Labial harmony in Turkic and Tungusic languages: An elemental approach

1 Introduction

The goal of this paper is to offer a comprehensive account of the conditions under which labial harmony (LH) occurs in Turkic and Tungusic languages. Working within Radical cv Phonology (van der Hulst 2005, 2012), I argue that LH is often subject to two types of further requirements, stated in terms of additional licensing relations. Radical cv Phonology uses a limited set of elements that can be involved in such licensing, resulting in a restricted typology of LH. I also propose a difference between lexically invariable elements, which are always visible, and elements derived by harmony, which become visible in cycles. Crucially, elements derived by LH do not have access to elements derived by tongue root harmony (TRH), accounting for the lack of LH in high vowels in TRH systems.

The structure of the paper is as follows. In section 2, I introduce the Turkic and Tungusic languages data that are the main focus of the paper.\textsuperscript{1} Section 3 introduces the model that this paper is couched in, Radical cv Phonology (Van der Hulst 2005, 2012), and how vowel harmony is modelled. In section 4, I analyse the data from the Turkic languages, discussing the two types of additional licensing relations that LH is often subject to: bridge licensing and asymmetric licensing. Here, I also discuss the restricted typology of LH that follows from the theoretical assumptions adopted in this

\textsuperscript{1}It should be noted that I focus on root-suffix alternations and largely ignore root-internal vowel harmony (see Harrison & Kaun 2001, Nevins 2010 for root-internal harmony). Also, in many languages vowel harmony is not absolute in the sense that there are invariable suffixes of both harmonic classes. In addition, in some languages vowel length plays a role in LH; however, this falls outside the scope of this paper and I only consider (short) vowels here (see Author in prep for the role of vowel length on LH triggers; see also Walker 2001). Finally, consonant-vowel interactions are not considered here. None of these issues bear on the argument developed here.
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paper. In section 5, I introduce the architecture in which vowel harmony occurs in cycles within a segment, making a crucial distinction between lexically invariable elements and elements derived through harmony, and show how this accounts for the observation that LH in Tungusic languages is only seen when both trigger and target are low. In section 6 I consider how the current proposal relates to some alternative approaches to LH, and section 7 concludes.

2 Labial Harmony

Across the Turkic languages there is a great deal of variation with regard to the restrictions that govern labial harmony. This paints the Turkic languages in stark contrast to Tungusic and Mongolic languages, where there is almost no variation (see also Korn 1969, Kaun 1995 i.a.). The Turkic languages that are investigated can be organised into 8 groups, based on the conditions under which labial harmony occurs. In the discussion below, I give data from a representative language for each group, followed by a description of what conditions labial harmony occurs under, then a list of languages that display this pattern.

It is important to note that Turkic languages also display palatal harmony, where vowels in the affix have the same value as their root vowels with regard to the front-back dimension. In contrast to labial harmony, palatal harmony in Turkic is not subject to additional restrictions. That is, a front root vowel will always result in a front affix vowel, and a back root vowel will always correspond to a back affix vowel.

The first pattern to be discussed is that of Turkish, where we see in (1a) that labial harmony is only observed when the affixal vowel is high. When the root vowel (trigger) is front (left column) labial harmony only occurs when the affix vowel (target) is high, but labial harmony fails when the affix vowel is non-high. Similarly, when the root vowel is back (right column) labial harmony again is only observed when the affix vowel is high and not when the target is non-high. This is captured in the table in (1b), where all non-high vowels are conflated into a category ‘low’, which bears that label in opposition to high vowels. In (1c), I list other languages where LH is observed under the same conditions.

(1) Pattern A
Labial harmony in Turkic and Tungusic languages

a. Turkish (Clements & Sezer 1982, 216)

<table>
<thead>
<tr>
<th></th>
<th>Front</th>
<th>Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>yüz-ün</td>
<td>‘face-GEN’</td>
<td>pul-un</td>
</tr>
<tr>
<td>kjöy-ün</td>
<td>‘village-GEN’</td>
<td>son-un</td>
</tr>
</tbody>
</table>

b. Conditions on LH

<table>
<thead>
<tr>
<th>Trigger-target</th>
<th>Front</th>
<th>Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>high-low</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>low-low</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>high-high</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>low-high</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

c. Pattern A is also observed in Urum (Verhoeven 2011), Tuvan (Krueger 1977), Azerbaijani (Comrie 1981), Uyghur (Hahn 1991, Lindblad 1990), Karaçay (Herbert 1962), Crimean Tatar (Kavitskaya 2012).

Pattern B, represented by Kachin Khakass, is characterised by a very restricted occurrence of LH; it is exclusively observed when both trigger and target are high vowels, irrespective of the front-back dimension.

(2) Pattern B

a. Kachin Khakass (Korn 1969, 102-103)

<table>
<thead>
<tr>
<th></th>
<th>Front</th>
<th>Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>künn-ge (*kün-gö)</td>
<td>‘to the day’</td>
<td>kuzuk-ta (*kuzuk-to)</td>
</tr>
<tr>
<td>čör-gen (*čör-gön)</td>
<td>‘who went’</td>
<td>pol-za (*pol-zo)</td>
</tr>
<tr>
<td>künn-nü</td>
<td>‘day-acc’</td>
<td>kušt-tuŋ</td>
</tr>
<tr>
<td>öd-ir (*öd-ür)</td>
<td>‘to kill’</td>
<td>ok-tiŋ (*ok-tuŋ)</td>
</tr>
</tbody>
</table>

b. Trigger-target | Front | Back |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>high-low</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>low-low</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>high-high</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>low-high</td>
<td>×</td>
<td>×</td>
</tr>
</tbody>
</table>

c. Pattern B is also observed in West-Siberian Tatar (Korn 1969).

Pattern C, exemplified by Kyzyl Khakass, represents unrestricted LH when trigger and target are front, but when trigger and target are back, LH is only observed when both vowels are high.

2In addition, Crimean Tatar LH is limited to occurring within the first two syllables in a word.
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(3) Pattern C

a. Kyzyl Khakass (Korn 1969, 102)

<table>
<thead>
<tr>
<th></th>
<th>Front</th>
<th>Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>kün-gö</td>
<td>‘to the sun’</td>
<td>kus-ka  (*kus-ko) ‘to the bird’</td>
</tr>
<tr>
<td>öl-zö</td>
<td>‘if (he) dies’</td>
<td>pol-za  (*pol-zo) ‘if (he) is’</td>
</tr>
<tr>
<td>kün-nüŋ</td>
<td>‘of the day’</td>
<td>kus-tuŋ</td>
</tr>
<tr>
<td>töl-duŋ</td>
<td>‘of posterity’</td>
<td>told-ir  (*told-ur) ‘to fill’</td>
</tr>
</tbody>
</table>

b. Trigger-target Front Back

<table>
<thead>
<tr>
<th></th>
<th>high-low</th>
<th>low-low</th>
<th>high-high</th>
<th>low-high</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>✓</td>
<td>×</td>
<td>✓</td>
<td>×</td>
</tr>
</tbody>
</table>

c. Pattern C is also attested in Nogai (Karakoç 2005).

Pattern D, represented by Shor-A, is characterised by unrestricted LH when trigger and target are front, but when trigger and target are back they must agree in height for LH to occur.

(4) Pattern D

a. Shor-A (Korn 1969, 101)

<table>
<thead>
<tr>
<th></th>
<th>Front</th>
<th>Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>külük-tö</td>
<td>‘at the brave man’s’</td>
<td>ug-ar  (*ug-or) ‘which will grasp’</td>
</tr>
<tr>
<td>sös-töy</td>
<td>‘from the word’</td>
<td>pol-zo</td>
</tr>
<tr>
<td>mün-üp</td>
<td>‘having mounted’</td>
<td>kuš-tun  ‘of the bird’</td>
</tr>
<tr>
<td>kök-tün</td>
<td>‘of the sky’</td>
<td>coñ-nüŋ</td>
</tr>
</tbody>
</table>

b. Trigger-target Front Back

<table>
<thead>
<tr>
<th></th>
<th>high-low</th>
<th>low-low</th>
<th>high-high</th>
<th>low-high</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
</tr>
</tbody>
</table>

c. Shor-A is the only example of this pattern.

Pattern E, exemplified by Yakut, is characterised by displaying LH when the target

3 According to Korn (1969), Shor optionally displays LH in case the trigger vowel is low and the target vowel is high, and both are back: coñ-nüŋ ~ coñ-niŋ ‘of the people’. I treat optionality here as variation that results from two different grammars (or in this case two phonologies); on co-phonologies, see e.g. Orgun (1996), Inkelas (1998), Anttila (2002, 2007), Inkelas & Zoll (2007). Thus, Shor-A shows LH when the trigger is low and the target high (and both are back) (Pattern D), and Shor-B disallows for it in this configuration (Pattern E). I assume that both descriptions are correct and treat them as two separate dialects; crucial here is that any analysis should be able to capture both patterns.
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is high (as in Pattern A), but also when both trigger and target are low, irrespective of whether the vowels are front or back. The only configuration where LH fails is when the trigger is high and the target is low.

(5) Pattern E

a. Yakut (Krueger 1962, 73-74)

<table>
<thead>
<tr>
<th>Front</th>
<th>Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>künnük-ter</td>
<td>kuul-lar</td>
</tr>
<tr>
<td>(*künnük-tör)</td>
<td>(*kuul-lor)</td>
</tr>
<tr>
<td>börö-lör</td>
<td>o yö-lor</td>
</tr>
<tr>
<td>‘window-PL’</td>
<td>‘sack-PL’</td>
</tr>
<tr>
<td>tübbüg-ü</td>
<td>murun-u</td>
</tr>
<tr>
<td>‘window-ACC’</td>
<td>‘nose-ACC’</td>
</tr>
<tr>
<td>börön-ü</td>
<td>ox-u</td>
</tr>
<tr>
<td>‘wolf-ACC’</td>
<td>‘arrow-ACC’</td>
</tr>
</tbody>
</table>

b. Trigger-target

<table>
<thead>
<tr>
<th>Front</th>
<th>Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>high-low</td>
<td>✗</td>
</tr>
<tr>
<td>low-low</td>
<td>✓</td>
</tr>
<tr>
<td>high-high</td>
<td>✓</td>
</tr>
<tr>
<td>low-high</td>
<td>✓</td>
</tr>
</tbody>
</table>

c. Pattern E is also observed in Altai-A (Dyrenkova 1940).  

Pattern F, exemplified by Kazakh, shows that when trigger and target are both front, LH occurs irrespective of height. When trigger and target are back, LH is observed when the target is high, but it fails when the target is low.

(6) Pattern F

a. Kazakh (Korn 1969, 101; Menges 1947)

<table>
<thead>
<tr>
<th>Front</th>
<th>Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>üj-dö</td>
<td>kul-da</td>
</tr>
<tr>
<td>‘house-LOC’</td>
<td>‘at the servant’</td>
</tr>
<tr>
<td>köl-dö</td>
<td>son-dan</td>
</tr>
<tr>
<td>‘lake-LOC’</td>
<td>(*son-don)</td>
</tr>
<tr>
<td>üj-dü</td>
<td>kul-du</td>
</tr>
<tr>
<td>‘house-ACC’</td>
<td>‘servant-ACC’</td>
</tr>
<tr>
<td>köl-dü</td>
<td>koy-du</td>
</tr>
<tr>
<td>‘lake-ACC’</td>
<td>‘sheep-ACC’</td>
</tr>
</tbody>
</table>

4I have found two descriptions of Altai. Altai-A is from Vaux (1993), who identifies Dyrenkova’s (1940) description of Altai as a case, in which LH only fails to occur when trigger is high and target is low, irrespective of the front-back dimension (Pattern E). Altai-B is from Korn’s (1969) description, in which LH only fails in the configuration of a high trigger and low target when they are both back (Pattern G).
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b. Trigger-target  Front  Back
<table>
<thead>
<tr>
<th></th>
<th>Front</th>
<th></th>
<th>Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>high-low</td>
<td>✓</td>
<td></td>
<td>✗</td>
</tr>
<tr>
<td>low-low</td>
<td>✓</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>high-high</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>low-high</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

c. Pattern F is also observed in Chulym Tatar (Korn 1969), Karakalpak (Menges 1947).

Pattern G, attested in Altai-B, shows LH in most configurations; the only configurations in which LH fails is when trigger and target are back, and the trigger vowel is high and the target vowel is low.

(7) Pattern G
a. Altai-B (Korn 1969, 101)

<table>
<thead>
<tr>
<th></th>
<th>Front</th>
<th>Back</th>
</tr>
</thead>
</table>
| kün-dö | 'in the day'   | uč-ar (*uč-or) 'which will fly'
| kös-tör | 'eyes'         | kol-do 'from the hand'
| kün-du | 'day-ACC'      | tud-un 'to restrain, o.s.'
| köl-dü | 'lake-ACC'     | ton-du 'fur coat-ACC'

b. Trigger-target  Front  Back
<table>
<thead>
<tr>
<th></th>
<th>Front</th>
<th></th>
<th>Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>high-low</td>
<td>✓</td>
<td></td>
<td>✗</td>
</tr>
<tr>
<td>low-low</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>high-high</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>low-high</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

c. Pattern G is also attested in Teleut (Menges 1947), Shor-B (Korn 1969), Kirghiz-A\(^5\) (Herbert & Poppe 1963).

Finally, pattern H is attested in Kirghiz-B; Korn (1969: 101) clearly indicates that a high trigger induces LH on a low target, but does not give an example. This is a case of (optional) unrestricted labial harmony, where LH is not subject to additional constraints.

(8) Pattern H
a. Kirghiz-B (Korn 1969, 100-101)

\(^5\)Again, I have found two sources for Kirghiz. Kirghiz-A is based on Herbert & Poppe’s (1963) description, in which a high trigger will not trigger LH on a low target if they are back vowels (Pattern G). The second description of Kirghiz is from Korn (1969), which includes optional rounding of a low target, in which case it falls, optionally, into Pattern H.
Labial harmony in Turkic and Tungusic languages

<table>
<thead>
<tr>
<th>Front</th>
<th>Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>no example*</td>
<td></td>
</tr>
<tr>
<td>tör-dö</td>
<td>kuš-ko</td>
</tr>
<tr>
<td>ür-dün</td>
<td>ot-ko</td>
</tr>
<tr>
<td>kök-tun</td>
<td>su-nun</td>
</tr>
<tr>
<td></td>
<td>čoro-nun</td>
</tr>
</tbody>
</table>

b. Trigger-target  | Front | Back |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>high-low</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>low-low</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>high-high</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>low-high</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

c. Pattern H is also attested in Turkmen (Clark 1998).

The genealogical relations of the Turkic languages (based on their genealogy listed in Ethnologue) are represented below, with the major branches (underlined) indicated in each language family. It should be noted that the number of languages within each branch is not necessarily exhaustive.

(9) Turkic languages

a. Urum

b. Bolgar: Chuvash (*No LH*; Čaušević 2002)

c. Eastern: Ainu (*No LH*; Itô 1984), Uyghur, Uzbek

d. Northern: Altai, Teleut, Kachin Khakas, Kyzyl Khakas, Shor, Tuvan, Yakut

e. Southern: Crimean Tatar

i. Azerbaijani: Azerbaijani

ii. Turkish: Turkish

iii. Turkmenian: Turkmen

f. Western:

i. Aralo-Caspian: Karakalpak, Kazakh, Kirghiz, Nogai

ii. Ponto-Caspian: Karačay

iii. Uralian: Chulym Tatar, West-Siberian Tatar

In contrast, Tungusic languages show much less variation: the overwhelming pattern is that labial harmony only occurs when both trigger and target are low. In addition, whilst in Turkic languages we observed (unrestricted) palatal harmony, in that trigger

*Though he does not give any example, Korn (1969: 100) indicates in the text and accompanying table that high front triggers cause rounding on low targets.
and target always have the same value for front/back, most Tungusic languages do not have palatal harmony. Instead, Advanced Tongue Root (ATR) or Retracted Tongue Root (RTR) harmony is observed; that is, trigger and target have the same value for the feature ATR or RTR (Li 1996, Zhang 1996). For the purpose of this paper, I conflate ATR and RTR into ‘Tongue Root Harmony’ (TRH) (cf. Zhang 1996, Dresher & Zhang 2005).

Mongolic languages behave by and large the same as Tungusic with regard to vowel harmony, the significant difference being that the high front vowels /i, ù/ in Tungusic block LH whilst in Mongolic they are ignored in LH. Unfortunately, space limitations prohibit me from a discussion of the similarities and differences between Tungusic and Mongolic (see Author 2015), and in the remainder of this paper, I ignore the discrepant behaviour of the high front vowels and treat Tungusic and Mongolic languages as belonging to the same category.

The main pattern in Tungusic and Mongolic is Pattern I, where, in order for LH to occur, both trigger and target must be low.\(^7\) For high target vowels, Li (1996) clearly states that these never alternate for labiality, but does not offer examples of all configurations. Rather, suffixes divide into two categories: those that are inherently round (e.g. the derivational suffix -ruk/ -rūk) and those that are inherently unrounded (e.g. the derivational suffix -xi / -xt). Below, we see (+)ATR roots on the left and non-ATR roots on the right:

\[(10) \text{ Pattern I} \]

\begin{itemize}
  \item \textbf{ATR}
    \begin{itemize}
      \item Baiyinna Orochen (Li 1996, 129)
      \begin{itemize}
        \item \text{bəjʊ(n)-kʊ} (\text{*bəjʊ(n)-kə}) ‘elk hide’
        \item \text{oolo-mo} ‘who likes to cook’
        \item \text{no ex.}
        \item \text{no ex.}
      \end{itemize}
    \end{itemize}
  \item \textbf{non-ATR}
    \begin{itemize}
      \item \text{ʊm-ma} (\text{*ʊm-mə}) ‘who likes to drink’
      \item \text{sənə-мо} ‘who likes to weep’
      \item \text{no ex.}
      \item \text{dəlbə-ӷ} (\text{*dəlbə-ӷə}) ‘to spend night’
    \end{itemize}
\end{itemize}

\(^7\)Again, the label ‘low’ stands in opposition to ‘high’ and refers to any non-high vowels.
Labial harmony in Turkic and Tungusic languages

b. Trigger-target | Front | Back
---|---|---
high-low | ☒ | ☒
low-low | ☑ | ☑
high-high | ☒ | ☒
low-high | ☒ | ☒


Pattern I is also attested in the following Mongolic languages: Khalkha Mongolian (Svantesson et al. 2005), Daur (Wu 1996), Shuluun Höh (Dobu 1983, cited in Svantesson (1985), Svantesson et al. (2005)), Huzhu Tu (Wu 1994).

The remaining pattern of Tungusic languages that have any LH is attested in Sibe and Sanjiazi Manchu. It should be noted here that in these languages vowel harmony is marginal, with only a handful of suffixes that are involved in harmonic alternations. For instance, the non-self-perceived immediate past tense suffix in Sibe alternates between a rounded vowel [u] and an unrounded vowel [i] (Li 1996, 202).

(11) a. tixi ‘to sit-PST’ b. utuxu ‘to dress-PST’
   dzi-xi ‘to come-PST’ ürü-xu ‘to rent-PST’
   sav-ɣi ‘to see-PST’ tə-ɣu ‘to curse-PST’
   türk-ɣi ‘to watch-PST’ gö-ɣu ‘to hit (the target)-PST’

For low target vowels, Li (1996, 200) clearly states that “vowels other than /u/ and /i/ do not alternate”, but again does not offer examples of all configurations. The pattern is similar to that of Turkish (Pattern A), where a high target undergoes LH, irrespective of the height of the trigger vowel.

(12) Pattern A
  a. Sibe (Li 1996, 202-203)

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8The velar/uvular [x]/[χ] fricative alternation is conditioned by (non-)adjacent high/non-high vowels, respectively (Li 1996:202).

9More accurately, it is a subset of the Turkish pattern; see section 5.2.
Labial harmony in Turkic and Tungusic languages

<table>
<thead>
<tr>
<th>front root</th>
<th>back root</th>
</tr>
</thead>
<tbody>
<tr>
<td>no ex.</td>
<td>suxu-maq</td>
</tr>
<tr>
<td>no ex.</td>
<td>tő-mätci</td>
</tr>
<tr>
<td>türü-xu</td>
<td>*suxu-mać</td>
</tr>
<tr>
<td>gő-γu</td>
<td>*tő-mätci</td>
</tr>
</tbody>
</table>

b. Trigger-target Front Back

<table>
<thead>
<tr>
<th></th>
<th>Front</th>
<th>Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>high-low</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>low-low</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>high-high</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>low-high</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

c. Pattern A is also attested in the Tungusic language Sanjiazi Manchu (Li 1996).

The geneological relations of the Tungusic languages (13) and Mongolic languages (14), again based on Ethnologue, are represented below. As before, the major branches in each family are underlined, the list of languages within each branch is not necessarily exhaustive.

(13) Tungusic languages

a. Northern:
   i. Even: Even (No LH; Aralova 2015)
   ii. Evenki: Solon, Baiyinna Orochen, Xunke Orochen, Literary Evenki
   iii. Negidal: Negidal (No LH; Campbell 2000)

b. Southern:
   i. Southeast:
      – Nanaj: Ulch
      – Udihe: Oroch
   ii. Southwest: Classical Manchu, Sibe, Sanjiazi Manchu

(14) Mongolic languages

a. Eastern:
   i. Dagur: Daur
   ii. Monguor: Huzhu Tu
   iii. Oirat-Khalkha:
      – Khalkha-Buriat:
         - Buriat: Buriat (Campbell 2000)
         - Mongolian Proper: Khalkha Mongolian, Shuluun Höh
– Oirat-Kalmyk-Darkhat: Kalmyk (No VH; Bläsing 2003)

b. Western: Mogholi (No VH; Weiers 2003)

Based on these nine patterns, we observe that there are two types of configurations that seem to most commonly allow for labial harmony (cf. Kaun 1995). Firstly, LH often occurs when trigger and target have something in common, such as both being high, or both being front. Secondly, LH often occurs when the target vowel is high (without the trigger being necessarily high as well). These two observations are implemented here as ‘bridge’ licensing (Charette & Göksel 1994; cf. Steriade 1981, on homogeneous rounding harmony as well as parasitic harmony; see also Cole & Trigo 1988), and ‘asymmetric’ licensing, respectively.

Having shown the diversity of conditions under which LH occurs, in the following section I introduce the framework in which the paper is couched.

3 Radical cv Phonology

In Radical cv Phonology (RcvP; Van der Hulst 2005, 2012), which is based on Dependency Phonology (DP; Anderson & Ewen (1987)) and Government Phonology (GP; Kaye et al. 1985), the different behaviour of different segments is built directly into their phonological representation. Segments are composed of smaller atoms, called elements. RcvP recognizes only two such atoms: a consonant- or onset-oriented (consonantal) element |C| and a vowel- or rhyme-oriented (vocalic) element |V| (Van der Hulst 2012). Furthermore, RcvP uses a feature geometry involving three class nodes (tone, aperture and color), each of which contains exactly two elements. Vertical lines indicate headedness, and slanted lines indicate dependent status; as such, aperture and color are in a head-dependency relationship, as are aperture and tone.

(15)
In each class node, |C| and |V| receive a different interpretation; as such, each of the six elements in (15) is distinctive. However, for ease of exposition, separate symbols for each of the six terminal elements in (15) are used; as such, the diagram in (16) only differs notationally from (15).

\[ (16) \]

\[
\text{tone (laryngeal)} \quad \mid \quad [L,H] \quad \mid \quad \text{aperture (manner)} \quad \mid \quad \text{color (place)} \quad \mid \quad [V,A] \quad \mid \quad [I,U] \]

The use of this feature geometry is partly supported in Odden (1991), who argues in favour of a single Height node, composed of the features \{low\}, \{ATR\} and \{high\} (the three of which would correspond to the aperture node), and a Back-Round node (corresponding to color) (see also Goad 1993).

The four elements that are relevant in the composition of vowels are |A|, |∀|, |I|, and |U|.\(^{10}\) As is characteristic of all models that employ elements, these melodic primes are single-valued in that the property they represent can be present or absent, rather than a value; as such, there is no sense in which \(-\text{A}\) can exist.\(^{11}\) These elements can occur as heads or dependents, and, as such, they have a ‘dual interpretation’, one as heads and one as dependents (van der Hulst 1988):

\[ (17) \]

<table>
<thead>
<tr>
<th>Element</th>
<th>Head</th>
<th>Dependent</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>/a/</td>
<td>‘low (or retracted)’</td>
</tr>
<tr>
<td>∀</td>
<td>/i/</td>
<td>‘high (or ATR)’</td>
</tr>
<tr>
<td>U</td>
<td>/u/</td>
<td>‘round’</td>
</tr>
<tr>
<td>I</td>
<td>/i/</td>
<td>‘front’</td>
</tr>
</tbody>
</table>

When an element occurs on its own (head), it constitutes a complete segment (Kaye et al. 1985), and I take a dependent to be a ‘defining property’ of its corresponding head; as such, a dependent is a subset of its head. For the purposes of this paper, the distinction

\(^{10}\) The laryngeal class node is not discussed further in this paper.

\(^{11}\) A discussion on the merits and disadvantages of single-valued primes falls outside the scope of this paper, see e.g. van der Torre (2003, section 2.1) for a brief discussion.
between head and dependent is not fundamental to the argument, and I abstract away from it (but see Van der Hulst 2012 for a discussion of headedness in RcvP).

With regard to the elemental make-up of vowel inventories, counter to RcvP, I assume an approach of full specification of vowels, with no underspecification. Specifically, I assume that if an element is ‘identifiable’ with a segment, it is present in the lexical representation of that segment, where I assume that an element is identifiable with a segment if its properties match those of the phonetics of the vowel. To show this, consider a three-vowel system containing /a, i, u/, which would be represented as follows:  

\[
\begin{array}{ccc}
/a/ & /i/ & /u/ \\
A & \forall & \forall \\
I & U \\
\end{array}
\]

In (18), /a/ has the property of being low, and as such it is identifiable with the (low) element \(|A|\). Similarly, /i/ is high (and ATR) and front, and /u/ is high (and ATR) and round. In the following section, I will discuss more complex systems.

Finally, it should be noted that the majority of work in DP/GP (Polgárdi 1998, Pöchtrager 2010, Botma & Smith 2011, Backley 2011 i.a.) employs three instead of four elements: \(|I, U, A|\). Thus, whilst the elements \(|A, I, U|\) are relatively uncontroversial in these frameworks, \(|\forall|\) is more contentious/debatable. Whilst a full discussion of the comparison between using three versus four elements falls outside the scope of this paper, we will see in section 4.2 that a theory which makes use of three elements runs into empirical problems, in that it cannot straightforwardly describe the range of variation in Turkic languages presented above. With regard to theoretical considerations, I refer the reader to van der Hulst (2015b), who discusses the justification of \(|\forall|\) in RcvP.

### 3.1 Vowel harmony in RcvP

Before turning to labial harmony, I discuss the more straightforward case of palatal harmony in Turkish to show how vowel harmony is modelled. Recall that in Turkish,

\[^{12}\text{In the following I use the shorthand in (18), but the elements are positioned in the feature geometry represented in (15).}\]

\[^{13}\text{Note that I conflate the distinction between head and dependent, and as such, I remain agnostic on whether /a/ contains |A| as a head or dependent; crucial here is that /a/ minimally contains the property of being low.}\]
Labial harmony in Turkic and Tungusic languages

Affixes agree in frontness with the roots; that is, a front root is followed by a front affix, and a back root is followed by a back affix. For instance, the Turkish plural suffix (19) alternates between front [-ljer] and back [-lar], but the fact that the morpheme always contains a non-high vowel is invariant (Clements & Sezer 1982:216).

(19)

<table>
<thead>
<tr>
<th>Palatal roots</th>
<th>Non-palatal roots</th>
</tr>
</thead>
<tbody>
<tr>
<td>ip-ljer 'rope-PL’</td>
<td>kiz-lar ‘girl-PL’</td>
</tr>
<tr>
<td>yüz-ljer ‘face-PL’</td>
<td>pul-lar ‘stamp-PL’</td>
</tr>
<tr>
<td>elj-ljer ‘hand-PL’</td>
<td>sap-lar ‘stalk-PL’</td>
</tr>
<tr>
<td>kjöy-ljer ‘village-PL’</td>
<td>son-lar ‘end-PL’</td>
</tr>
</tbody>
</table>

In RcvP, invariable occurrences of particular vowels (i.e. non-harmony) are encoded directly into the phonological representation as a vocalic head containing an element. In contrast, alternations (i.e., harmony) are represented by remaining un(der)specified at the level of the lexicon (cf. Steriade 1981). Specifically, the alternation is represented by a variable element “(X)” that is encoded as such in the phonological representation of lexical items. The parentheses indicate that the element is variable, and that it can be ‘laterally licensed’ (van der Hulst 2015a,b).

(20) Lateral licensing: A variable element “(X)” is licensed by a preceding/following occurrence of X.

When a variable element is (laterally) licensed it effectively is granted the same status as an invariable lexically present element, leading to phonetic interpretation and realisation. In contrast, when a variable element fails to be licensed, it is invisible and remains unexpressed phonetically. The Turkish plural morpheme then is represented by a single underlying representation, and its surface realisation with or without ‘frontness’ depends on whether the variable palatal element [I] is licensed or not. Specifically, the vowel of the Turkish plural morpheme invariably contains the element [A] indicating it is a non-high vowel, but it contains the palatal element [I] as a variable.15

---

14 Note that licensing here refers specifically to lateral licensing as defined in (20), and does not refer to other types of licensing used in linguistic theory.

15 I restrict myself to the representation of vowels, since the internal structure of consonants is orthogonal to the paper (see van der Hulst 2015b for an elemental representation of consonants).
Labial harmony in Turkic and Tungusic languages

(21) -lAr
   A
   (I)

In (22), we see a step-wise derivation of palatal licensing in *ip-ljer ‘rope-pl’*. In (22a), the input is a root vowel that is high and front, which, as such, contains the high element |∀| and the front element |I| invariantly; the suffix has the representation in (21). Then, the variable front element in the suffix is licensed by the front element in the root per (20), visualised by “≫” (22b). The licensing of the variable front element leads to the phonetic interpretation of this element, and the morpheme is realised with a front vowel -[ljer] (22c).

(22) a. ip -lAr b. ip -lAr c. ip -ljer
    ∀   A   ∀   A   ∀   A
    I   (I)   I   ≫   (I)   I   I

In contrast, in *kiz-lar ‘girl-pl’*, the input is a root vowel that is back and, as such, does not contain |I| (23a). In consequence, no lateral licensing occurs in the suffix, and the variable element is rendered invisible and remains uninterpreted phonetically, leading to a back realisation [-lar] (23b).

(23) a. kiz -lAr b. kiz -lar
    ∀   A   ∀   A
    (I)

In the following, I use a shorthand representation, and for successful lateral licensing I only depict step (b) in (22), and for unsuccessful lateral licensing I depict step (a) in (23).

Finally, the current account requires target and trigger to be adjacent at the vocalic tier (contra e.g. Nevins 2010, Kimper 2011). That is, licensing relations in RcvP are absolutely local (cf. van der Hulst & Smith 1986, who adopt absolutely locality for spreading), and cannot apply across a vowel (rhymal head). In a word such as *ev-ler-imiz-de ‘house-PL-1.PL.POSS-LOC’*, the front element in the root licenses the variable front element in the first suffix, which, once licensed, in turn licenses the variable front element in the next suffix, and so on.
In section 5.1, I include a brief discussion on the strict locality espoused in RcvP.

4 Turkic languages

In this section, I discuss the various patterns under which LH is licensed in Turkic languages, identified in section 2, and offer an analysis cast in RcvP. Firstly, the vowel inventory of Turkic languages is fairly uniform, represented in (25), and holds for all Turkic languages discussed here.

(25) i ü i u
e o a o

If we exclusively base the elemental make-up of the vowel inventory on whether an element is identifiable with a vowel, then we would have the following in (26), which will be revised in (30):

(26) Turkic vowel make-up (preliminary)
i e ü o u o i a
\forall \forall \forall \forall A
I I I I
U U U U

With regard to aperture, the high vowels /i, ü, u, i/ contain \(|\forall|\), and the low vowel /a/ contains \(|A|\). With regard to color, the front vowels /i, e, ü, ö/ contain \(|I|\), and the round vowels /ü, ö, u, o/ contain \(|U|\). However, the mid vowels, being neither high nor low, are not immediately associated with an aperture element. Though phonological behaviour does not necessarily mimic the phonetics (Dresher 2009, i.a.), this still creates the somewhat unintuitive situation where, e.g., a vowel that exclusively contains the front element \(|I|\) is realised as /e/. Focussing here exclusively on Turkic languages, I propose that all vowels are required to have an aperture element. We can formulate this in an inventory constraint that applies to the aperture node of vowels in the Turkic languages.\footnote{Cf. Van der Hulst’s (2012) constraints.}
Labial harmony in Turkic and Tungusic languages

(27) Aperture: $\neg\emptyset$

This constraint forces the aperture node to contain either $\vert A \vert$ or $\vert \forall \vert$, depending on the compatibility between segment and element.

Recall from the diagram in (15) that aperture is the head class node, and (27) would then be an instance where, in Turkic languages, a head cannot remain empty. In (26), the elemental representations of the mid vowels do not conform and require a repair in order to accommodate to (27). We are then faced with three possibilities: (i) the mid vowels, since they are not incompatible with high/ATR, contain $\forall$ (28i), (ii) the mid vowels, since they are not incompatible with low, contain $\vert A \vert$ (28ii), and (iii) the mid vowels contain both $\vert \forall \vert$ and $\vert A \vert$ (28iii).

\[
\begin{array}{c@{}c@{}c@{}c}
\text{i. } e & \ddot{o} & o & \\
\text{\forall} & \text{\forall} & \text{\forall} \\
\text{I} & \text{I} & \text{I} \\
\text{U} & \text{U} & \text{U} \\
\end{array}
\quad \begin{array}{c@{}c@{}c@{}c}
\text{ii. } e & \ddot{o} & o & \\
\text{\forall} & \text{\forall} & \text{\forall} \\
\text{A} & \text{A} & \text{A} \\
\text{I} & \text{I} & \text{I} \\
\text{U} & \text{U} & \text{U} \\
\end{array}
\quad \begin{array}{c@{}c@{}c@{}c}
\text{iii. } e & \ddot{o} & o & \\
\text{\forall} & \text{\forall} & \text{\forall} \\
\text{A} & \text{A} & \text{A} \\
\text{I} & \text{I} & \text{I} \\
\text{U} & \text{U} & \text{U} \\
\end{array}
\]

The representations in (28i) are problematic, since they conflate the mid vowels with their high counterparts: the elemental make-up of, e.g., $/e/$ in (28i) is identical to that of $/i/$ in (30). This leaves us with the representations in (28ii) and (28iii). The crucial difference between the two is that (28ii) has the natural classes of the aperture elements as in (29a), whilst the natural class of aperture on the basis of (28iii) is in (29b).

\[
\begin{array}{c@{}c@{}c@{}c}
\text{a. } & \vert \forall \vert: & /i, \ddot{u}, u, i/ \\
\text{\quad \vert A \vert: } & /e, \ddot{o}, o, a/ \\
\text{b. } & \forall \vert: & /i, e, \ddot{u}, \ddot{o}, u, o, i/ \\
\text{\quad \vert A \vert: } & /e, \ddot{o}, o, a/ \\
\end{array}
\]

I suggest that (28ii) is the preferred option, since the phonological behaviour of vowel harmony in Turkic languages makes (29a) a better natural class of $\forall$ than (29b) (cf. van der Hulst 2015a, Dresher 2009). Thus, we arrive at the following elemental

---

17For simplicity, I do not indicate headedness within the aperture class node; cf. van der Hulst 2015a.
18Clearly, though, additional support from phonological processes other than vowel harmony for the preference of (29a) over (29b) needs to be established in order for the argument not to be circular; at this stage, I leave this to future research. Another possibility that may favour (29a) over (29b) is that of some sort of economy, since in (29a) one element is introduced, whilst in (29a) two elements are introduced.
make-up of the vowels in Turkic languages: 19

(30) Turkic vowel make-up (final)

\[
\begin{array}{ccccccc}
i & e & \ddot{u} & \ddot{o} & u & o & i & a \\
\forall & A & \forall & A & \forall & A & \forall & A \\
I & I & I & I & & & U & U & U
\end{array}
\]

Turning to labial harmony, I now discuss the patterns that facilitate LH in Turkic languages introduced in section 2.

4.1 Licensing labial harmony

Bridge licensing (BL), introduced by Charette & Göksel (1994, 1996), refers to the configuration where trigger and target agree for some element X. Assuming that agreeing for an element (indicated by underlining in (31)) enhances a lateral licensing relation, it thus facilitates LH (see also Kaun 2004, i.a., for phonetic considerations favouring equal high harmony). That is, the lateral licensing relation of the variable labial element |U| is facilitated by trigger and target sharing some element X (other than |U|):

(31) Bridge licensing

\[
\begin{array}{c}
X_i \\
\gg
\end{array}
\begin{array}{c}
X_j \\
U
\end{array}
\]

Leaving aside Pattern A for the moment, consider Pattern B, in which the only configuration in which we observe LH is when trigger and target are both high: \(\text{kûn-niû} ‘\text{day-ACC}’\) and \(\text{kùs-tu} ‘\text{of the bird}’\). In (32), we see that the root vowel /\ddot{u}/ contains the

---

19It should be noted that given the dual nature of |∀|, we could divide the Turkic vowel inventory as follows, where |∀| picks out ‘ATR’ vowels rather than ‘high’ vowels:

\[
\begin{array}{ccccccc}
i & i & e & \ddot{u} & \ddot{o} & u & o & i & a \\
\forall & \forall & \forall & \forall & \forall & \forall & \forall & \forall & A \\
I & I & I & I & & & U & U & U
\end{array}
\]

In a second step, in order to differentiate ‘ATR’ vowels with the same color elements, such as /i/ and /e/, vowels that are not incompatible with the element |A|, the mid vowels, contain that element (cf. the Baiyinna Orochen vowel inventory discussed in section 5). This, however, leads to a situation similar to (29b), and is again dispreferred compared to (29a), given the phonological generalisations concerning vowel harmony.
Labial harmony in Turkic and Tungusic languages

high element |∀|, the front element |I| and the round element |U| in its lexical representation, whilst the suffix contains only |∀| lexically, but |I| and |U| are variable, since the suffix (potentially) undergoes palatal and labial harmony, respectively. As mentioned above, palatal harmony in Turkic languages is unrestricted and thus lateral licensing suffices, where the variable element “(I)” is licensed by a preceding occurrence of |I|. In contrast, given that LH is only observed when both trigger and target are high, labial harmony in Pattern B is not unrestricted and therefore subject to the additional constraint that it must be licensed by a bridge, specifically an |∀|-bridge (since only high vowels participate in LH). In what follows, I indicate bridges by underlining. Similarly, in (33), labial harmony is licensed by trigger and target both containing |∀| (there is no palatal harmony).

\[
\begin{array}{c}
(32) \quad \text{k"un} & -n\ddot{u} \\
& |I| \gg (I) \\
& |U| \gg (U) \\
\end{array}
\quad \begin{array}{c}
(33) \quad \text{ku\u0161} & -tu\ddot{u} \\
& |I| \gg (I) \\
& |U| \gg (U) \\
\end{array}
\]

When trigger and target are not both high, LH fails in Pattern B, as in for instance čör-gen ‘who went’. In (34), we see that palatal harmony, not restricted by additional constraints, is observed, but variable |U| remains unlicensed, since the additional requirement of an |∀|-bridge is not met, and LH fails to be observed (indicated by the absence of “\(\gg\)” at the labial element line).

\[
\begin{array}{c}
(34) \quad \text{čör} & -\text{gen} \\
& A \quad A \\
& |I| \gg (I) \\
& |U| \quad (U) \\
\end{array}
\]

In a similar vein, in Pattern C, LH is observed when trigger and target are both high, but, in contrast to Pattern B, also when trigger and target are both front. In (35), we see the same |∀|-bridge as in Pattern B, but in (36), we see that an |I|-bridge also licenses LH in Pattern C (cf. (34) in Pattern B, in which LH is not licensed by an |I|-bridge).
Labial harmony in Turkic and Tungusic languages

Pattern D also displays a BL pattern: LH is observed when trigger and target are both high (|∀|-bridge), or when trigger and target are both front (|I|-bridge), or when they are both low (|A|-bridge). As such, the only two configurations where LH is not observed are when (i) the trigger vowel is back and high and the target vowel is back and low (37), and (ii) the trigger vowel is back and low and the target vowel is back and high (38), exactly the two configurations in which no bridge is possible, since trigger and target have no elements in common, other than the harmonic element |U|.

Returning to Pattern A, however, we see that LH cannot (only) be licensed by a bridge configuration; crucially, the fact that a back high affix undergoes LH when the trigger vowel is back and low, son-un ‘end-GEN’, shows that this LH cannot stem from BL, as trigger and target have no element in common that could serve as a bridge.

Rather, what we observe in Pattern A is the preference for high targets to undergo LH (Kaun 1995, 2004, i.a.). At this stage, I propose the hypothesis of asymmetric licensing (AL), which stipulates that the |∀|-element, when present in the target, licenses LH (indicated by underlining of |∀| in the target):

\[
\text{(39) } \begin{array}{c}
\text{son} \\
\begin{array}{cc}
|A| & \forall \\
U & (U)
\end{array}
\end{array}
\]

At this point, AL is a pure stipulation, but see section 4.2 for some discussion.
As such, in Pattern A, we see that when a trigger vowel is low, LH can still be saved if the target vowel is high, crucially containing $|\forall|$, which, per the hypothesis in (40), facilitates LH.21

\[
\begin{align*}
(41) & \quad \text{son} & \text{-un} \\
& \quad A & \forall \\
& \quad U \gg (U)
\end{align*}
\]
\[
\begin{align*}
(42) & \quad \text{kjöy} & \text{-ün} \\
& \quad A & \forall \\
& \quad I \gg (I) \\
& \quad U \gg (U)
\end{align*}
\]

It is important to stress here, that asymmetric licensing facilitates labial harmony, and does not license the variable element directly; as such, when the trigger does not contain a labial element $|U|$, LH is not observed, as in the form *kiz*-in ‘girl-gen’:

\[
\begin{align*}
(43) & \quad \text{kiz} & \text{-in} \\
& \quad \forall & \forall \\
& \quad (U)
\end{align*}
\]

When the target vowel is low in Pattern A, LH also fails, irrespective of whether trigger and target share any other elements, such as $|A|$ (44) or $|I|$ (45).

\[
\begin{align*}
(44) & \quad \text{son} & \text{-lar} \\
& \quad A & A \\
& \quad U \gg (U)
\end{align*}
\]
\[
\begin{align*}
(45) & \quad \text{yüz} & \text{-ljer} \\
& \quad \forall & A \\
& \quad I \gg (I) \\
& \quad U \gg (U)
\end{align*}
\]

Note that languages are subject to cross-linguistic variation as to whether BL and/or AL are active, and in the case of BL, which element serves as a bridge. Indeed, Patterns B, C and D make use of exclusively BL, and Pattern A only shows AL, but most patterns identified in section 2 employ a combination of both. In Pattern E, we saw LH when (i) trigger and target are both low, or when (ii) the target vowel is high, which translates into LH being licensed by an $|A|$-bridge (i) or AL. In Pattern F, LH occurs when (i) trigger and target are both front, or when (ii) the target vowel is high: LH licensing by $|I|$-bridge or AL. In Pattern G, LH is observed when both trigger and target are front ($|I|$-bridge), when both trigger and target are low ($|A|$-bridge) or when the target vowel is high (AL). Finally, in Pattern H, LH is observed in all configurations, which can be

\[\text{21In high trigger and high target configurations, the licensing mechanism that facilitates LH is ambiguous between AL and an $|\forall|$-bridge; see also section 4.2.}\]
characterised as unrestricted LH, where no additional restrictions hold for LH.

4.2 Discussion

In the above section I have proposed that we can account for the variation in LH in Turkic languages through a combination of BL and AL. However, a couple of assumptions made in the analysis warrant further discussion, and it is to this which I turn to now. Firstly, the typology discussed in the previous section supports a framework which incorporates four rather than three elements (see also Author 2012). Notably, the patterns involving an |∀|-bridge are unstatable as bridge constraints in standard DP/GP, since there is no element |∀|. Rather, in such an approach, high vowels are considered to contain no aperture element at all (adapted from Charette & Göksel 1996):22

\[(46) \quad i \quad ü \quad i \quad u\]

\[
\begin{array}{ccc}
I & I & \\
U & U & \\
\end{array}
\]

Given that high vowels do not contain any aperture element, standard DP/GP cannot account for Pattern D, in which LH is observed in high-high configurations (47), but not in low-high configurations (48), by drawing on a bridge (the same argument holds for Patterns F and G). The only way to derive the difference between the two is to assume that |A| in the trigger prohibits LH in (48) - whilst this is possible, it introduces a new mechanism of ‘prohibiting’ LH rather than ‘facilitating’ LH, and fails to unify the diversity of LH conditions under a single mechanism.23

\[(47) \quad kuš \quad -tuğ \quad (48) \quad ok- \quad -tiğ\]

\[
\begin{array}{ccc}
U & (U) & \\
A & U & (U) \\
\end{array}
\]

Secondly, I turn to the stipulative nature of AL, the ability of a high target to license LH without the need for a bridge. Kaun (1995, 2004) has argued on articulatory and perceptual considerations that high targets are better than non-high targets and non-high triggers are better than high triggers (see also Suomi 1983, Walker 2005, Finley &

22The representation of the vowels in (46) is simplified for clarity: headedness is not included, and the presentation is adjusted to that discussed here.

23Many thanks to Markus Pöchtrager for discussion on this point.
Badecker 2008, Finley 2008). Following Kaun, I assume that phonetic principles can be encoded as phonological conditions, such as AL. Specifically, Kaun argues that high targets are better than non-high targets, because rounded high vowels are articulatorily more rounded and perceptually more salient, and as such maximises the recoverability of rounding on a given vowel. The fact that high vowels are better targets is then translated into the licensing condition that has high targets facilitate LH: AL (40).

This raises the question, if we equate non-high with low, why there is no additional licensing condition ‘asymmetric licensing-2’, whereby non-high (low) triggers facilitate LH, thus capturing the phonetic preference for non-high (low) triggers over high triggers:

\[(49) \text{Hypothetical: Asymmetric licensing 2}\]

\[
\begin{array}{c}
\text{A} \\
\text{U} \\
\end{array}
\Rightarrow \text{(U)}
\]

However, Kaun’s conclusion that non-high vowels are better trigger compared to high vowels rests on the reasoning that high round vowels, because of their labial saliency, are at no risk to be misidentified; in contrast, LH triggered by non-high vowels performs “a more critical function”, since roundedness in non-high vowels is not as salient (Kaun 2004:96). As such, non-high round vowels do not have some phonetic property that makes them good triggers; rather, high round vowels are phonetically enhanced for labiality, which makes them less likely to require LH to further enhance them, which then results in non-high round vowels being good triggers being an epiphenomenon. In other words, given an even distribution, since high round vowels are less likely to be LH triggers, this makes non-high round vowels to be more likely to be LH triggers. The burden of being a good or bad trigger then always lies with high round vowels, which makes the hypothetical licensing statement in (??) not derived from any phonetic principles. Note, also, that, if anything, we would predict that a high trigger

\[24\text{Cf. Jurgec (2011), who, working in Optimality Theory and drawing heavily on Autosegmental Phonology, appeals to constraints on feature heads and maximal headedness to model the observation that non-high vowels are better triggers than high vowels, and high vowels are better targets than non-high vowels.}\]

\[25\text{Finley (2008) shows that English native speakers were able to learn a LH pattern with the mid vowel trigger /o/ but not with the high vowel trigger /u/, supporting that non-high vowels are better triggers; however, this does mean that Kaun’s reasoning is incorrect.}\]
would potentially ‘prohibit’ LH; however, given that the current theory does not adhere to any prohibiting factors, I do assume this would be encoded as a phonological condition.

Finally, I turn to the predictions of the current analysis. Specifically, the mechanisms of BL and AL result in the predicted patterns in (50), given that a bridge for LH can consist of any (combination of) elements other than |U|. The left column indicates the type of bridge (note that the combinations are disjunctive rather than conjunctive), the middle column shows which patterns fall in this category, and the right column shows patterns that make use of the relevant bridge combined with AL. Note that the combination of an |∀|-bridge and AL is indistinguishable from AL only, since an |∀|-bridge is a subset of AL, hence some patterns occur in two cells.26

(50) Overview of LH licensing conditions in Turkic languages

<table>
<thead>
<tr>
<th>Bridge type</th>
<th>without asymmetric licensing</th>
<th>with asymmetric licensing</th>
</tr>
</thead>
<tbody>
<tr>
<td>–</td>
<td>no LH</td>
<td>Pattern A</td>
</tr>
<tr>
<td>A</td>
<td>Pattern E</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Pattern F</td>
<td></td>
</tr>
<tr>
<td>∀</td>
<td>Pattern B</td>
<td>Pattern A</td>
</tr>
<tr>
<td>A, I</td>
<td>Pattern G</td>
<td></td>
</tr>
<tr>
<td>A, ∀</td>
<td>Pattern E</td>
<td></td>
</tr>
<tr>
<td>I, ∀</td>
<td>Pattern F</td>
<td></td>
</tr>
<tr>
<td>A, I, ∀</td>
<td>Pattern G</td>
<td></td>
</tr>
</tbody>
</table>

Two of the four patterns unattested in Turkic languages occur in other languages. An |A|-bridge without AL is Pattern I, observed in many Tungusic and Mongolic languages (see section 2), and I will discuss these in detail in section 5. Yowlumne Yokuts may be an instance of LH being licensed by an |A|-bridge or an |∀|-bridge. The Yowlumne Yokuts vowel inventory consists of high vowels /i, u/ and non-high vowels /a, o/, and LH is observed when trigger and target have the same height (Kenstowicz & Kisseberth 1979). Here I take non-high vowels to contain |A| (in a way similar to the elemental composition of vowels in Turkic; see (30) above), and thus to phonologically pattern as ‘low’ vowels.27

---

26Despite the diversity, there seems to be no example of a language where two bridges are in a conjunctive condition, resulting in e.g. LH only when trigger and target are both high and front. I leave this to future research, noting that perhaps complexity may play a role.

27Crucial here is that Yowlumne Yokuts fits one of the predictions made by the model assumed here,
(51) Pattern J

a. Yowlumne Yokuts (Kenstowicz & Kisseberth 1979)
   dub-al (*dub-ol) ‘might lead by the hand’
   bok’-ol ‘might find’
   dub-hun ‘leads by the hand, non-future’
   bok’-hin (*bok’-hun) ‘finds, non-future’

b. Trigger-target Front Back

<table>
<thead>
<tr>
<th></th>
<th>Front</th>
<th>Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>high</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>low</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>high</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>low</td>
<td>✗</td>
<td>✓</td>
</tr>
</tbody>
</table>

Thus, there remain, as far as we know, two configurations that are unattested:

(52) Overview of attested LH licensing conditions

<table>
<thead>
<tr>
<th>Bridge type</th>
<th>without asymmetric licensing</th>
<th>with asymmetric licensing</th>
</tr>
</thead>
<tbody>
<tr>
<td>−</td>
<td>no LH</td>
<td>Pattern A</td>
</tr>
<tr>
<td>A</td>
<td>Pattern I</td>
<td>Pattern E</td>
</tr>
<tr>
<td>I</td>
<td>Pattern F</td>
<td>Pattern A</td>
</tr>
<tr>
<td>∀</td>
<td>Pattern B</td>
<td>Pattern A</td>
</tr>
<tr>
<td>A, I</td>
<td>Pattern G</td>
<td>Pattern A</td>
</tr>
<tr>
<td>A, ∀</td>
<td>Pattern J</td>
<td>Pattern E</td>
</tr>
<tr>
<td>I, ∀</td>
<td>Pattern C</td>
<td>Pattern F</td>
</tr>
<tr>
<td>A, I, ∀</td>
<td>Pattern D</td>
<td>Pattern G</td>
</tr>
</tbody>
</table>

Leaving aside Pattern I for the moment, we observe that the attested patterns always involve licensing by |∀|. Whilst this is unsurprising in systems that make use of AL as this licensing condition states exactly this, it is striking that in systems that exclusively rely on bridges, |∀| is always involved. Indeed, as briefly mentioned, AL stands in a superset relation to an |∀|-bridge, and then we see that all attested patterns of LH licensing, bar Pattern I, include, at a minimum, an |∀|-bridge. This makes sense if we go back to the observed generalisations based on the Turkic patterns: (i) LH often occurs when trigger and target have an element in common, and (ii) LH often occurs when the target vowel is high. These two observations lead to the following implicational hierarchy with regard to trigger-target aperture licensing LH:

irrespective of whether Pattern J should be expressed as LH being licensed by an |A|-bridge or an |∀|-bridge, or as a bridge type where Aperture elements need to be identical, something along the lines of an ‘Aperture |a|-bridge’.
(53) high-high > low-high, low-low > high-low

High-high is the best configuration for LH, given that (i) and (ii) are satisfied; low-high and low-low each satisfy one generalisation, (ii) and (i), respectively; and high-low is the worst configuration for LH, given that trigger and target have no elements in common and the target is low. Given that ‘high’ and ‘low’ are represented in RcvP as $|\forall|$ and $|A|$, respectively, one way that we can capture this generalisation is to introduce the following as a minimal requirement for LH:

(54) Minimal Requirement Hypothesis (MRH): At a minimum, labial harmony in a language is licensed by an $|\forall|$-bridge.

Note that the MRH holds at the level of LH-licensing in a language and not at the level of a specific configuration; that is, in order for a language to show LH, it is necessary that an $|\forall|$-bridge must be used within that language. This does not mean that every configuration requires an $|\forall|$-bridge to be used in order for LH to occur, rather, it means that before a language utilises other bridges in licensing LH, it must also make use of a $|\forall|$-bridge.

Thus, the MRH correctly rules out the existence of the two unattested patterns in (52), but also incorrectly rules out Pattern I. In the next section I discuss Pattern I in detail and argue that exactly in these languages $|\forall|$ is unavailable, to function either as a bridge or asymmetric licensing, which leads to the necessity of relying on a different type of bridge.

5 Tungusic languages

Firstly, we turn to the elemental make-up of the vowel inventories of Tungusic languages; we again observe that their vowel inventories are fairly uniform, and I take Baiyinna Orochen to be the representative, for which Li (1996) identifies the following vowel inventory:

(55) i i u o
     ø a o ö

Exclusively based on whether an element is identifiable with a vowel, this leads to
the following two possible elemental compositions, where $\forall$ is correlated with high (56) and ATR (57), respectively.

<table>
<thead>
<tr>
<th></th>
<th>(56)</th>
<th>(57)</th>
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<tbody>
<tr>
<td>$\forall$</td>
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</tbody>
</table>

Both configurations are problematic, however, since certain segments have an identical elemental make-up; for instance, in (56) /i/ and /I/ both contain the same elements: $\forall$ and $\forall$, and in (57), /u/ and /o/ are elementally indistinguishable, both only containing $\forall$.

To resolve (56), we could insert the element $\forall$ for the mid vowels, since they are not incompatible with it (cf. Turkic languages above), but this clearly does not resolve the problem of /i/ and /I/ containing the same elements - indeed, neither of the two elements not yet associated with these vowels ($\forall$ and $\forall$) are compatible with it.

In contrast, to resolve the representation in (57), all we need to do is to insert the element $\forall$ for the mid vowels, which are not incompatible with it, and then all segments are elementally distinguishable, as can be seen below, which is the representation I assume for the Tungusic languages represented by Baiyinna Orochen:

<table>
<thead>
<tr>
<th></th>
<th>(58)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\forall$</td>
<td>$\forall$</td>
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<tr>
<td>$\forall$</td>
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</tbody>
</table>

As mentioned in section 2, in addition to LH, Turkic languages display palatal harmony, but Tungusic (and Mongolic) languages display tongue root harmony (TRH). Vowels do not fall into the categories of ‘front’ versus ‘back’, but ‘ATR’ versus ‘non-ATR’, as in the forms below, where the words in the left column all contain ‘ATR’ vowels, and the ones in the right column all contain ‘non-ATR’ vowels.

---

28 Note that, in contrast to Turkic languages, I do not assume a ban on empty Aperture (see (27) above).

29 Ard (1984) assumes the vowel harmony to be relative height in Classical Manchu, but Li convincingly argues that the harmony process involves retraction of the tongue root (see Li 1996: §4.5-4.6). Following Zhang (1996), Dresher & Zhang (2005), I assume that Retracted Tongue Root (RTR) can be reanalysed as Advanced Tongue Root (ATR). As such, I will refer to this type of harmony as TRH, and assume that the element $\forall$ is involved.
Labial harmony in Turkic and Tungusic languages

(59) Baiyinna Orochen (Li 1996, 127-129)

<table>
<thead>
<tr>
<th>‘ATR’ root</th>
<th>‘non-ATR’ root</th>
</tr>
</thead>
<tbody>
<tr>
<td>nalki-xi 'to spend spring'</td>
<td>morm-a ‘horse-indef.ACC’</td>
</tr>
<tr>
<td>ur-o-du ‘mountain-DAT’</td>
<td>brra-dö ‘river-DAT’</td>
</tr>
<tr>
<td>uktu-ruk ‘gun powder container’</td>
<td>amu(n)-rok ‘toilet’</td>
</tr>
<tr>
<td>owon-du ‘pancake-DAT’</td>
<td>dölbö-xi ‘to spend night’</td>
</tr>
</tbody>
</table>

As is the case with palatal harmony in Turkic, TRH in Tungusic languages is not subject to any additional restrictions, such as BL or AL. Whilst palatal harmony was encoded as the lexical presence of a variable \(|I|\), the element involved in TRH is variable \(|∀|\), so the derivational suffix [-xi]/[-xl] is represented with an invariable \(|I|\) since it is front but with a variable \(|∀|\). When the suffix combines with a root which lexically contains \(|∀|\) invariably, the variable element in the suffix is licensed and we observe [-xi] (60); when the suffix combines with a root which does not contain \(|∀|\), the variable element in the suffix is not licensed and is realised as [-xl] (61):

(60) nalki-xi \(∀ \quad ∀ \quad \Rightarrow \quad (\forall)\)  
(61) dölbö-xi \(A \quad A \quad (\forall)\)  

\(I \quad I\)

In section 4, we saw that when \(|∀|\) and \(|A|\) form bridges in Turkic languages they are lexical, and thus are present in the underlying representations as invariant “\(|∀|\)” and “\(|A|\)”. \(|I|\) however, is in Turkic languages derived through palatal harmony, and is present in the underlying representations as variable “(\(|I|\)” in alternating suffixes (and invariant in non-alternating morphemes). In contrast, in Tungusic languages, \(|I|\) is always invariant, but it is \(|∀|\) that is represented as a variable in alternating suffixes (and invariant in non-alternating morphemes). Furthermore, as mentioned, in the vast majority of Tungusic languages LH is licensed by an \(|A|-bridge without \(|∀|-licensing (Pattern I), a configuration ruled out by the MRH (54), which requires that LH is minimally licensed by an \(|∀|-bridge. In the next section, I discuss this property of Tungusic languages, arguing, in essence, that given that \(|∀|\) is variable in TRH systems, it cannot function as a licensor for LH (cf. Author 2013). Crucially, in section 5.2 we will see that in the Tungusic language Sibe, which does not display TRH, the element \(|∀|\) is lexically present and becomes accessible again as a licensor for LH and, in accordance with the MRH, is involved in LH licensing.
Labial harmony in Turkic and Tungusic languages

5.1 Licensing labial harmony

As mentioned in section 2, LH is not observed in high target vowels; rather, high targets are either prespecified as lacking |U|, leading to disharmonic sequences such as dolbo-xi ‘to spend night’ and dol-γi ‘fish-Poss’, or they are prespecified as containing |U| invariably, leading to disharmonic sequences such as bira-du ‘river-DAT’ and ur-γ-du ‘mountain-DAT’ (Li 1996).\(^{30}\) Notably, the representation of bira-du in (62) shows that the suffix is labial, even though none of the root vowels contains |U|.

\[(62)\] bIra -dU
\[\begin{array}{c}
\text{A} \\
\text{I}
\end{array}
\]

In contrast, in low targets, in addition to TRH, we do observe LH, but only when both trigger and target are low, showing that |A|-bridge licensing is active. For instance, one of the derivational suffixes has four realisations, [-mo]/[-mo]/[-m]/[-ma], resulting from TRH and LH, and, as such, contains the elements |∀| and |U| variably. When this suffix combines with the root olo ‘to cook’ which contains the elements |∀|, |A| and |U| invariably, both variables are licensed (63), since TRH is not subject to further restrictions and the additional restriction on LH of an |A|-bridge is met. Similarly, in (64), we see the root soγ ‘to weep’ which licenses |U| but not |∀| in the suffix.

\[(63)\] olo -mO
\[\begin{array}{c}
\text{∀} \\
\text{A} \\
\text{U}
\end{array}\]

\[(64)\] soγ -mO
\[\begin{array}{c}
\text{∀} \\
\text{A} \\
\text{U}
\end{array}\]

In addition, all high vowels are opaque and block harmony: in (65) we see that when the vowel immediately preceding a low vowel is high, the low vowel fails to undergo LH (Li 1996, 132):

\[(65)\] a. bolboxi-wO (*bolboxi-wO) ‘wild duck-DEF.ACC’
b. tfəlik-pa (*tfəlik-pO) ‘cloud-shaped design-DEF.ACC’
c. owon-dulO (*owon-dulO) ‘pancake-DEST’
d. ᵈOγ-ðOn (*Oγ-ðOn) ‘reindeer-DEST’

Focusing first on the blocking front vowels (65a,b), taking bolboxi-wO as an exam-
ple, depicted in (66), we see that, though TRH is observed, the suffix is realised as unrounded [-wɔ], and, as such, the labial element in the suffix remains unlicensed.

(66) \[ \text{bol bo xi -w} \]
\[ \forall \quad \forall \quad \forall \quad \gg \quad (\forall) \]
\[ A \quad A \quad A \]
\[ U \quad U \quad I \quad (U) \]

The front vowels /\text{i, u}/ are expected to be opaque on two accounts of locality. Recall that licensing relations are absolutely local and cannot skip a nucleus (cf. van der Hulst & Smith 1986). Two types of licensing are involved in LH: (i) the lateral licensing of variable |X| (cf. (20)), and (ii) additional licensing constraints, which in Tungusic are an |A|-bridge. Given that licensing relations cannot skip a nucleus (they have to be adjacent), we then predict /\text{i, u}/ to block LH: (i) the lateral licensing of |U| in (66) is non-adjacent, and (ii) |A|-bridge licensing is non-adjacent.

Turning to the blocking back vowels (65c,d), we see in (67) that though adjacency of lateral licensing is satisfied, |A|-bridge licensing is still violated, thus accounting for the lack of LH in the second syllable of the destinative suffix [-dulɔ]/[-dulaa].

(67) \[ \text{o won -du l} \]
\[ \forall \quad \forall \quad \gg \quad (\forall) \quad \gg \quad (\forall) \]
\[ A \quad A \quad A \]
\[ U \quad U \quad U \quad (U) \]

This account of locality then predicts that blockers that contain the harmonic element can only be blockers when that harmony is subject to additional licensing requirements of the type argued here to hold for LH.

As mentioned, the uniform character of LH in Tungusic languages, which is mostly subject to |A|-bridge licensing (Pattern I), contrasts sharply with the variety of conditions that LH is subject to in Turkic languages (see (50)). The absence of |I|-bridge simply is due to the fact that Pattern I languages do not contain labial front vowels, which then leaves the aperture elements |A|and |\text{U}| as potential bridges. Though we have seen |A| function as a bridge, there is no \textit{a priori} reason to exclude a language Baiyinna Orochen-B, in which LH would be licensed by an |\text{U}|-bridge (or AL); indeed, given the MRH (54) we would even expect a language like that. Imagine a language Baiyinna Orochen-B, in which LH would be subject to |\text{U}|-bridge licensing: only ATR
Labial harmony in Turkic and Tungusic languages

vowels would be subject to LH. That is, a form such as owondulɔ (68) would surface owon-dulo (while a form such as sɔ̌-mo (in (64) above) would surface as sɔ̌-ma):

\[(68) \quad \text{owon} - \text{du} - \text{loo} \quad \text{(unattested)}\]

However, this situation is unattested, which I argue is predictable from the fact that Baiyinna Orochen has TRH. Firstly, I propose that since the primary vowel harmony of Tungusic languages involves the variable element ‘(∀)’, this element is not accessible as an anchor to form a bridge. Recall that variable elements encoded in lexical representations signify the potential presence of these elements (section 3.1); their actual presence depends on whether the variable elements are laterally licensed or not. As such, in TRH systems, when not yet licensed, variable (∀) has not yet been ‘approved’ to be present in the representation, and is, as such, invisible. Secondly, I put forward the hypothesis that the lateral licensing of elements proceeds serially in Tungusic languages:31,32

\[(69) \quad \text{Harmony Ordering Hypothesis (HOH): The color node } (|I,U|) \text{ is licensed prior to the aperture node } (|∀,A|).\]

This means that at the time that LH requires licensing, variable (∀) has not yet been licensed and as such is unaccessible. Crucially, this ordering relation only applies to elements derived through harmony; that is, variable elements that are subject to lateral licensing. Specifically, in the case of LH variable |U|, and in the case of TRH variable (∀). Note that invariable elements, not subject to vowel harmony, remain accessible at all times and there is no ordering relation. This situation is schematised in (70) below. N₁ and N₂ represent two adjacent nuclei, where, in N₁, all elements are present invariably, but in N₂ all elements are variable (thus depicting all possible vowel harmonies). Crucially, though, |I|-licensing (palatal harmony) and |U|-licensing (LH) -obligatorily subject to an additional licensing requirement- are the first to occur (1), while |A|-licensing (low harmony) and |∀|-licensing (TRH) apply afterwards (2); this is

31Cf. Godfrey (2012) for a similar idea of ordered search in a Nevins (2010) style approach to vowel harmony, see section X for discussion.
32In section 5.2, I briefly discuss the question of the universal status of the HOH.
Labial harmony in Turkic and Tungusic languages

depicted below in the feature geometry of RcvP (cf. (16)):

(70)  

For Tungusic languages, this means that LH occurs before TRH. Let us then first consider the derivation of *oloolo-mo* ‘who likes to cook’ with the HOH (cf. (63)). The lexicon gives the following structure of the root and the suffix:

(71)  

Then, according to the HOH, we first license |U|; at this stage, variable |∀| has not been licensed and since it is not being laterally licensed, it is invisible (72a), indicated by it being in gray. Note that it is not absent, but since it is present as a variable it cannot be accessed in LH licensing. However, since both the final vowel of the root and the suffix contain |A|, an |A|-bridge is established and LH is licensed (72b), which results in the variable being interpreted and realised (72c). Then, on the next cycle, we license |∀|, which is not subject to any restrictions (72d), resulting in the final representation in (72e).

(72)  

d. o loo -mo e. o loo -mo

Turning to a case where LH fails, consider the derivation for *owon-duloo* ‘pancake-destin.’; the lexical representation is given below:
Below, I show the relevant stages of the derivation. Crucially, at the point of LH (74a), the variable element is invisible and no other element could license labial harmony, given that licensing is subject to absolute locality. In the second step, TRH is successful, and we observe [-dulə].

Returning to the MRH (54), which requires LH to be licensed at a minimum by an |∀|-bridge, we see that the HOH (69) has an effect on the availability of |∀|. Recall that the MRH was based on the implicational hierarchy in (53), repeated here in terms of the trigger-target elemental structure:

$$|∀| > |A| > |∀|$$

The best configuration, |∀|-|∀|, is unavailable, since it requires the presence of |∀| on the target - a configuration which, assuming the HOH, is not met, since |∀| only is present as a variable at that point. Similarly, |A|-|∀| is unavailable for the same reason. This leaves us with the configurations |A|-|A| and |∀|-|A|, of which the |A|-bridge is the better one on the hierarchy. Thus, we can amend the MRH as follows:

Minimal Requirement Hypothesis (MRH): At a minimum, labial harmony in a language is licensed by the optimal available aperture configuration.

In Turkic languages the full hierarchy is available, since no aperture elements are involved in a harmony process of their own. In Tungusic languages, |∀| is unavailable as a licensor on the target, given that it is present as a variable, combined with the HOH. In this way, we account for the fact that in TRH systems, LH exclusively relies on an |A|-bridge.
5.2 Discussion

A word is in order here concerning how the cyclic architecture affects Turkic languages, notably with regard to LH being able to be licensed by an |I|-bridge derived from palatal harmony. Crucially, the HOH (69) is stated as an ordering hypothesis concerning the color node and aperture node, rather than individual elements, and |I| and |U| are within the same cycle. As such, |I| is visible, and the derivation of kün-gö ‘to the sun’ is exactly the same as shown in (36)). Also, it is worth noting that, crucially, only derived |∀| is not accessible. In the Turkic languages that rely on an |∀|-bridge or AL, |∀| is accessible at all stages of the derivation.

According to the HOH, we do not, however, expect the following: a language with a color harmony that is subject to additional restrictions, where the additional restrictions are determined by an aperture element that is involved in harmony. However, given that color harmony precedes aperture harmony, we predict that a color element could function as a licensor for aperture harmony. Though I have not found any instance of an aperture harmony being dependent on a color element derived through harmony, there is an “exceptionally alternating suffix” in Classical Manchu, which is dependent on invariable |U| (Li 1996, 172). In general, Classical Manchu displays the regular Pattern I of Tungusic languages, where LH is licensed by an |A|-bridge, but this particular derivational suffix displays both TRH and height harmony:

\[
(77) \begin{align*}
\text{dɔrbo-xun} & \quad \text{‘wet’} \\
\text{wəsi-xun} & \quad \text{‘upwards’} \\
\text{yada-χon} & \quad \text{‘wretched’} \\
\text{doksɔ-χon} & \quad \text{‘protruding’}
\end{align*}
\]

Given that the suffix alternates between [-xun]/[-χon]/[-χon], it contains |U| invariably (it is always labial), but since it has both alternating height and ATR, the representation here would be as follows:

---

33 At this stage, I leave it open whether palatal harmony occurs prior to LH, or simultaneously.
34 As mentioned, the vowel inventories of Tungusic languages are fairly uniform, and I assume the elemental representation in (58). Also, since it’s irrelevant to the discussion at hand, I ignore the consonantal alternation.
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(78)  -xUn
      (∀)
      (A)
      U

Crucially, in (77) we see that the non-high realisation of the suffix is only observed when the trigger vowel is a rounded non-high vowel (79a). In contrast, when the root does not contain a labial element, |A| remains unlicensed (79b).

(79)  a. dɔk sɔ -χɔn
      (∀)      ∨  ∨  ≫ (∀)
      A  A  (A)
      U  U  U

   b. dɔb bɔ -xun
      (∀)      ∨  ∨  ≫ (∀)
      A  A  (A)
      U  U  U

In addition, other languages that seem to show a harmonic aperture element being reliant on an |U|-bridge could be Kisa (Hyman 1999) and Shona (Fortune 1981), where vowels only agree for height in case both trigger and target are round.

Not all suffixes in Tungusic languages alternate, which allows for an interesting prediction. If a suffix does not show TRH and is ATR, then it contains the element |∀| invariably, which, as such, should then be a potential licensor of LH. Unfortunately, most of the Tungusic non-alternating affixes reported in Li (1996) are low, and thus not informative. However, Li mentions that Sibe and Sanjiazi Manchu include high vowels that alternate harmonically. The vowel inventory for Sibe is given below (Li 1996: 189):

(80)  i ü i u
       ε ō a ɔ

Here, I follow Li (1996), who classifies /i, ü, i, u/ as high, and argues that tongue root specifications are not phonologically relevant in Sibe, which means that |∀| picks out the high vowels as a class. This leads to the following elemental compositions, based on whether an element is identifiable with a vowel or not:

35It should be noted here that a vowel inventory in which |∀| picks out ATR vowels does not pose a problem to the current analysis. This would generate the following elemental make-up:

|  i  i  i  u  r  ō  a  ɔ |
|  ∀  ∀  ∀  ∀  A |
|  I  I  I  I  |
|  U  U  U  U |

We would need the additional assumption that either no segment can be elementally empty, which would result in /i/ containing |∀|, since all other elements are incompatible (/i/ is not low, front or
As Li (1996) discusses, Sibe has undergone a series of vowel changes, which led to the vowel inventory above, which, in turn, has led to a vowel harmony pattern that is uncharacteristic for Tungusic languages. The language does not show any TRH any more, and the only remaining harmony pattern is that of a number of suffixes being subject to LH. As noted in section 2, certain suffixes with high targets show an [u]/[i] alternation (11), irrespective of the value of the trigger vowel, a pattern reminiscent of Turkish LH.

The vocalic structure of the alternating non-self-perceived immediate past tense suffix contains |∀| invariably, and since it alternates for labiality contains |U| as a variable.

(82) -Xu/-Xi
    ∀
    (U)

The variable is laterally licensed, irrespective of the aperture values of the trigger. However, a difference compared to Turkish is that only back high vowels alternate; the front/back value of the trigger vowel has no impact on LH, since LH is licensed by AL. 36

(84) tO
    (U)

In sum, we see in Sibe a configuration where |∀| is not present as a variable on the rounded). Then, the only difference between the two elemental compositions is that here /ö/ contains |∀| but in (81) it does not - whilst this makes different empirical predictions, Sibe does not provide evidence for whether /ö/ contains |∀| or not, since no front vowels alternate. 36 Kaun (1995, 2004) notes that phonetically front rounded vowels are less salient than back rounded vowels, making back round targets better than front round target. Note that the current theory cannot incorporate as a positive licensing constraint (cf. AL), since ‘backness’ is the absence of an element; rather, the only way this could be incorporated would be a ‘blocking’ constraint on ‘front’ ([I]-containing) structure. I do not discuss this here further, and leave it as an accident that there are no high front vowels that alternate.

36
target, and, in line with the MRH (76), we see that LH is licensed by $\forall$ on the target. 37

6 Other approaches

In this section, I briefly discuss how the current paper relates to some other approaches to (labial) harmony. Specifically, I focus on the conditions to which LH is subject being stricter than in many other approaches (section 6.1) and the proposal of a crucial distinction between invariable and variable elements, with only the latter being subject to cyclicity effects within a segment (section 6.2).

I start with a brief discussion on how the current proposal relates to Optimality Theory (OT). Whilst many aspects of the proposal can be translated into an OT approach, there are at least two insights that seem difficult to capture. 38 Notably, the current paper crucially relies on cyclicity within a segment in order to account for the lack of variability of LH conditions in languages that display TRH. The traditional approach of parallel OT cannot capture that the output of TRH is invisible to the input of LH, and, as such, misses this generalisation. Turning to OT approaches that do assume derivation, some of these incorporate a (limited) number of ‘morphological’ cycles in the sense of Lexical Phonology Rubach (1997), Kiparsky (2000), Bermúdez-Otero (2003), i.a.), and thus do not apply to intra-segmental cycles. Other derivational OT approaches incorporate step-wise ‘phonological processes’, as exemplified by OT with Candidate Chains (McCarthy 2007), in which Precedence constraints state that a certain constraint $C_1$ must be violated before another constraint $C_2$. Crucially, however, these Precedence constraints exclusively operate over faithfulness constraints, and OT approaches to vowel harmony do not consider the harmonising constraint to belong to the class of faithfulness constraints Sasa (2009).

In addition, the fact that $\forall$-bridge licensing and AL stand in a subset-superset relationship is problematic in OT (cf. McCarthy 2002), since any analysis would always favour a situation in which both are satisfied, effectively nullifying the effect of AL. As

37 The Sibe pattern is also observed in one of two alternating suffixes in Sanjiazi Manchu (Li 1996: 181).

38 In addition, given the free ranking of constraints cross-linguistically, an OT approach predicts considerable variation, whilst the current approach can more easily incorporate limited variation by appealing to headedness relations. As mentioned above, the extent of variation remains an empirical issue, and cannot be resolved here.
such, the current proposal seems incompatible with OT assumptions.

### 6.1 Conditions (non-)facilitating LH

As mentioned before, since Steriade (1981) it has been acknowledged that harmony can be sensitive to requirements of identity on trigger and target. Indeed, most approaches to LH refer to this identity requirement as a given (Vaux 1993, Dresher 2009, Nevins 2010, among many others). In that respect, this paper is not at odds with any of these theories and endorses BL as a LH licensing operation. However, the above approaches struggle to account for cases where trigger and target have different height specifications; specifically, it is hard to explain why *o-u* is often observed, whereas *u-o* is not. For instance, assuming Visibility Theory, Nevins (2010), following Calabrese (1995), assumes that there are conditions on what (trigger) segments are ‘visible’ to donate their (binary) value for the harmonic feature onto the target vowel.\(^{39}\) There is no principled reason for why in cases where a low trigger /o/ is visible to donate its value to low targets (*o-o*), this same trigger is also visible to donate its value to high targets (*o-u*), whereas in cases where a high trigger /u/ is visible to donate its value to high targets (*u-u*), this same trigger /u/ is not visible to be a donor for low targets (*u-o*). Although one might presumably take recourse to positional markedness to account for the fact that low triggers often round high targets (*o-u*) while a high trigger enforcing labiality on a low target (*u-o*) is rare, the latter configuration is not ruled out categorically.

In contrast, in the current approach, the non-occurrence of high triggers causing low targets to round (*u-o*), other than in unrestricted LH, follows from the fact that there is no possible licensing relation between a high trigger and low target: neither bridge- nor asymmetric licensing can apply in that configuration.

Another difference is the use of elements, which here leads to a minimal typology (see the table in (52) above), given that there are only four elements, and one of them, [U], is involved in lateral licensing of LH and as such cannot be an additional licensor. Were we to use features, then the number of possible licensing conditions on LH would

---

\(^{39}\)Note that Visibility Theory requires a relativised notion of locality (locality relative to the type of feature). In a similar vein, the Contrastivist approach (Dresher 2009) draws on relativised locality, but in this case the relativisation is determined by contrastiveness in the vowel inventory of a language. Space limitations prohibit me from a full discussion, but the approach advocated here assumes absolute locality (cf. section 5.1); see Author (in prep).
be expected to be higher, since the number of features is usually assumed to be larger than four. As mentioned, standard DP/GP only assumes three elements, $|A|$, $|I|$ and $|U|$, but has no prime corresponding to ‘high’. This was shown to be problematic in section 4.2 in light of Patterns B, C and D, since these patterns crucially rely on an $|∀|$-bridge, which is unstatable in a system that makes use of only $|A|$, $|I|$ and $|U|$. In addition, RcvP’s architecture is unique in allowing to collapse ‘ATR’ and ‘high’ into a single element $|∀|$, which enables us to have a uniform account of conditions on LH across the languages investigated here.

6.2 Cyclicity

In this paper, I make a crucial distinction between invariant and variable elements in the lexical representation. Notably, variable elements receive the status of bona fide elements only after having been laterally licensed. In addition, I proposed the Harmony Ordering Hypothesis (HOH; in (69), with LH crucially preceding TRH within a single segment. Taken together, this led to the impossibility of the element $|∀|$ being a licensor for LH when TRH is active, as in most Tungusic languages.

Godfrey (2012) also argues for the ordering of vowel harmony processes. Assuming Dresher’s Successive Division Algorithm and the Contrastivist Hypothesis together with Visibility Theory as implemented in Nevins (2010), he however argues for the opposite order than the HOH, with TRH preceding LH, in the Mongolic language Khalkha Mongolian. As mentioned in section 2, space limitations prohibit me from a discussion of the similarities and differences between Tungusic and Mongolic, but, in brief, Godfrey’s ordering is based on (i) a data point that is originally problematic for Nevins’ (2010) theory, and (ii) the invisibility of the high front vowel $i/ to LH. Firstly, abstracting away from the details, the item mor-t$^{h}$e-ge ‘way-COM-RFL’ is under Nevins’ account predicted to incorrectly be realised with a final rounded vowel: [mor-t$^{h}$e-go] (see Godfrey 2012 for details). However, no problem is faced by the current account, if we assume Svantesson et al.’s (2005, 51) analysis, whereby the comitative suffix does not contain $|U|$ at the relevant point in the morphological derivation, and, as such, does not license labiality on the reflexive morpheme.

Secondly, in Khalkha Mongolian $i/$ is invisible for LH, as in po:r-i-go ‘kidney-ACC-RFL’, where we see that the reflexive suffix surfaces as a rounded vowel, despite the
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accusative suffix intervening (cf. Baiyinna Orochen where /i/ blocks LH, as in boboxi-
ɬʊ (66)). In effect, Godfrey accounts for this invisibility by drawing on the fact that
Khalkha Mongolian /i/ is not contrastive for ATR, since it has no tongue root counter-
part. That is, the language has only a single front high vowel /i/, rather than ATR /i/ and
non-ATR /ɪ/, which, in accordance with the Successive Division Algorithm, allows for
/i/ not being specified for ATR-ness. This, in turn, then allows for /i/ to be skipped in
TRH, and then, assuming that LH proceeds where TRH left off, /i/ is also skipped in
LH (adapted from Godfrey 2012: 10):

\[(85)\]

\[
\begin{array}{c}
\text{po:r} \\
\text{[-high]} \\
\text{[+ATR]} \\
\text{[+round]}
\end{array}
\begin{array}{c}
\text{-i} \\
\text{[+high]} \\
\text{[+back]}
\end{array}
\begin{array}{c}
\text{-go} \\
\text{[-high]} \\
\text{[+ATR]} \\
\text{[+round]}
\end{array}
\]

Whilst an elegant solution, it does not hold across Mongolic languages in general.
The related language Shuluun Höh (Dobu 1983, cited in Svantesson 1985, Svantesson
et al. 2005) includes both /i/ and /ɪ/, and front high vowels are thus contrastive for ATR,
but both are still invisible for LH (Svantesson 1985, 318):

\[(86)\]

\[
\begin{array}{c}
očigdor \quad \text{‘yesterday’} \\
gət-ı:xo: \quad \text{‘town’} \\
nœ:r-ı:xo: \quad \text{‘sleep’} \\
tomr-ı:xo: \quad \text{‘iron’}
\end{array}
\]

Crucially, Godfrey’s account of the invisibility of /i/ for LH is linked to it not being
contrastive for ATR, which, however, does not generalise to other Mongolic languages.

In the current framework, the invisibility of front high vowels for LH in Mongolic
languages is accounted for by assuming that any high font vowels are not present in the
structure at the point that LH is evaluated. As mentioned, space restrictions preclude a
full exposition, and so I refer the reader to Author (2015).

As such, no recourse to a reverse order of TRH preceding LH in Khalkha Mongolian
is warranted, and I argue that in Tungusic (and Mongolic) languages the order is that
of LH preceding TRH, as stated in the HOH. However, this raises the question whether
the HOH is universal or parametric. There is nothing inherent in the theory that would
prevent an ordering of aperture preceding color, in which a language would display TRH
or height harmony reliant on an |U|-bridge or |ɪ|-bridge, which is derived through LH

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or palatal harmony. Similarly, within color or aperture, there could be ordering effects; e.g., within color, palatal harmony could precede LH or vice versa (see also footnote 33). However, since they form constituents, it would be more surprising to find evidence for LH preceding TRH, which in turn precedes palatal harmony (LH > TRH > palatal harmony), thus ‘mixing’ color and aperture, rather than (any) sequential ordering.

In this paper, we have seen evidence for the orders that (i) palatal harmony cannot follow LH, and (ii) TRH must follow LH, but, ultimately, it remains an empirical issue to what extent the orders in which vowel harmony occurs are reversible.

7 Final remarks

In this paper, I focused on the conditions governing labial harmony in Turkic and Tungusic languages. Firstly, to account for the diversity of conditions on LH in Turkic languages I assume four elements and two additional conditions on LH: bridge licensing and asymmetric licensing. Supplemented with the Minimal Requirement Hypothesis, which states that LH is minimally licensed by a (phonetically motivated) optimal aperture configuration, these lead to a minimal typology of LH.

Secondly, the contrastive lack of diversity in the condition on LH in Tungusic (and Mongolic) languages is here linked to the presence of tongue root harmony in these languages, and the ordering vowel harmony processes. Specifically, the data discussed in this paper warrant the following ordering relations: (i) TRH must follow LH, and (ii) palatal harmony cannot follow LH. The first ordering relation accounts for the non-occurrence of $\forall$-licensing in languages in which TRH is operative; in contrast, when such languages do not display TRH the element becomes available again as a potential licensor of LH. The second ordering relation accounts for the observation that in Turkish languages LH can build a bridge on palatal harmony.

Ultimately, it is an empirical question whether the generalisations identified here can be maintained beyond LH processes in Turkic and Tungusic languages. Specifically, the claims made here need to be tested against a much larger sample of languages, including those that involve vowel harmony processes other than LH. Finally, the hypothesis that there is a crucial difference between invariable and elements derived by harmony pertains to processes other than vowel harmony as well, and it remains to be investigated whether additional support for this architecture can be found. In this sense, this paper is
clearly merely a preliminary investigation.

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