[4] For discussion of the phonetic interpretability of elements, see Harris (1994: chapter 3), Harris & Lindsey (1995), Anderson & Ewen (1987) and Backley (2011).

However, in roots that do not contain a front element, N_1 does not lexically license any |I| element and, as such, cannot license |I| in N_2. As a consequence, |I| is de-linked, resulting in a back suffix:

(8)	kɨz	-	lar
	N	$\longrightarrow$	N
	|		|
	N_1		N_2
			|
			<u>A</u>
			ǂ
			I

2.2 Labial harmony in Turkish

The vowel inventory of Turkish is given in (9), together with the structural make-up as *per* GP (Charette & Göksel 1996: 8):

(9)	/i/	/e/	/ü/	/ö/	/u/	/o/	/ɨ/	/a/
		A		A		A		<u>A</u>
	<u>I</u>	<u>I</u>	I	I				
			<u>U</u>	<u>U</u>	<u>U</u>	<u>U</u>		

In Turkish, labial harmony is consistently observed when the target vowel is high (10) and is not attested when the target vowel is low (11).

(10) *High targets always display labial harmony*

yüz-ün	'face-GEN'	
k^{j}öy-ün	'village-GEN'	
pul-un	'stamp-GEN'	
son-un	'end-GEN'	(Turkish; Clements & Sezer 1982)

(11) *Low targets never display labial harmony*

yüz-l^{j}er	(*yüz-l^{j}ör)	'face-PL'	
k^{j}öy-l^{j}er	(*k^{j}öy-l^{j}ör)	'village-PL'	
pul-lar	(*pul-lor)	'stamp-PL'	
son-lar	(*son-lor)	'end-PL'	(Turkish; Clements & Sezer 1982)

As argued in Charette & Göksel (1994, 1996) and Denwood (2002), high targets (10) always undergo harmony (labial as well as palatal), because high targets are elementally 'empty'. That is to say, given that the elements |I| and |U| *in target vowels* are governed by palatal and labial harmony, respectively, they are, as such, not lexically licensed. As they contain no lexically licensed elements they are 'empty'. Consequently, nothing prevents N_1 from licensing an element ε in N_2 if it lexically licenses such an element in N_1.

In (12), the nucleus N_1 in the roots *yüz-* and *k^{j}öy-* (lexically) licenses |I| and |U|, and, as such, N_1 can license |I| and |U| in the suffix (N_2), resulting in a front rounded variant of the genitive suffix:

(12)
$$\begin{array}{ccccccccc} \text{yüz} & \text{-} & \text{ün} & \qquad & \text{k}^{\text{j}}\text{öy} & \text{-} & \text{ün} \\ \mathrm{N} & \longrightarrow & \mathrm{N} & & \mathrm{N} & \longrightarrow & \mathrm{N} \\ | & & | & & | & & | \\ \mathrm{N}_1 & & \mathrm{N}_2 & & \mathrm{N}_1 & & \mathrm{N}_2 \\ | & & | & & | & & | \\ \mathrm{I} & & \mathrm{I} & & \mathrm{A} & & \mathrm{I} \\ \underline{\mathrm{U}} & & \underline{\mathrm{U}} & & \mathrm{I} & & \underline{\mathrm{U}} \\ & & & & \underline{\mathrm{U}} & & \end{array}$$

When the root vowel contains a labial element |U| but no palatal element |I|, only labial harmony is observed (|I| is de-linked):

(13)
$$\begin{array}{ccccccccc} \text{pul} & \text{-} & \text{un} & \qquad & \text{son} & \text{-} & \text{un} \\ \mathrm{N} & \longrightarrow & \mathrm{N} & & \mathrm{N} & \longrightarrow & \mathrm{N} \\ | & & | & & | & & | \\ \mathrm{N}_1 & & \mathrm{N}_2 & & \mathrm{N}_1 & & \mathrm{N}_2 \\ | & & | & & | & & | \\ \underline{\mathrm{U}} & & \underline{\mathrm{U}} & & \mathrm{A} & & \underline{\mathrm{U}} \\ & & \nmid & & \underline{\mathrm{U}} & & \nmid \\ & & \mathrm{I} & & & & \mathrm{I} \end{array}$$

However, low targets (11) differ from high targets in one crucial respect: whereas the latter were elementally empty, the former contain the element |A|. In effect, the presence of this element *in* N_2 prevents labial harmony.[5]

(14)
$$\begin{array}{ccccccccc} \text{son} & \text{-} & \text{lar} & \qquad & \text{yüz} & \text{-} & \text{l}^{\text{j}}\text{er} \\ \mathrm{N} & \longrightarrow & \mathrm{N} & & \mathrm{N} & \longrightarrow & \mathrm{N} \\ | & & | & & | & & | \\ \mathrm{N}_1 & & \mathrm{N}_2 & & \mathrm{N}_1 & & \mathrm{N}_2 \\ | & & | & & | & & | \\ \mathrm{A} & & \underline{\mathbf{A}} & & \mathrm{I} & & \underline{\mathbf{A}} \\ \underline{\mathrm{U}} & & \nmid & & \underline{\mathrm{U}} & & \mathrm{I} \\ & & \mathrm{I} & & & & \nmid \\ & & \mathrm{U} & & & & \mathrm{U} \end{array}$$

As we will see in the next section, though, the restriction of |A| blocking labial harmony is subject to cross-linguistic variation.

2.3 Variation in labial harmony

In contrast to Turkish, however, we saw that in Yakut low targets sometimes do undergo labial harmony; in particular, when trigger and target are both low (data are repeated from (2) above):

[5] For details how to derive the blocking effect (a ban on 'switching') of |A|, see Charette & Göksel (1994: 43-44).

(15)

(15)	künnük-ter	(*künnük-tör)	'window-PL'	
	börö-lör		'wolf-PL'	
	kuul-lar	(*kuul-lor)	'sack-PL'	
	oɣo-lor		'child-PL'	(Yakut; Krueger 1962)

However, when the target vowel is high, labial harmony is always observed:

(16)	tübbüg-ü	'window-ACC'	
	börön-ü	'wolf-ACC'	
	murun-u	'nose-ACC'	
	ox-u	'arrow-ACC'	(Yakut; Krueger 1962)

In GP, the data involving high targets (16) are easily accounted for: as in Turkish, any vowel harmony process occurs unrestrictedly in elementally empty nuclei (Charette & Göksel 1994, 1996; Denwood 2002).

The data involving a low suffix (15) are accounted for by an additional licensing mechanism. In effect, the presence of an |A|-*bridge* between trigger and target 'neutralizes' the blocking effect of |A| (cf. Steriade 1981).[6] A bridge is formed by trigger and target agreeing for some element ε, in this case the element |A|. That is to say, in Yakut, an |A|-bridge allows for N_1 to license |U| in N_2 across an otherwise blocking |A|.

(17)

$$\begin{array}{ccc}
\text{oɣo} & \text{-} & \text{lor} \\
N & \longrightarrow & N \\
| & & | \\
N_1 & & N_2 \\
| & & | \\
A & & A \\
| & & | \\
\underline{U} & & \underline{U}
\end{array}$$

Crucially, though, if no |A|-bridge is available, |A| in N_2 still blocks labial harmony; in (18), licensing of |U| fails given that the root vowel (N_1) is a high vowel and as such does not contain |A|:

(18)

$$\begin{array}{ccc}
\text{kuul} & \text{-} & \text{lar} \\
N & \longrightarrow & N \\
| & & | \\
N_1 & & N_2 \\
| & & | \\
 & & \underline{A} \\
| & & \nmid \\
\underline{U} & & U
\end{array}$$

[6] See Charette & Göksel (1994: 44-45) for details how a bridge configuration allows for switching, which in turn is required for labial harmony.

In a similar vein, in Kazakh (see the data in (3)) labial harmony in low targets is observed only when both trigger and target are front. This is accounted for by positing that an |I|-bridge neutralizes the blocking effect of |A| (as predicted, high targets always display labial harmony).

2.4 The spanner in the works: Kachin Khakass

As we saw above, a crucial aspect of the standard GP analysis is that high vowels are elementally empy. However, consider data from Kachin Khakass in (19), in which not all high ('empty') targets display labial harmony. In Kachin Khakass, labial harmony is exclusively observed when trigger and target are both high (low targets never display labial harmony).

(19)	kün-nü		'day-ACC'	
	čör-zip[7]	(*čör-züp)	'having gone'	
	kuš-tuŋ		'of the bird'	
	ok-tiŋ	(*ok-tuŋ)	'of the arrow'	(Kachin Khakass; Korn 1969)

In standard GP, there is nothing that can prevent licensing into an empty slot. Indeed, even if one would prevent that, there is no element that could form a bridge to save labial harmony in forms such as *künnü* and *kuštuŋ*. In sum, standard GP cannot account for Kachin Khakass (West-Siberian Tatar (Korn 1969) patterns the same way; Kyzyl Khakass (Korn 1969) and Nogai (Karakoç 2005), in which labial harmony is observed if trigger and target are both high or front, also cannot be captured in standard GP).[8]

3 Radical cv Phonology

Radical cv Phonology (RcvP; van der Hulst 2005, 2012), based on both GP as well as Dependency Phonology (Anderson & Ewen 1987), assumes only two elements: a consonant- or onset-oriented element |C| and a vowel- or rhyme-oriented element |V|. Furthermore, these elements are organized into a feature geometry involving class nodes, as can be seen in Figure 1 on the next page.[9]

[7] Korn's (1969) text reads <čör-zp>; however, his description explicitly states that this form fails to undergo labial harmony. I assume it does undergo palatal harmony (cf. *öd-ir* 'to kill'; Korn 1969: 103).

[8] One could expand the standard GP account by including elements in the *trigger* to block labial harmony; that is, in Kachin Khakass the presence of the element |A| on the trigger (rather than the target) could somehow block the licensing of |U| in the suffix. Thanks to Markus Pöchtrager for discussion on this point.

[9] I will not discuss the laryngeal class node in this paper.

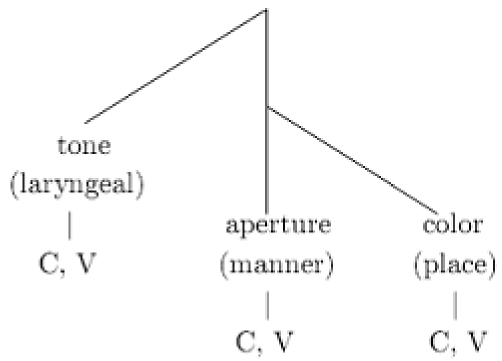

Fig. 1 The feature geometry of Radical cv Phonology

In each class node, |C| and |V| receive a different interpretation; as such, each of the six terminal elements in Figure 1 is distinctive. However, for ease of exposition, I will use separate symbols for each of the elements; as such, Figure 2 only differs notationally from Figure 1.

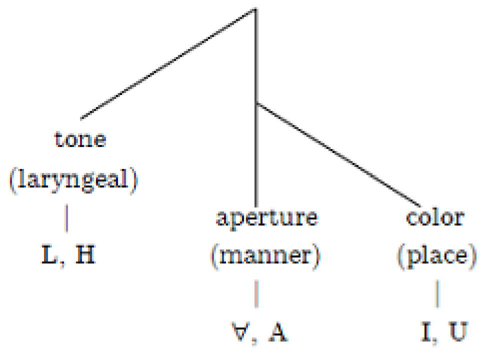

Fig. 2 The feature geometry of Radical cv Phonology (practical use)

The four elements relevant in the composition of vowels are: |U|, |I|, |A| and |∀|.[10] As in GP, these can either be a head or a dependent:

[10] It is important to note that even though the surface number of elements involved in the formation of vowels is four, formally only two elements (distributed over two class nodes) are involved: |C| and |V|. In the following, a subscript 'V' or 'C' is sometimes added to indicate the class an element belongs to.

(20)

element	head	dependent
A_V	/a/	'low'
$\forall_C$	/ɨ/	'high (or ATR)'
U_V	/u/	'round'
I_C	/i/	'front'

In contrast to GP, RcvP uses (contrastive) headedness obligatorily to resolve the asymmetry which arises from merging (maximally two) elements per class node; mono-elemental structures are headed by default (that is, unheaded |A| is not a legitimate structure).

3.1 Vowel harmony in RcvP

In RcvP, vowel harmony alternations remain underspecified in the lexicon (cf. Steriade 1981, Denwood 2002). Specifically, when a lexical item is involved in a vowel harmony alternation, it includes a variable element "(ε)". Consider the RcvP representation for the plural in Turkish, which alternates between [l^jer] and [lar] (see (1)). Given that the suffix never alternates for height, |A| is lexically licensed; in contrast, the morpheme alternates between a front and back variant, and, as such, the front element |I| is represented as a variable "(|I|)", which is crucially not *lexically* licensed:

(21)

(21)	-lAr
	A
	(I)

The variable element in the Turkish plural suffix can be licensed (22), resulting in a palatal realization [l^jer], or it remains unlicensed (23), resulting in a non-palatal realization [lar], both being harmonic with their root. In particular, in (22) the variable element (|I|) is licensed (indicated by "≫") by an immediately adjacent instance of the same element; as in GP, this means it is phonetically realized, and we observe a front suffix [l^jer]:[11]

(22)	ip	-	l^jer
	$\forall$		A
	I	≫	(I)

In case the preceding vowel does not contain an |I|, the variable (|I|) in the suffix is not licensed (and as such cannot be interpreted), and we observe a back suffix [lar]:

[11] Specifically, the type of licensing that is involved in harmonizing processes is *lateral licensing* (van der Hulst 2012): "A variable element X is licensed by a preceding/following occurrence of X." This contrasts with *lexical licensing*, which I take to encompass reference to both structural configurations (e.g. initial syllable) as well as reference to specific vowels (*contra* van der Hulst 2012, who assumes a distinction between positional ('structural') and lexical licensing).

(23)

kɨz	-	lar
∀		A
		(I)

Note that licensing relations are absolutely local; that is, licensing cannot apply across a vowel (rhymal head).[12]

4 A typology of labial harmony

In GP, a bridge configuration neutralizes the blocking effect of |A| on the target (section 2.3). However, I claim that labial harmony in a sense is always blocked and requires additional conditions at all times. Below, I argue that labial harmony not only can be licensed by a bridge, but, rather, that it obligatorily must be licensed by a relation between trigger and target.

4.1 An inventory of bridges

In (24) below, the vowel inventory of Turkish is given again, together with its structure as *per* RcvP (cf. (9) above).

(24)

/i/	/e/	/ü/	/ö/	/u/	/o/	/ɨ/	/a/
∀		∀		∀		∀	
	A		A		A		A
I	I	I	I				
		U	U	U	U		

Expanding on Charette & Göksel (1994, 1996), I take bridge licensing to refer to the configuration of trigger and target agreeing for an element ε, which, as such, facilitates labial harmony (cf. Steriade 1981):

(25) *Bridge licensing*

$$\frac{\varepsilon \qquad \varepsilon}{\Downarrow}$$
$$\mathrm{U} \gg (\mathrm{U})$$

Whether or not an element can function as a bridge for labial harmony is subject to cross-linguistic variation, but since RcvP assumes four (surface) elements, and |U| is active in labial harmony, bridges are predicted to be built of |∀|, |A| and |I|. Indeed, Kachin Khakass (data in (19)) ceases to be problematic within this framework; rather, it is expected: labial harmony is only

[12] A note on so-called 'transparent' vowel is in order; these vowels seemingly allow for harmony to skip them. Consider Finnish, in which /i/ (as well as /e/) seems to be 'ignored' in the process of palatal harmony: *läkääri-nä* 'doctor-ESS' and *pappi-na* 'priest-ESS' (Ringen 1975). I argue that these vowels are 'inert' in that they transmit but do not initiate a harmonic wave; crucially, they are not 'skipped' in any sense but participate in vowel harmony (see Moskal 2012 for details).

observed when both trigger and target are high, that is, when it is licensed by an |∀|-bridge. Consider the full representation for *künnü* in (26); both trigger and target are high (i.e., they contain |∀|), and, as such, the |U| on the trigger can license the variable |U| on the target:

(26)	kün	-	nü
	∀		∀
	I	≫	(I)
	U	≫	(U)

In contrast, the stem in *čörzip* in (27) does not contain the element |∀|, and no |∀|-bridge can be built to allow the trigger |U| to license the variable |U| on the target. As such, the resulting vowel is unrounded. (Note that palatal harmony is not subject to any restrictions and (|I|) in the suffix is always licensed by a preceding |I|.)

(27)	čör	-	zip
	A		∀
	I	≫	(I)
	U		(U)

In a similar vein, the behavior of low targets in Yakut (data in (2)) and Kazakh (data in (3)) is accounted for by these languages requiring an |A|- and |I |-bridge, respectively, to license labial harmony.[13]

In addition to labial harmony needing to be licensed by a bridge of some single designated element ε, a language can also allow for a variety of bridges to license labial harmony. Consider data from Kyzyl Khakass in (28) and (29); low targets only display labial harmony when both trigger and target are front:

(28)	kün-gö		'to the sun'	
	öl-zö		'if (he) dies'	
	kus-ka	(*kus-ko)	'to the bird'	
	pol-za	(*pol-zo)	'if (he) is'	(Kyzyl Khakass; Korn 1969)

High targets also display labial harmony when trigger and target are front; in addition, labial harmony is observed when trigger and target are both high:

(29)	kün-nün		'of the day'	
	töl-düŋ[14]		'of posterity'	
	kus-tuŋ		'of the bird'	
	told-ɨr	(*told-ur)	'to fill'	(Kyzyl Khakass; Korn 1969)

Labial harmony in Kyzyl Khakass is licensed by an |I|- or an |∀|-bridge.

[13] The behavior of high targets, which always display labial harmony, will be discussed in the next section.

[14] Korn (1969: 102) lists <töl-dun>; however, given that this is the only instance of apparent failure of palatal harmony in Kyzyl, I assume this to be a transcription error.

Similarly, in Altai, labial harmony occurs indiscriminately in front vowels, whereas in back vowels it is observed when both target and trigger are low; that is, labial harmony is licensed by an |I|- or an |A|-bridge.[15]

(30)	kün-dö		'in the day'	
	kös-tör		'eyes'	
	uč-ar	(*uč-or)	'which will fly'	
	kol-do		'from the hand'	(Altai; Korn 1969)

Finally, there is the possibility that labial harmony can be licensed by any bridge; indeed, this situation seems to be attested in Shor. In (31), low targets display labial harmony when trigger and target are both front (an |I|-bridge) as well as when trigger and target are both low (an |A|-bridge):

(31)	külük-tö		'at the brave man's'	
	sös-töy		'from the word'	
	ug-ar	(*ug-or)	'which will grasp'	
	pol-zo		'if (he) is'	(Shor; Korn 1969)

In high targets, however, the target optionally displays rounding when the trigger vowel is low:[16]

(32)	mün-üp	'having mounted'	
	kök-tün	'of the sky'	
	kuš-tun	'of the bird'	
	coň-nuŋ ∼ coň-nɨŋ	'of the people'	(Shor; Korn 1969)

When in the final form in (32) the target is rounded (*coňnuŋ*), Shor falls in the same category as Altai (Shor-A). However, in case labial harmony is not observed (*coňnɨŋ*), it is exactly the configuration when trigger and target disagree for height, which classifies Shor as a language where labial harmony is licensed by any bridge: |∀|, |A| or |I| (Shor-B).

In sum, we can draw the (interim) overview in Table 1:

Table 1 Labial harmony typology based on bridge licensing

bridge	language(s)
∀	Kachin Khakass (Korn 1969), West-Siberian Tatar (Korn 1969)
A	Yakut (Krueger 1962), Altaic-B (Dyrenkova 1940)
I	Khazakh (Korn 1969, Menges 1947), Chulym Tatar (Korn 1969), Karakalpak (Menges 1947)
∀, I	Kyzyl Khakass (Korn 1969), Nogai (Karakoç 2005)
A, I	Altai (Korn 1969), Kirgiz-B (Herbert & Poppe 1963), Ojrat (Menges 1947), Teleut (Menges 1947), Shor-A (Korn 1969)
∀, A	Yawelmani, *non-Turkic* (Cole & Kisseberth 1995)
∀, A, I	Shor-B (Korn 1969)

[15] High targets always display labial harmony, see section 4.2.

[16] I assume that variation is the result of two different grammars (see e.g. Orgun (1996), Inkelas (1998), Antilla (2002, 2007) on co-phonologies).

4.2 Asymmetric licensing

Bridge-licensing accounts for a large portion of labial harmony patterns. However, what remains to be explained is the fact that in a considerable number of languages high targets always display labial harmony. Consider Turkish again, which displays absolute rounding when the target is high (data are repeated from (10)):

(33)	a.	yüz-ün	'face-GEN'	
	b.	k^jöy-ün	'village-GEN'	
	c.	pul-un	'stamp-GEN'	
	d.	son-un	'end-GEN'	(Turkish; Clements & Sezer 1982)

The data in (33a) *yüzün* and (33c) *pulun* are readily accounted for: labial harmony in these cases is licensed by an |∀|-bridge. With regard to the remaining forms, *k^jöyün* (33b) and *sonun* (33d), I argue that labial harmony is licensed by the relation between a vocalic trigger and a consonantal target: asymmetric licensing.

Asymmetric licensing is taken to be an instantiation to the Head-Dependent Asymmetry (HDA) introduced by Dresher & van der Hulst (1989). Originally proposed to account for asymmetries in the structure of metrical feet, the HDA captures the asymmetry that a dependent cannot be more complex than its head. In particular, feet consisting of a head syllable and a dependent syllable allow for the following configurations:[17]

(34)		*head*	*dependent*
	a.	✓heavy	light
	b.	✓light	light
	c.	✓heavy	heavy
	d.	*light	heavy

Crucially, a dependent cannot be more complex than its head. Extending this concept to vowel harmony, in which triggers and targets stand in a licensor (head) and licensee (dependent) relation, respectively, in RcvP, |∀| is a consonantal element and |A| is a vocalic element (see (20)). As such, the term 'complexity' doesn't seem entirely appropriate, and I will use the term 'prominence' instead. Prominence refers to the fact that vocalic positions wish to be as prominent as possible, as seen in, for instance, the fact that nuclei attract the most sonorous material (Prince & Smolensky 1993, Kenstowicz 1996). In RcvP, this translates into vocalic elements |V| (i.e., |A| and |U|) being more prominent than consonantal elements |C| (i.e., |∀| and |I|).[18] As such, the HDA commands that a licensee cannot be more prominent than its licensor: vocalic elements can license both vocalic and consonantal elements, but consonantal

[17] It should be noted that heavy-heavy feet are not embraced by everybody; see e.g. Hammond (1993, 1999) for heavy-heavy feet.

elements can only license consonantal elements. This amounts to the following schema (cf. 34)):

(35)

	trigger	*target*
a.	$^{\checkmark}A_V$	$\forall_C$
b.	$^{\checkmark}\forall_C$	$\forall_C$
c.	$^{\checkmark}A_V$	A_V
d.	$^{*}\forall_C$	A_V

Crucially, the HDA predicts that (35d), in which trigger and target stand in a |C|-to-|V| relation, should not be a well-formed structure; this configuration is indeed not attested in the data.[19] When we look at the four configurations in (35) as potential facilitators for labial harmony, (35b) and (35c) are already in our repertoire as bridge licensing configurations. I suggest that (35a) is a 'strict' interpretation of the HDA, which, as such, licenses labial harmony:[20]

(36) *Asymmetric licensing*

A_V		$\forall_C$
U	$\gg$	(U)

Languages differ as to whether asymmetric licensing is active or not. However, it seems to be the case that asymmetric licensing implies an |∀|-bridge; that is to say, there are no cases where low triggers round high targets without high triggers rounding high targets (cf. Steriade 1981). This makes intuitive sense, since in order for harmony to be(come) an active process, target and trigger need to agree (at least) in some respect (agreement in this sense constitutes a shared element). In other words, for a harmonic element on a target to be the most saliently recognizable as resulting from an adjacent harmonic element (on a trigger), a relation between the two needs to be established: a bridge is the clearest way to do this.

Table 2 shows an overview of the various possible licensing conditions, based on the discussion above. Given that there are three elements that can form a bridge, as well as asymmetric licensing (which is taken to presuppose an |∀|-bridge), this gives rise to eleven configurations that could theoretically

[18] Presumably, it is not the case that |V|-elements being more prominent than |C|-elements is context-neutral, but, rather, |V|-elements are only more prominent in vocalic positions (as opposed to consonantal positions). As such, 'compatibility' might be a better term than 'prominence'.

[19] Khirgiz (Korn 1969) is claimed to display unrestricted labial harmony; however, this seems to be the only counterexample to the claim that labial harmony is always subject to additional restrictions. Indeed, although Korn classifies it as a language in which labial harmony occurs unrestrictedly, he indicates that in one configuration labial harmony is optional: when the trigger is high and the target is low, which is exactly the configuration that the current account excludes. If it turns out that the language truly displays absolute harmony, however, it might be the case that labial harmony in Khirgiz is licensed at the level of the root node rather than the nucleus.

[20] The HDA holds between elements within a single class node; that is, even though a trigger $|A|_V$ and a target $|I|_C$ also stand in a |V|-to-|C| relation, since they are not within the same class node, this does not license labial harmony.

facilitate labial harmony. As can be seen in the table, nine of these have been attested; "+" indicates asymmetric licensing.[21]

Table 2 Labial harmony typology (Turkic languages, unless specified otherwise)

	language(s)
∀	Kachin Khakass (Korn 1969), West-Siberian Tatar (Korn 1969)
A	*Tungusic and Mongolian languages, non-Turkic*
I	?
∀, +	Turkish (Clements & Sezer 1982), Ottoman Turkish (Hagopian 1907), Tuvan (Krueger 1977), Azerbaijani (Comrie 1981), Uyghur (Hahn 1991, Lindblad 1990), Karaçay (Herbert 1962)
∀, A	Yawelmani, *non-Turkic* (Cole & Kisseberth 1995)
∀, I	Kyzyl Khakass (Korn 1969), Nogai (Karakoç 2005)
A, I	?
∀, A, +	Yakut (Krueger 1962), Altaic-B (Dyrenkova 1940)
∀, I, +	Khazakh (Korn 1969, Menges 1947), Chulym Tatar (Korn 1969), Karakalpak (Menges 1947)
∀, A, I	Shor-B (Korn 1969)
∀, A, I, +	Altai (Korn 1969), Kirgiz-B (Herbert & Poppe 1963), Ojrat (Menges 1947), Teleut (Menges 1947), Shor-A (Korn 1969)

5 Final remarks

By investigating the diversity in the conditions governing labial harmony in Turkic languages, I showed in this paper that labial harmony obligatorily requires additional licensing requirements (*contra* e.g. Mailhot & Reiss 2007). Furthermore, formalizing bridge-licensing and asymmetric licensing as requirements on the *relation* between trigger and target allows us to reduce the conditions under which labial harmony operates to a single source. Indeed, rather than saying that labial harmony requires an identity condition on trigger and target *in some cases* (Steriade 1981; Vaux 1993; Charette & Göksel 1994, 1996; Kaun 1995, 2004; Dresher 2009; Nevins 2010; Godfrey 2012; among others), I claim that labial harmony requires such a condition *in all cases* (though the identity condition is expanded with the asymmetry condition).

Given the framework adopted here, this offers a restrictive typology since there is a limited number of elements which can enter a trigger-target relation. Indeed, out of the eleven predicted configurations which presumably facilitate labial harmony, nine have been attested.

Notably, although the current claims only concern labial harmony, future research will have to reveal whether all types of restricted harmony should be accounted for in terms of a requirement pertaining to the relation between trigger and target.

[21] Under the current assumptions, it is predicted that there should be languages in which an |I|-bridge licenses labial harmony; if it turns out this is unattested, though, it might be the case that labial harmony necessarily needs to be licensed by an aperture element.

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