Loanwords, prominence and the basis for Mongolian vowel harmony

Sarala Puthuval

A thesis

submitted in partial fulfillment of the

requirements for the degree of

Master of Arts

University of Washington

2013

Committee:

Sharon L. Hargus

Richard A. Wright

Program Authorized to Offer Degree:

Linguistics

1 Using loanwords to examine Mongolian vowel harmony

The standard analysis of Modern Mongolian vowel harmony is as rightward spreading of the features [pharyngeal] and [round] starting from the first syllable of the word (Svantesson et al. (2005) and others). Root vowels must all belong to the same harmony class; a minimal pair example is pharyngeal [xaʃaː] "corral" vs. non-pharyngeal [xureː] "enclosure". Suffixes also alternate according to the class of the root, thus: /xaʃaː-(g)E/→[xaʃaː-gaː] "corral-RFL" versus /xureː-(g)E/→[xureː-geː] "enclosure-RFL".[1] Because Mongolian has exclusively suffixing morphology and native non-compound roots are always internally harmonic, native data alone cannot rule out leftward spreading within roots. The standard analysis would have the underlying form of "corral" be /xaʃE:/, but there is no way to be sure from native data that it is not /xEʃa:/ or even the fully specified /xaʃa:/. Intriguingly, data from recent Russian borrowings in the Halh dialect seems to show that leftward spreading can occur during loan assimilation (Svantesson et al., 2005; Lubsangdorji, 2004). Sometimes initial syllables seem to assimilate to the following syllable; an example involving round /ɔ/ and unround /a/ is when Russian [ˌfanˈtazijə] "fantasy" becomes Mongolian [pʰantʰaːts], while [ˌvaˈgon] "train carriage" becomes [pɔgɔːŋ]. Svantesson et al. 2005 propose that the reason is that the syllable which had primary lexical stress in Russian triggers vowel harmony in Mongolian. Lubsangdorji 2004 makes similar claims.

The above claims about the possible role of stress in Mongolian have been made on the basis of relatively few lexical items, as side notes to broader phonological studies; furthermore, no attempt has been made to integrate their implications into the theoretical description of the synchronic phonology. This paper presents results of a field phonology study aimed at verify-

---

[1]See 10.1 for list of abbreviations.

ing and further investigating the above observations using a larger, systematically collected set of speech production data. The study also incorporates data from Mandarin Chinese loans in Mongolian.[2]

Mandarin is included because loans from Mandarin appear to follow different principles with regard to the possible effect of stress on the borrowed Mongolian form. These words tend to remain disharmonic, regardless of the location of primary stress in Mandarin. Examples of rounding disharmony taken from the Horchin Mongolian dialect include [xɔːmaːr] "number" from Mandarin [ˈxaʊ⁵¹ˌma²¹] "number" and [jaːgɔː] "toothpaste" from [ˈja²⁴ˌkaʊ⁵⁵] (Bayancogtu, 2002).

In fact, stress is not lexically distinctive in Mongolian (see 4). Therefore, the claims made about Russian loans by Svantesson et al. (2005) and (Lubsangdorji, 2004) are equivalent to proposing that one suprasegmental feature (stress) maps to another suprasegmental feature (harmony trigger). But another explanation, suggested by the Mandarin data, is that segmental correlates of stress such as vowel duration and reduction are responsible for the apparent salience of stresss. By this reasoning, the preservation of disharmony in Mandarin loans might be explained by the fact that Mandarin syllables carrying secondary stress undergo little reduction (Peng et al., 2005), thus creating multiple loci for harmony within a single word.

To test the merits of these explanations, this study tested a large number of recent Russian

and Mandarin loans which, based on their pronunciation in the source language, might be disharmonic in their Mongolian forms. Native Mongolian speakers were presented with lists of 40-70 Russian or Mandarin loanwords common in their area, and asked to pronounce the items in isolation and with Mongolian case or aspect suffixes. The isolation forms reveal whether the root has been altered to conform to vowel harmony, and the suffixed forms reveal which syllable in the root is triggering harmony on suffixes. The paper presents results from transcribed recordings of the above task as performed by 10 speakers from 3 different dialects (Halh, Chahar and Horchin).

Results do not bear out the prediction of leftward assimilation from stressed syllables. Instead, the assimilation patterns described above for Mandarin loans actually apply to both Mandarin and Russian loans: vowel qualities are usually preserved even if the result is disharmonic. Examples such as [ˌvaˈgon] → [pɔgɔːŋ] are rare (though this particular example was verified in the study). Furthermore, syllables which were stressed in the source language sometimes failed to trigger harmony even on following suffixes; in other words, harmony features sometimes spread from initial syllables *across* intervening syllables which had carried primary stress in the source language. Therefore, the hypothesis that stress in the source maps to harmony trigger in Mongolian is not supported.

Even though little evidence for leftward spreading was found, the results still call into question the standard analysis of vowel harmony as spreading from initial syllables only. Disharmonic roots were prevalent in the dataset (so harmony was not productively applying within roots), yet suffixed forms in the data showed harmony applying with almost complete regularity across the root-suffix boundary. Descriptions of the native phonology need to be modified

to account for this morphological asymmetry. (Similar asymmetries have of course been noted for most other vowel harmony languages for which this aspect has been studied.)

The structure of the paper is as follows: Sections 2–5 present the background and motivation for the study. Section 2 situates the study in terms of the theory of loanword adaptation. Section 3 outlines the geography and history of Mongolian-Chinese and Mongolian-Russian language contact, and the factors which make it necessary to include different dialects in the study. Section 4 provides a more detailed comparison of word stress in Russian, Chinese and Mongolian and how this affects borrowings. Section 5 presents a detailed phonological picture of Mongolian vowel harmony on general and dialect-specific levels. Based on the information in Sections 2–5, Section 6 outlines the goals of the present study. Section 7 details the field data collection methodology, including elicitation tasks, recording methods, and transcription. Results are presented in Section 8 and discussed in Section 9 along with their implications for Mongolian phonology and the analysis of disharmonic elements in general.

2 Loanword adaptation in phonological theory

Studies of the phonology of borrowing are often built around the concepts of an "input" form, an "adaptation" process, and an "output" form. The present study begins from the observation that certain types of Chinese and Russian words can give rise to Mongolian forms which are unusual, exceptional, and perhaps problematic compared to the rest of the lexicon and the phonology. This study is mainly concerned with how the native phonology handles the anomalous outputs, and is less concerned with the adaptation process than with the input and output. "Adaptation" herein can be understood quite broadly as the diachronic process by which the speech community has arrived at a consensus pronunciation for a given item; the "output" of adaptation is defined as the underlying form in a given Mongolian speaker's lexicon. The question of "inputs" merits a little more discussion, as follows.

When loanword adaptation patterns are brought forth as evidence for some general phenomenon in the phonology of a language, conclusions may differ depending on what is considered to be the "input" to adaptation. One view holds that the input is identical to the underlying representation in the source language, because words are typically borrowed by bilinguals who have access to this representation. This view underlies the "phonological model" of loan adaptation outlined in LaCharité & Paradis (2005) and Jacobs & Gussenhoven (2000). An alternative view holds that the input to adaptation consists purely of acoustic information as processed by an extragrammatical module of speech perception. Borrowers are assumed to be ignoring (or ignorant of) the lending language's phonology. This "phonetic" or "perceptual" model is argued for in Peperkamp & Dupoux (2003) and Dupoux et al. (1999). Naturally, the "phonological" and "phonetic/perceptual" models may not be mutually exclusive in practice;

investigators favoring one or the other tend to be working with different bodies of evidence. In the present study, this question is left open and it is assumed that either type of input is a possibility. It is also understood that input sources may vary because speakers of the borrowing language (Mongolian) will inevitably vary in their level of competence and degree of exposure to the lending language (Russian or Chinese).

This study investigates a possible relationship between an element that is phonologically distinctive in the source languages, but not in the borrowing language (lexical stress), and an element that is relevant in the borrowing language, but not in the sources (vowel harmony.) Lexical stress is distinctive in both Russian and Chinese.[3] When words from these languages are borrowed into Mongolian, the "input" to adaptation must contain some kind of information about stress: either stress itself (as a phonological feature) or else some phonetic and/or phonological correlates of stress, such as vowel duration, degree of reduction, intensity, and so forth.

In Mongolian, on the other hand, lexical stress is phonologically irrelevant. Stress on the surface follows a default pattern, inasmuch as speakers have any intuitions about stress placement. Therefore, there is no reason to suppose that the underlying representation of any Mongolian word, even a loanword, contains a specification for stress. Still, we may reasonably expect stress in the "input" to leave some trace in the "output" of loanword adaptation. One oft-noted case of this is Russian primary stress mapping to Mongolian long vowels (Baljinnyam, 2008; Svantesson et al., 2005; Lubsangdorji, 2004). If we adopt a phonological view of adaptation, borrowers are probably converting [+stressed] to [+long]. Under a perceptual view, speakers may be simply hearing the lengthening that accompanies stress in Russian, and interpreting

---

[3]See Section 4 for an overview of stress in all three languages.

it as [+long]. Regardless of how it comes about, Russian stress to Mongolian length is a robust input-output correspondence.

But are such traces only present at a segmental level, as in the vowel length example above? The claim that stressed syllables tend to "determine", "dominate" or "trigger" vowel harmony implies something more: that vowel harmony triggering is somehow associated with prominence. Elements of prominence such as stress and tone are known to be transferable in borrowing, for example in the stress-to-tone mappings identified for English-to-Cantonese borrowings (Yip, 2006), but sometimes borrowing languages ignore such elements completely (Kang, 2010). A question to be addressed by this study is, is there in fact something special about the reflexes of stressed syllables when borrowed into a vowel harmony language with predictable stress/prominence patterns such as Mongolian? Does stress on a particular syllable in the source directly determine the harmony relationship between that syllable and its neighbors in the resulting Mongolian form? Are the reflexes of stressed syllables more likely to trigger vowel harmony?

This study will attempt to answer these questions by eliciting spoken productions of loanwords and comparing two types of vowel harmony environment, within-root harmony and root-suffix harmony. Looking at roots alone can tell us the surface form of the output of adaptation. Looking at how speakers add suffixes to borrowed roots can tell us how these output forms function in the synchronic phonology.

3 Contact between Mongolian and Russian (to the north) and Chinese (to the south)

Mongolian is a Mongolic language spoken in northeastern Asia. Speakers of Mongolian proper are concentrated in Mongolia and in the Inner Mongolia Autonomous Region (IMAR) of the People's Republic of China. Other Mongolic languages include Buriad, Oirad, Kamnigan, Dagur, Shira Yogur, Monguor, Santa, Bonan, and Kangjia. Speakers of these languages are found in Mongolia, the IMAR, the Russian Federation (especially the Autonomous Republics of Buryatia and Kalmykia) and in other parts of China (notably Xinjiang Uighur Autonomous Region, Ningxia Hui Autonomous Region, and Qinghai, Gansu, Jilin, Liaoning and Heilongjiang provinces.) All the Mongolic languages are assumed to descend from a common ancestor, Old Mongolian, which was spoken over most of the same territories.

"Mongolian proper" itself is actually a complex of dialects not all of which are mutually intelligible. Naturally, different dialects find themselves in different contact situations due to geography and geopolitics. This study is concerned with recent loans from both Russian and Chinese; since there is no single dialect community that has had recent, intensive contact with both languages, it has been necessary to collect data from speakers of several dialects. The dialects included are: Halh (ISO 639-3: khk), spoken throughout most of the country of Mongolia; Chahar (ISO 639-3: mvf), spoken in central Inner Mongolia; and Horchin (also ISO 639-3: mvf), spoken in eastern Inner Mongolia. Their respective language contact situations are detailed in 3.1, and the interaction between Russian, Chinese and Mongolian phonologies with respect to stress and its correlates is described in 4.

3.1 Language contact for different dialects of Mongolian

Halh and Horchin represent opposite ends of the Mongolian dialect and are barely mutually intelligible. Chahar has features in common with both Halh and Horchin. It is sometimes classified as its own group (by Svantesson et al. (2005) and by Secenbagatur et al. (2005) and other Inner Mongolian works), sometimes lumped together with Horchin and other dialects under "Southern Mongolian" or "Peripheral Mongolian" (as in Lewis et al. (2013)), and sometimes treated as a variety of Halh (as in Janhunen (2012)). To complicate the picture, all three labels serve as ethnonyms referring to subgroups of the Mongols.

The map in Figure 1 shows the geography of Halh, Chahar and Horchin respective to other dialects (map redrawn from Svantesson et al. (2005)).

Figure 1: Distribution of Mongolic in Mongolia, China and Eastern Russia

These three dialects have been in contact with each other throughout their history and have shared a common writing system for about 700 years. Today Inner Mongolia continues to use the traditional Uigurjin Mongolian script, but Mongolia adopted a Cyrillic alphabet in the mid-twentieth century. The standard language of Mongolia is Halh. The standard form of spoken Mongolian in China is Chahar.

Phonological differences relevant to vowel harmony and loan assimilation are discussed in Section 5 of this paper. Janhunen (2012), Svantesson et al. (2005) and Secenbagatur et al. (2005) provide comparative overviews of all the Mongolian dialects.

Halh, Chahar and Horchin each have a different history of contact with neighboring languages, and the divergence has been particularly pronounced since the early twentieth century when Mongolia separated from China. Previously, "Outer Mongolia" (today the independent country of Mongolia) and "Inner Mongolia" (today the Inner Mongolia Autonomous Region of China) were both subject to the Qing Empire of China.

Halh speakers were in frequent contact with Russian speakers during the nineteenth and twentieth centuries, especially from about 1924-1990 when Mongolia was a Communist republic with ties to the Soviet Union. Russian was an important language for education during this time. Soviet experts came to live in Mongolia, and many Mongols attended university in the Soviet Union. The influence of Russian on Halh has declined since Mongolia's democratic revolution of 1990 and subsequent economic and educational reforms.

Horchin speakers, almost all located in China, were mostly insulated from Russian influence, but in close contact with speakers of Chinese, especially from the mid-nineteenth century onwards. The Horchin Mongols' traditional territory includes some marginal farmland. Starting

in the 19th century, the Qing administration encouraged farmers from central China to relocate to Horchin areas, and many Horchin Mongols became fully or partly agricultural as well. Since that time, Horchin Mongols have had periodic face-to-face contact with Chinese speakers, and there have been higher rates of bilingualism than in other parts of the IMAR.

Chahar was somewhat more isolated from outside linguistic influences until recently. The traditional Chahar territory is arid and unsuitable for farming, and no large-scale Chinese settlement took place in the rural areas. However, since the mid-20th century Chahar speakers have come in closer and closer contact with Chinese speakers, especially in urban areas.

4 Interactions of Russian and Chinese prominence with Mongolian prominence in loan adaptation

This section is about stress and vowel length.

Stress is not lexically contrastive in Mongolian. Instead, it is assigned based on prominence (vowel length) and position in the word. The rules for stress assignment in Halh are summarized in (1), based on the analysis of Walker (1997), which in turn represents a refinement of earlier descriptions by Poppe (1970) and Bosson (1964).

(1) a. If there are no heavy syllables in the word, primary stress falls on the first syllable.
   b. If there is exactly one heavy syllable, primary stress falls on that syllable.
   c. If there is more than one heavy syllable, primary stress falls on the rightmost non-final heavy syllable.
   d. Any heavy syllables (and perhaps initial syllables) which do not receive primary stress based on the above, receive secondary stress.

Dialects other than Halh have received less attention in the recent Western theoretical literature, but descriptions of Chahar and Horchin by Mongolian-speaking linguists are largely in agreement with the analysis in (1). The most important points for the present study are that stress is non-contrastive, and that stress assignment is based on vowel length and syllable position.

Phonetic studies have found that there is often a mismatch between different acoustic cues such as duration, intensity and F0, leading to ambiguity about which is primary and which is secondary stress (hence the "perhaps" in (1d). This may be part of why stress seems not to be strongly salient to native speakers.

Russian and Chinese, unlike Mongolian, both have lexically contrastive stress. In Russian, there are three levels of stress: primary (tonic), secondary (pretonic), and unstressed. The position of primary stress is unpredictable and lexically contrastive. Every (non-compound) word

has exactly one main stress, regardless of the number of syllables. Secondary stress always falls on the syllable immediately before primary stress. All other syllables are unstressed.

For Mongolian listeners, durational contrasts are likely to be important. Jones & Ward (1969) estimates that Russian primary-stressed vowels on average are 1.75-1.9 times as long as unstressed vowels, which is similar to the contrast between long and short vowel phonemes in Mongolian (described in section 5.3).

Besides duration, intensity and pitch, vowel quality is a key correlate of stress in Russian. Not only are vowel qualities reduced in secondarily- and un-stressed syllables, but some vowel phoneme categories are collapsed. A simplified schema of these collapses, omitting some allophones, is given in (2|).

(2)

Russian stress-based vowel category collapses (schematic)

Primary	i	e	a	o		u
Secondary	i		a			u
Unstressed	ɪ		ə			ʊ

Evidence for the above pattern is partly historical and partly from synchronic alternations brought about by stress shifts. Shifting stress is a lexical property of certain words; contrast "mountain" (shifting) and "book" (non-shifting) in (3).

(3)

'mountain'	'book'	
ˌgaˈra	ˈkniga	NOM.SG
ˈgoru	ˈknigu	ACC.SG

For the purposes of this study, I will generally assume that the input to Mongolian borrowing has consisted primarily of nominative forms with their attendant stress patterns, though the possibility of other inputs will be addressed in the discussion.

Loans into Mongolian from Russian consistently show the pattern that Russian lexical stress maps to Mongolian vowel length (see e.g. Svantesson et al., 2005, Lubsangdorji, 2004, Baljin-nyam, 2008). This pattern is schematized as follows (refer to Section 5.3 for more on the Mongolian length contrast.)

	Russian	Mongolian
(4)	ˈa.a	ˈaː.ă
	ˌa.ˈa	ˌa.ˈaː

In Chinese, there are two easily discernable levels of stress: stressed (tone-bearing) and un-stressed (neutral tone) (Chao, 1968). In addition to lacking a distinctive tone, unstressed vowels are also shortened and reduced. Unstressed syllables never occur in initial position, so there are two possible stress patterns for disyllabic words, stressed-unstressed and stressed-stressed. For those double stress sequences, some authors have argued that there is a difference between primary and secondary stress (some arguments are summarized in Duanmu (2007)). But because the phonetic cues for this distinction are much weaker than in Russian, this study will concentrate on the stressed-unstressed distinction.

The literature on Chinese borrowings into Mongolian has not commented on stress to length mapping. Bayancogtu (2002) states that length falls out from syllable structure: open syllables end up as long vowels, and closed syllables end up as short vowels.

Stress in Russian carries a much heavier functional load than in Chinese, which has many fewer minimal pairs distinguished only by stress. The distribution of stressed syllables is very different. In Chinese, unstressed syllables are relatively rare.

5 Vowel harmony in Halh, Chahar and Horchin Mongolian

This section begins with a definition of terms. This is followed by a general cross-dialect overview of the harmony rules (5.2), a discussion of how harmony interacts with vowel length (5.3), a more detailed look differences between dialects (5.4), and a presentation of disharmonic compounds (5.5).

5.1 Terminology for vowel harmony

The following definitions derive from Clements (1980) and Archangeli & Pulleyblank (1994), among others, and reflect general usage in the literature on vowel harmony. For a language to have "vowel harmony" means that within certain given morphological domains, all vowels must have the same value for certain features; in other words, they must belong to the same harmonic class. A "harmonic" root or word respects this principle. A "disharmonic" root or word contains vowels from different harmony classes. Pairs of vowels which have the same value for all features except the relevant harmony feature are said to "alternate", and are found in complementary distribution. Some vowels lack an alternating counterpart, and thus do not participate in harmony alternations. These vowels are known as "neutral". Neutral vowels may be either "transparent" or "opaque." If transparent, they do not affect harmony features of the surrounding vowels (they neither "block" harmony from spreading further, nor "trigger" harmony alternations.) If opaque, they do affect harmony features of surrounding vowels (they both block and trigger harmony). Consonant segments, if non-alternating, can also be analyzed as "neutral".

5.2   General operation of vowel harmony for all dialects

The description of Mongolian given here is synthesized from the following sources, which include general and dialect-specific material: Bayancogtu (2002); Harnud (2009); Iivonen & Harnud (2005); Janhunen (2012); Norjin (1998); Svantesson (1985); Svantesson et al. (2005).

Modern Mongolian exhibits vowel harmony in two dimensions, pharyngeality (also known as [-ATR]) and rounding. [4] The domain of harmony is the word, including derivational and inflectional suffixes. Example 5 illustrates pharyngeal alternations in the causative and perfective converb suffixes as applied to two verb roots, the non-pharyngeal /ult-/ "to remain, be left" and the pharyngeal /xʊr-/ "to gather, congregate". The items in (5) are from Halh.

(5)

root	root-CAUS	root-CAUS-C.PRF	
uɮt-	ult-eː-	ult-eː-geːt	"remain, be left"
xʊr-	xʊr-aː-	xʊr-aː-gaːt	"gather, congregate"

Rounding harmony is parasitic on pharyngeal harmony, applying only within pharyngeal classes. Example 6 illustrates rounding alternations with two non-pharyngeal roots, /xəɮ/ "tongue" and /xoɮ/ "foot", and two pharyngeal roots, /gaɮ/ "fire" and /gɔɮ/ "river". The items in (6) are from Chahar.

(6)

root	root-INS	
xəɮ	xəɮ-əːr	"tongue"
xoɮ	xoɮ-oːr	"foot"
gaɮ	gaɮ-aːr	"fire"
gɔɮ	gɔɮ-ɔːr	"river"

Rounding harmony only applies after non-high vowels. It will be noted that the rounded suffix forms in (6) do not appear in (5), despite the fact that /u/ and /ʊ/ are rounded. This is because /u/ and /ʊ/ are both classed as high vowels in Halh.

Most dialects have at least one so-called transparent vowel phoneme which does not partic-

---

[4]Acoustic and articulatory evidence that the basis for Modern Mongolian vowel harmony is pharyngeal constriction, not backness as in Old Mongolian, is summarized in Svantesson (1985).

ipate in harmony alternations and can co-occur with vowels of either class. One such vowel is /iː/ in Halh. Example 7 shows that /iː/ neither alternates based on the preceding vowel nor triggers alternations in a following vowel.[5]

(7)

	root	root-ACC	root-ACC-RFL	
	eːtʃ	eːtʃ-iːg	eːtʃ-iːg-eː	"mother"
	aːw	aːw-iːg	aːw-iːg-aː	"father"

Transparent vowels in Mongolian are usually considered to belong to the nonpharyngeal class, because roots containing only transparent vowels take non-pharyngeal suffixes, as shown in 8.

(8)

	root	root-DPST	
	xiː-	xiː-ʥeː	"do"

Halh, Chahar and Horchin each have at least one opaque vowel phoneme. Some are opaque only to rounding harmony, while others are opaque to both pharyngeal and rounding harmony. An instance of the latter is the pharyngeal vowel /ɛː/ in Horchin, which is always followed by pharyngeal vowels regardless of what precedes it.[6] Example 9 illustrates this with a nonpharyngeal root /xuː/ "son" and a pharyngeal root /xʊː/ "teapot".

(9)

	root	root-RFL	root-POSS	root-POSS-RFL	
	xuː	xuː-gəːn	xuː-tʰɛː	xuː-tʰɛː-gaːn	"son"
	xʊː	xʊː-gaːn	xʊː-tʰɛː	xʊː-tʰɛː-gaːn	"teapot"

The general principles given above hold true for Halh, Chahar and Horchin, as does the role of the length contrast in harmony, which is explained below in 5.3. Nonetheless, the three vowel inventories are different enough to generate significant cross-dialect variation in the surface implementation of vowel harmony. Dialect-specific vowel systems and their effects on harmony are outlined in 5.4. This section concludes with an overview of disharmonic elements such as compounds (5.5).

---

[5]Acoustic studies have found that /i/ and /iː/ in Halh do have different surface forms in pharyngeal versus nonpharyngeal words. This is a subphonemic alternation (Svantesson et al., 2005).

[6]Except in the Jalaid, Jasatu and Dörbed subdialects of Horchin.

5.3 Vowel harmony and the length contrast

Vowel length is contrastive in Modern Mongolian, as illustrated with the minimal pairs in (10) below.

	Halh	Chahar	Horchin	
(10)	xɔɮ	xɔɮ	xɔl	"far"
	xɔːɮ	xɔːɮ	xɔːl	"food, meal"

However, long-short pairs only contrast in the first syllable of the word. In post-initial syllables, there are indeed two different lengths of vowel, but only the "long" ones have a phonemically contrastive quality. The "short" vowels are ultra-short, and their quality is predictably a reduced, centralized version of the preceding vowel. Therefore, as illustrated in (11), there are no minimal pairs that contrast based solely on the quality of a post-initial short vowel.

(11) a. [xʊrŏɮ] vs. [xʊrʊːɮ]: a possible contrast

b. [xʊrʊːɮ] vs. [xʊraːɮ]: another possible contrast

c. [xʊrŏɮ] vs. [xʊrăɮ]: an impossible contrast

This phenomenon has been noted for many dialects of Modern Mongolian, including Halh, Chahar and Horchin. Phonological interpretations vary. Bayancogtu's grammar of Horchin (2002) and Janhunen's cross-dialectal grammar of Mongolian (2012) both posit a single post-initial short vowel phoneme with allophonic variations in quality. Svantesson et al.'s phonology of Halh (2005, p.65-68) goes even further, arguing that the surface occurrences of post-initial short vowels are completely predictable from consonant phonotactics, and therefore such vowels must be absent from the phonemic representation. On the other hand, Janhunen (2012, p.69-73) cites minimal pairs to show that post-initial short vowels must be present in the underlying form in at least some cases. Regardless, all these analyses agree on the important point for present purposes: that post-initial short vowels should not be expected to trigger harmony alternations in subsequent syllables.

This paper adopts the working assumption that initial and post-initial long vowels still form a phonological class, despite their different durations. Both are transcribed with a length mark, e.g. [aː]. Initial short vowels are transcribed with a single vowel letter, e.g. [a]. Post-initial short vowels are assumed to be vocalic segments without quality features and therefore without the ability to trigger harmony alternations. To emphasize this aspect, they are transcribed with an ultrashort diacritic, e.g. [ă].[7]

5.4   Dialect differences in vowel inventories and their effect on harmony

To give a birds-eye view of harmony alternations and facilitate phonetic comparison, the five plots in Figure 2 (page 21) locate the basic vowels of Halh[8], Chahar[9] and Horchin[10] in F1xF2 space. Red arrows indicate pairs that alternate in pharyngeal harmony. The Halh vowel space displays the classic ATR/RTR (non-pharyngeal/pharyngeal) diagonal division, although the line between harmony classes is less straightforwardly drawn for Chahar and Horchin. Another difference is that almost every vowel phoneme in Chahar is involved in pharyngeal alternations, while Halh and especially Horchin contain more non-alternating vowels. The phonological bases for these differences are discussed next.

Halh has seven basic vowels, Chahar has twelve, and Horchin has nine. Most of the basic vowels have both short and long forms. Tables 1, 2 and 3 show each dialect's full inventory of short and long monophthongs. The same symbols have been used for historically related vowels across dialects, even where the phonetic qualities are not identical (for instance, the qualities of the vowels labeled /o/ and /oː/ vary quite a bit by dialect and length.) The one excep-

---

[7]The vowel letters under the ultrashort diacritic are chosen as follows: in the illustrative examples, the vowel letter reflects the preceding phonemic vowel. In transcriptions from recordings, the vowel letter chosen reflects the auditory profile of the vowel, necessarily with some imprecision given the degree of reduction.

[8]Source: Means of 8 tokens per vowel from male speaker HB recorded by Jan-Olof Svantesson in Ulaanbaatar in 1990, reported in Svantesson et al. (2005).

[9]Source: Means of multiple tokens produced by three male speakers, reported in Harnud (2009). Formant values for long values were missing from this source. Plots for Chahar long vowels (again, without precise formant values) can also be found in Iivonen & Harnud (2005).

[10]Source: Means of 1-3 tokens from female speaker 15, recorded for this study in Hohhot in 2011. Data are from a practice task using native vocabulary that took place before the loanword task.
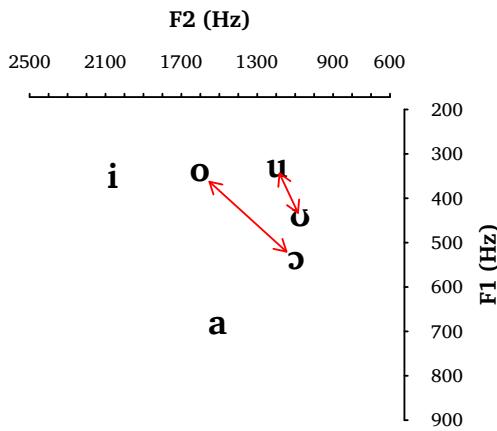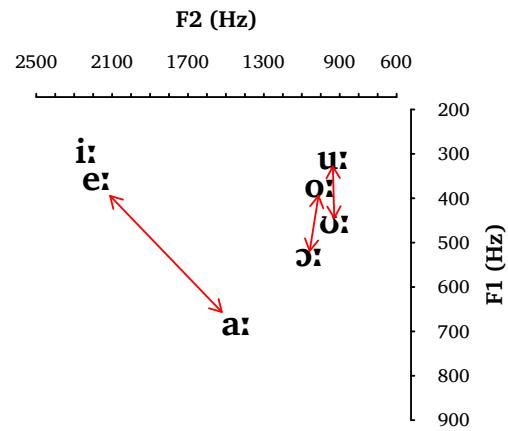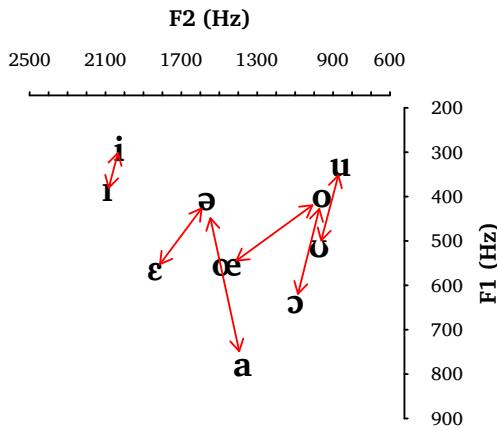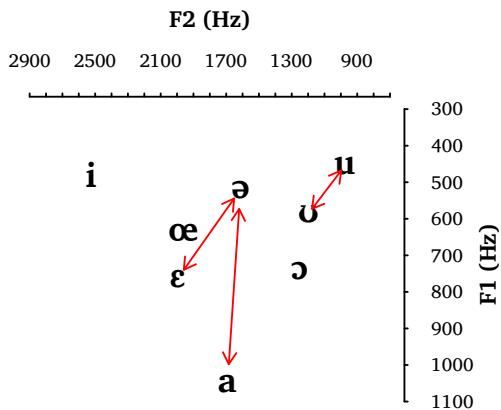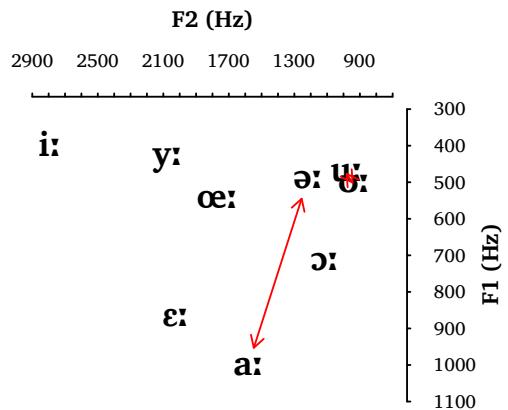
Figure 2: Basic vowels of Halh, Chahar and Horchin. Arrows indicate pairs that alternate in pharyngeal harmony.

tion is the vowel labeled as /e/ for Halh and /ə/ for Chahar and Horchin; as can be seen from the plots on page 21, the phonetic difference in this case is simply too great to be glossed over.

Table 1: Halh vowels: distinctive features

| | -pharyngeal | | +pharyngeal | |
	-round	+round	-round	+round
+high	i, iː	u, uː		ʊ, ʊː
-high	eː	o, oː	a, aː	ɔ, ɔː

Halh long and short /i/ vowels are transparent to pharyngeal and rounding harmony, while /u/ and /ʊ/ are opaque to rounding harmony. Historically there was a short /e/, but it has now merged with short /i/ in most varieties.

Chahar has five more basic vowels than Halh. Four of these, /ɛ/, /œ/, /e/ and /y/, are accounted for by a frontness distinction which does not exist in Halh. The fronted vowels arose historically from coarticulation with palatalized consonants or from monophthongization of i-diphthongs. Halh retains phonemic consonant palatalization and i-diphthongs instead of fronted vowels. The fifth additional vowel /ɨ/ is a pharyngeal counterpart to /i/.

Table 2: Chahar vowels: distinctive features

| | | -pharyngeal | | +pharyngeal | |
		-round	+round	-round	+round
+high	+front	i, iː	yː	ɨ, ɨː	
	-front		u, uː		ʊ, ʊː
-high	+front	eː		ɛ, ɛː	œ, œː
	-front	ə, əː	o, oː	a, aː	ɔ, ɔː

Despite divergent vowel inventories, vowel harmony applies very similarly in Halh and Chahar. The fronted vowels behave exactly like their non-fronted counterparts with respect to harmony; for example, /ɛ/ and /a/ both alternate with /ə/. The main difference is that, in those varieties of Chahar where pharyngeal /ɨ/ is present, there is no transparent vowel.

Horchin has nine basic vowels, shown in Table 3. Compared with Halh, it has one missing vowel /o/ and three added vowels /ɛ/, /œ/ and /y/. The /o/ phoneme in Horchin has merged

with /u/, with consequences for rounding harmony: there is no rounded counterpart to /ə/, and thus rounding harmony cannot apply in non-pharyngeal words. The three added vowels are fronted, by the same process that obtained in Chahar.

Table 3: Horchin vowels: distinctive features

		-pharyngeal		+pharyngeal	
		-round	+round	-round	+round
+high	+front	i, iː	y, yː		
	-front		u, uː		ʊ, ʊː*
-high	+front			ɛ, ɛː	œ, œː
	-front	ə, əː		a, aː	ɔ, ɔː

*occurs only in initial syllables

Another merger which has affected harmony is the merger of /ʊː/ with /uː/ (in post-initial syllables only). The resulting vowel /uː/ is transparent to pharyngeal and rounding harmony, like /iː/. A third merger, between non-pharygneal/eː/ (shown in the Chahar inventory) and pharyngeal /ɛː/, has given rise to a /ɛː/ phoneme that is opaque to harmony, as was illustrated in (9) above. Interestingly, if the result of a cross-harmony merger is non-pharyngeal, it is transparent, while if the result is pharyngeal, it is opaque. Despite all the mergers, it is not the case that harmony is "fossilized" or "lexicalized" in Horchin. Wherever the alternating elements have *not* been eliminated by mergers, harmony continues to apply regularly and productively. Plenty of evidence from the native lexicon is provided in (Bayancogtu, 2002).

In sum, pharyngeal and rounding harmony behave slightly differently in Halh, Chahar and Horchin because changes in the vowel inventories have eliminated some alternating pairs or created new pairs.

5.5   Compounds and harmony

The only disharmonic roots prevalent in the native lexicon are compounds. Compounds behave like two separate words with respect to vowel harmony. The elements of the compound retain their original harmony class, and suffixes agree with the rightmost element. In (12) the

compound "phonetics" consisting of a pharyngeal-nonpharyngeal sequence takes nonpharyngeal suffixes, and the compound "Hohhot (Blue City, Eternal City)" shows the opposite pattern (shown with Halh pronunciation).

(12) a. awʲaː-tsui   awʲaː-tsui-geːr
         sound-ology sound-ology-INS
         phonetics

     b. xox-xɔtʰ xox-xɔtʰ-ɔːs
         blue-city blue-city-ABL
         Hohhot (placename)

There are a few suffixes which behave like compound-forming rather than word-forming elements, for example /-xiː-/, a verb-forming affix derived directly from the common verb /xiː-/ "do". Even though /-xiː-/ as a suffix contains the transparent vowel /iː/, it actually triggers nonpharyngeal vowels in following suffixes. An example with Halh pronunciation is given in (13), contrasting /-xiː/ with the accusative /iːg/ in the same position. (The vowel in /tʊg/ is pharyngeal).

(13) a. tʊg   tʊg-xiː- tʊg-xiː-ɮeː
         nap(n.) nap(v.) nap(v.)-DPST

     b. tʊg   tʊg-iːg   tʊg-iːg-aː
         nap(n.) nap-ACC nap-ACC-RFL

An important point illustrated by "nap" is that even transparent /iː/, when found in the second part of a compound, does not behave transparently. Thus, post-initial [iː]-vowels provide a test for compound-ness. This diagnostic is brought forth by Svantesson et al. (2005) to show that /-xiː-/ is compound-forming, and it will later help to show that the loan data in this study are not being treated by speakers as compounds.

6   Goals of this study

The classic analysis of Mongolian vowel harmony, which has it that harmony originates from the first syllable of the root, conflicts with some observations in the Mongolist literature about the behavior of loanwords, namely: some loan roots contain disharmonic combinations of vowels, and some loans are assimilated to vowel harmony based on the quality of a syllable other than the first one. Such observations have led to the claim mentioned above that harmony can spread backward from stressed syllables in loanwords, and also to the claim that loanwords are exceptions to vowel harmony. The former claim is incompatible with the usual analysis of how vowel harmony applies synchronically, and the latter fails to explain how this exceptionality is preserved if vowel harmony is a productive process. Thus, both claims pose problems for a full and consistent analysis of Mongolian vowel harmony.

The present study aims to examine the application of vowel harmony in loanwords more fully by using systematically collected speech production data, and to apply the results to arrive at a consistent description of the native phonology that can account for the behavior of loanwords.

Because most (perhaps all) disharmonic loanwords are relatively recent, that is, less than a century old, the study will focus on recent loans, and on two of the languages which are in the most intense and widespread contact with Modern Mongolian: Russian and Chinese. Both Russian and Chinese loans are considered because published observations about disharmony in loanwords have usually focused on one or the other but not both. Therefore, claims based on those observations cannot be fully addressed unless both are considered. However, there is no dialect which has a large number of recent loans from both Russian and Chinese; therefore it has been necessary to gather data from speakers at both the northern and southern edges of the Mongolian-speaking area.

7   Methods

This study uses a modified wug-test design (Berko, 1958), with recent loanwords instead of made-up words, in order to collect evidence about the productive application of vowel harmony across morpheme boundaries. Specifically, it looks at cases where the root morpheme's internal composition violates either pharyngeal or rounding harmony. The main body of data comes from field recordings made in Ulaanbaatar, Mongolia and Hohhot, Inner Mongolia, China over a six-week period in August and September of 2011. Native speakers of several dialects of Mongolian were presented with borrowed roots and prompted to attach certain suffixes to them, either case markers (for nouns) or tense/aspect markers (for verbs). Loans from Russian were presented to speakers from Mongolia only. Loans from Chinese were presented to speakers from China only. Responses were audio recorded and transcribed by the researcher. Vowels were transcribed according to the phonemic categories of the relevant dialect. Root-internal (dis)harmony and root-suffix (dis)harmony were determined based on the transcriptions, given the harmony rules of the relevant dialect.

Data was collected in the form of audio recordings rather than orthography for two crucial reasons. First, it would be impossible to compare across dialects using orthography. The Cyrillic Mongolian writing system (used in Mongolia, i.e. by Halh speakers) has a fairly close grapheme-to-phoneme correspondence, with seven vowel symbols for six to seven distinctive vowel qualities. However, the traditional Uighurjin Mongolian script (used in China, i.e. by Chahar and Horchin speakers) uses three to five vowel letters[11] to represent nine to twelve distinctive vowel qualities. Dialects whose speakers all use Uighurjin script are thus not accessible to orthography-based analysis. The second reason to collect acoustic data was to eliminate ambiguity in the case of variable pronunciations with conventionalized spellings. Russian loans are written in Cyrillic Mongolian with the same letters as in Russian, and there are many "disharmonic" sequences in orthography which are commonly, but not universally, harmonic in

---

[11]Mongolian uses a cursive syllabic script with different initial, medial and final forms for each CV sequence. Five vowels are distinguished in initial syllables, three in medial and final syllables.

speech. Since the research question here concerns cases where the root morpheme is internally disharmonic, it is essential to know how individuals actually pronounce the root. (Uighurjin writing presents the further problem that Chinese loans are conventionally avoided as a matter of style; translations are preferred for new terminology.)

7.1   Word selection

About 60 words from Mandarin Chinese and 40 words from Russian[12] were selected as potentially disharmonic based on the source language pronunciation. The criteria were that the word must contain at least two syllables whose surface vowels would map to vowels of different classes in Mongolian, and that the non-initial syllable(s) should include at least one long vowel. A dictionary of foreign borrowings in Mongolian (Baljinnyam, 2008) provided useful information on typical pronunciations of loanwords in Halh. Some of the list was drawn from this dictionary, some from the examples in phonological works (Svantesson et al., 2005; Bayancogtu, 2002), and the rest from consultation with native speakers.

Despite these efforts the exact Mongolian pronunciations were not all known in advance, much less the degree of inter-speaker variability. Therefore, the study incidentally collects data on both of these.

An attempt was made to balance the lists according to the native vowel inventory so as to equally represent each type of vowel. This proved to be difficult due to an unequal distribution of vowel types in loanwords. In particular, pharyngeal disharmony is not as well represented as rounding disharmony because non-pharyngeal vowels were harder to find in loans than pharyngeal vowels.[13]

The lists focused on recent borrowings as the best test site for productive rule application.

---

[12]The number of words was constrained by the goal of keeping elicitation sessions to one hour or less including consent and training.

[13]It is worth noting that this unintentional imbalance may mirror frequency patterns within the native lexicon, as suggested by data from a corpus of written Halh (LaCross, 2011).

In the absence of detailed etymological information, the two main criteria for recency were that ordinary speakers be aware of the word's foreign origin, and that the word denote a relatively recent cultural or technological import. Most words met both these criteria, though a few met just one or the other. Because of the technological-import criterion, most of the "Russian" loanwords used in the study are not Slavic in origin but rather can be traced to other European languages such as English, French, Greek or Latin. For the purposes of this study I assume that the words came into Mongolian via Russian, based on the historical factors laid out in Section 3. The technological-import criterion did not affect Chinese loans in the same way because Chinese overwhelmingly prefers semantic loans over phonological ones (e.g. $[t^{j}æn^{53}.x^{w}a{:}^{53}]$ 'electric-speech' for "telephone".)

A side effect of the focus on recent borrowings was that some items had a marginal status in the lexicon and were unfamiliar to some speakers. All speakers were instructed to skip unfamiliar items, but their interpretation of the instructions varied (see 7.7).

Some fully harmonic loan roots were included as distractors.

7.2   Speaker sample

The study set out to record roughly equal numbers of speakers from Halh, Chahar (or other south-central dialects) and Horchin (or other eastern dialects). Speakers were recruited by word of mouth via acquaintances in Ulaanbaatar, Mongolia and Hohhot, China. When the recruiting process turned up speakers of other dialects, they were recorded anyway, yielding a total of 24 speakers of 7 different dialects: 7 Halh, 4 Barg, 4 Chahar, 4 Horchin, 2 Ujemchin, 2 Harchin, and 1 Ordos (all self-identified). [14] All were between 20 and 30 years of age. After the recordings were complete, 12 speakers were chosen for analysis, 4 each from Halh, Chahar and Horchin.

---

[14]An additional 3 speakers' recordings were discarded because of problems with the elicitation method.

7.3 Wordlist presentation

Different methods of presenting the wordlist were used with speakers from Mongolia (Halh) and from China (all other dialects) in order to elicit the most naturalistic pronunciations possible.

With Halh speakers, the main problem was to avoid spelling pronunciations. The official orthography of Mongolia is relatively phonemically transparent with respect to native Mongolian words and older loanwords, but Russian loans are spelled as in Russian rather than reflecting the colloquiual pronunciation. It became apparent during the study that speakers presented with a written Russian loan would sometimes pronounce it completely differently than if they were shown a picture of the object, and in some cases failed to recognize familiar words because they were not used to seeing them written. Elicitation via pictures, though it limited the types of words that could be tested, turned out to work well if speakers were shown the images in advance and given time to come up with the word. It also provided a reliable test of whether speakers were actually familiar with the target word.

For an initial test group of three Halh speakers, the loanwords were presented in Cyrillic orthograpy on a computer screen, one at a time, in random order. For the remaining speakers, i.e. those which were actually used in the analysis, the loanwords were elicited via images in a computer slideshow. The orthographic group recorded some Mongolian words as well as loanwords; the slideshow group recorded only loanwords. The slideshow was not randomized.

With speakers in Inner Mongolia, the orthography problem was different. A large portion of the words being tested were not considered part of Standard Mongolian and therefore did not have a Mongolian spelling. Since the speakers consulted were literate in Chinese, the entire wordlist was presented in Chinese characters. Speakers were instructed to pronounce the words as they did when speaking Mongolian, and to skip any words that they did not use. To better disambiguate the Chinese and Mongolian pronunciations, speakers were told to give the Chinese pronunciation first, followed by the Mongolian pronunciation, followed by the suffixed

form. Prior to the recording speakers were shown a printed wordlist in Chinese orthography. The same list was then presented on a computer screen, one word at a time, in random order.

7.4   Task

Speakers were instructed to pronounce each target word twice in isolation and twice with an inflectional suffix. For nouns, they were to add the instrumental, dative or reflexive case suffix, whichever one they thought made most sense with the word. For verbs, they were asked to add the present/future or imperfective endings. These suffixes were chosen because their surface vowels alternate based on both pharyngeal and rounding harmony. Where time permitted, speakers also recorded a list of Mongolian words in isolation and with suffixes as a training task. Speakers were instructed to skip any words that they did not know, did not use, or would not use in Mongolian. They were also allowed to skip adding suffixes if they did not feel that any of the suffixes sounded right.

Instructions were given in Mongolian, either by the researcher or an assistant. During some of the interview sessions in Ulaanbaatar a native Halh-speaking assistant, Bulgan Ganbaatar, was present. Her role was to help explain the task to the speakers and to coach them through a practice round of the picture-naming task. When speakers were not sure what word a picture was meant to evoke, she attempted to give clues that would get them to say the word first without saying it herself. She also helped to choose the images, which was invaluable because of her knowledge of local culture. An assistant was not needed for the Hohhot recordings due to the researcher's greater familiarity with the local languages and culture.

7.5   Recording setup

Speakers were seated in front of a laptop computer with a microphone on a tabletop stand between them and the screen (low enough not to block their view.) The researcher sat next to

or across from them, usually with a separate mic and channel. All recordings were made using an M-Audio Microtrack digital flash recorder and Audio-Technica AT-4041 cardioid microphones. Pictures were presented on the computer screen as PowerPoint slides. Written words were presented as white text on a black screen using the University of Washington Phonetics Lab's Flash wordlist presenter and randomizer. Recordings were made in a variety of sites around Ulaanbaatar, Mongolia and Hohhot, China. Typical locations were private homes, classrooms and offices. Because cultural norms made it easier to recruit speakers in small groups rather than individually, some were interviewed in groups of up to five. In that case they went through the training phase together and then made recordings one by one. Sometimes other members of the group remained in the room while the recording proceeded.

7.6   Transcription

Recordings were transcribed to Praat Textgrids by the author, a competent non-native speaker of Mongolian. Auditory information was primary, supplemented by visual inspection of spectrograms and formant tracks. The Halh transcriptions were cross-checked against transcriptions by Bulgan Ganbaatar. For Chahar and Horchin, each speaker recorded a set of native words representing a full vowel inventory, which was used to cross-check the vowels in loans. All segments were transcribed according to the phonemic categories of the relevant dialect's phonology as analyzed in published sources. See Section 5 for the full vowel inventories and sources.

7.7   Observations on the target words' familiarity and status in the lexicon

It was expected that some of the items on the wordlist, being relatively recent loanwords, would be unknown to some of the participants. The goal of the study was to collect naturalistic pronunciations of words known to the participants. To ensure that this was the case, speakers were instructed to skip any words that they did not know, did not use, or would not use when

speaking Mongolian. Most of the words tested were accepted by all of the speakers and pronounced the same way within each dialect.

Each speaker interpreted the instruction "skip unknown words" differently. The more puristic speakers rejected words during the recording that they were then heard to use freely in conversation (maybe they considered this "code-switching" rather than "borrowing".) This was marked in field notes where observed. On the other hand, more compliant speakers accepted words that they clearly did not understand or were unsure how to pronounce (perhaps they had heard the word once or twice but did not know it well). This was marked in field notes and can be detected in recordings if they hesitate over the pronunciation or ask for help with the picture-naming task. Finally, a few speakers decided to faithfully represent the speech of their home village rather than their own urbanized dialect, which became apparent when they rejected words for reasons like "we don't say *gōngjiào* (Chinese: 'city bus') where I come from because there is no public transit." This interpretation of the instructions was marked in field notes where they mentioned it overtly.

Further information about acceptability could be gleaned from speakers' level of comfort with adding suffixes to the target words. Two factors seemed to be at work: the need for context, and a reluctance to add Mongolian morphology to words that were perceived as foreign.

As far as context goes, some speakers (often language and literature students) seemed to be able to mechanically add the same suffix to any word, while others seemed to need some context, and would embed their suffixed forms in complete sentences. Still others lacked the imagination to come up with the context themselves, but would add suffixes once prompted with a plausible context (either by the researcher or a fellow native speaker who was present during the recording). All this reveals more about individual differences in linguistic awareness than about the status of the target words in the lexicon.

In addition, some speakers explicitly expressed reluctance to add Mongolian suffixes to words that they considered foreign. One speaker in Ulaanbaatar joked after her interview, "thanks for

all the tongue-twisters!" Other speakers used suffixing to effectively add an intermediate level to their acceptability judgments , stating that they were familiar with a word and would use it in Mongolian, but that it could not take suffixes. This tended to happen with proper names in particular, such as the Chinese names for "McDonald's" and "Kentucky Fried Chicken". These names received such variable responses that I excluded them from the data to be analyzed.

Variable interpretations of the task notwithstanding, enough data was collected from enough speakers to shed light on the research questions.

8 Results

Results from Halh speakers are presented in 8.1, results from Chahar in 8.2, and results from Horchin in 8.3. In each section, data are grouped by the type of vowel sequence in the root: harmonic, with rounding conflicts, or with pharyngeal conflicts. Some of the loan roots in the dataset display both rounding and pharyngeal disharmony; such roots are included in both groupings.

Each subset of the data is illustrated with transcriptions of particular pronunciations from particular speakers. A complete set of transcriptions can be found in the Appendix. The Appendix is first broken down by dialect and then organized alphabetically according to the English glosses. To facilitate reference to the Appendix, English glosses in this and subsequent sections are either identical with those in the Appendix or, where this conflicted with the desired interlinear gloss format, close enough to the Appendix gloss that alphabetic lookup is still possible.

8.1 Halh

Data presented here was collected from 42 lexical items as presented to 4 speakers. Disregarding repetitions, they produced a total of 153 suffixed tokens out of a possible 168 (42x4), or 91%.

For words where the root contained only one vowel quality, in all cases the suffixed forms were as expected, i.e. they contained the appropriate vowel for that class. This is illustrated with a nonpharyngeal monosyllable in (14) and a pharyngeal disyllable in (15).

(14) kʰuːp kʰuːp-eːr
     cube cube-INS
     kub; Speaker 03

(15) ɮampaːrt ɮampaːrt-aːr
     pawnshop pawnshop-INS
     lombard; Speaker 03

If disyllabic words contained different vowels belonging to the same harmony class, they likewise received appropriate suffixes. This is illustrated with a non-pharyngeal word in (16) and a pharyngeal word in (17).

(16) siɸtʃʰeː   siɸtʃʰeː-geːr
     spark.plug spark.plug-INS
     sveča; Speaker 03

(17) mainʊːts   mainʊːts-aːr
     mayonnaise mayonnaise-INS
     majonez; Speaker 07

So far root-suffix harmony seems to be applying normally in foreign loan roots. We now come to items where the root contained vowels belonging to more than one harmony class. The results here are more complicated.

8.1.1 Rounding Conflicts

Results for rounding conflicts were sometimes surprising given the standard account of rounding harmony in the native phonology, which is summarized here in Table 4 and discussed in detail in Section 5.

Table 4: Standard Account of Halh Rounding Harmony

	Non-Phar.	Phar.
Triggers [+round]	o, oː	ɔ, ɔː, ɔi
Triggers [−round]	eː	a, aː, ai, ʊa, ʊai
Blocks [+round] and triggers [−round]	u, uː, ui	ʊ, ʊː, ʊi
Transparent		i, iː

Unround-round sequences turned out to be a clear case of the "compound-like" pattern, i.e. the suffixes always harmonized with the rightmost syllable in the root. Of 29 tokens of this

type (drawn from 12 lexical items), all 29 received rounded suffixes. A representative example is given in (18) below.

(18) ʐapărtʰɔːr ʐapărtʰɔːr-ɔːr
laboratory laboratory-INS
laboratori(â); Speaker 07

The sequence [a]C[ɔ] is the most common one in this set. The sequence [ʊ]C[ɔ] accounts for 3 tokens and the sequence [i]C[ɔ] accounts for 6 tokens. Since /i/ is transparent to rounding harmony in native words regardless, (see Table 4), the [a]C[ɔ] and [ʊ]C[ɔ] tokens are the most significant examples. It happened that there were zero instances of the non-pharyngeal rounding trigger [o], simply because this vowel rarely if ever occurs in loans from Russian.

Round-unround sequences generally demonstrated the "compound-like" pattern as well, but there are many exceptions which require explanation. Of a total of 26 tokens (12 lexical items), only 7 tokens (5 items) were straightforwardly "compound-like", as in (19).[15] Most of these items contained the vowel sequence [ɔ]C[a].

(19) nɔtʰraːtʰ nɔtʰraːtʰaːr (7 tokens, 5 items)
notary notary-INS
notariat; Speaker 09

In analyzing the remaining 19 tokens, the first complicating factor is that one speaker (#09) sometimes vacillated between [a] and [ɔ] in her choice of suffix vowels, using one for ablative /Eːs/ and another for instrumental /Eːr/. The four items for which this occurred are listed in (20); it was not consistent which suffix received which vowel.

(20) a. mɔteːʐn-aːs mɔteːʐ-ɔːr
model-ABL model-INS

b. mɔteːm-aːs moteːm-ɔːr
modem-ABL modem-INS

c. ɔmʐʲeːtʰn-aːs ɔmʐʲeːtʰ-ɔːr
omelet-ABL omelet-INS

---

[15]See "format, fountain, notary, Oscar, veterinarian" in Appendix.

d. xɔɮʝ̌striːn-ɔːs   xɔɮʝ̌striːn-aːr
   cholesterol-ABL cholesterol-INS
   model', modem, omlet, holesterin; Speaker 09

Since there appears to be no systematic explanation for the vacillation, I will set the data in (20) aside for the moment. This leaves 15 tokens, because the pronunciations in (20) have been counted as 0.5 tokens each or 4 tokens total so as not to overrepresent that particular speaker.

The remaining 15 all have suffixes that harmonize with the first vowel and not the last, the opposite of the "compound-like" pattern. This can be called the "transparent" pattern. Tokens following the "transparent" pattern can be subdivided according to whether the final vowel was [iː] or [eː]. About one-third had [iː] in the final syllable, as in (21). In such cases, it turns out that [iː] is invariably transparent to rounding harmony, just as it would be in a native Halh non-compound word.

(21) xɔːpi: xɔːpiː-gɔːr (6 tokens, 2 items)
     hobby hobby-INS
     hobbi; Speaker 03

The pattern in (21) demonstrates that Russian loanwords do not necessarily function like compounds with respect to vowel harmony, since a native compound with only [i] vowels in the second element would take non-pharyngeal suffixes (see Section 5). More surprising was the other two-thirds of the "transparent" group: these roots had [eː] as their final vowel, which is *not* transparent in the native Halh sytem.

(22) mɔtʲeːɮʝ mɔtʲeːɮʝ-ɔːr (9 tokens, 4 items)
     model   model-INS
     model'; Speaker 03

Roots with [ɔ]C[e] sequences followed this pattern in all cases but one,[16] strongly suggesting that the speakers treated [e] as a transparent segment. However, since the "transparent [e]" pattern involves pharyngeal disharmony as well as rounding, it will be discussed in full in the next section, so that [a]C[e] sequences can be included.

---

[16]The one exception is *zootehnik[č]* "veterinarian", to be discussed further below.

To summarize the results so far: in rounding harmony, suffixes follow the rightmost vowel so long as that vowel is [a] or [ɔ]. If the rightmost vowel is [i] or [e], suffixes may follow a preceding rounded vowel. (There is no data for [ʊ], [u] and [o] in final syllables.)

8.1.2 Pharyngeal Conflicts

Nonpharyngeal-pharyngeal sequences generally displayed the "compound-like" pattern. Of 26 tokens of this type, drawn from 10 lexical items, almost all (24.5) took suffixes harmonizing with the rightmost vowel, as in Example (23).[17]

(23) **signaːʤ signaːʤ-aːr** (24.5 tokens, 10 items)
car.horn car.horn-INS
signal; Speaker 03

It should be noted that this dataset is heavily skewed towards initial [i] vowels, due to the i-e merger in initial position (see Section 5), the lack of [o] vowels in loans from Russian, and the tendency to interpret Russian /u/ as either /u/ or /ʊ/ in Mongolian. In fact, only one [i]-less item occurred:

(24) **kʰursɔːr kʰursɔːr-ɔːr**
cursor   cursor-INS
kursor; Speaker 03

Nonetheless, given the consistent "compound-like" results found for rounding harmony (e.g. Example 18 above), there is no reason to suppose that the pattern in (23) and (24) is anomalous.

For Pharyngeal-nonpharyngeal sequences, the "transparent" pattern heavily predominated. Out of 43 tokens drawn from 14 lexical items, 38 clearly displayed the "transparent" pattern, 2 clearly displayed the "compound-like" pattern, and 3 were anomalous (the suffix vowel did not correspond to any vowel in the root). The Pharyngeal-nonpharyngeal dataset overlaps with the Round-unround dataset.

---

[17]The remaining 1.5 tokens took suffixes whose vowels corresponded with nothing in the root. Fractional tokens represent vacillation between two different suffix qualities by the same speaker.

Among those following the "transparent" pattern, more than half had [i] as the rightmost vowel, as in (25), are easily explained according to native Halh phonology.

(25) aspʰriːŋ aspʰriːn-aːr (21.5 tokens, 8 items)
    aspirin   aspirin-INS
    aspirin; Speaker 03

However, the remainder surprisingly contained [e] as the rightmost vowel:

(26) manʲkʰeːŋ manʲkʰeːn-aːr   (16.5 tokens, 6 items)
    mannequin mannequin-INS
    maneken; Speaker 03

There were no roots in the dataset that containted a pharyngeal vowel followed by non-pharyngeal [u] or [o]. Therefore it is not clear whether these vowels could be treated transparently as well as [e].

The only "compound-like" instances were two tokens of zootehnik[č] "veterinarian".[18]

(27) tsɔːtʰeːxněg-tʃʰ   tsɔːtʰeːxněg-tʃʰ-eːr   (2 tokens, 1 item)
    veterinary-PROF veterinary-PROF-INS
    zootehnik[č]; Speaker 07

One possible reason is that this root is longer than any of the others, the rounding trigger [ɔː] being separated from the right edge of the root by two syllables instead of one. In this case, the explanation would be that pharyngeal and rounding harmony decline with distance. Another possible explanation is that the word in Russian is a compound of the bound morpheme *zoo* and free morpheme *tehnik*; if other words containing either morpheme have been borrowed into Mongolian, speakers may be aware of *zootehnikč* as a compound.

The 3 anomalous tokens all had pharyngeal suffixes, and thus were close to the "transparent" pattern, but the suffix vowels had the opposite rounding feature from the leftmost vowel in the root. One example is given in (28). The remaining 2 come from the set with vacillating suffixes

---

[18]These two tokens are the only pronunciations collected for *zootehnik[č]*. The other two speakers gave a different word for the same image, *malyn emč* lit. "livestock doctor", a natively derived term which has become popular in the post-Communist era.

produced by Speaker 09, previously discussed and listed in (20).[19]

(28) kʰaɸtʂiːsm kʰaɸtʂiːsm-ɔːr 1 item, 1 token
capitalism   capitalism-INS
kapitalizm; Speaker 07

These anomalous tokens, while they must be interpreted with caution, may be able to throw some light on the phenomenon of the unexpectedly transparent [eː].

8.2   Chahar

The data presented for Chahar was collected from 49 lexical items as presented to 3 speakers. Disregarding repetitions, they produced a total of 111 suffixed tokens out of a possible 147 (49x3), or 76%. The dataset included mostly disyllabic roots, with a few monosyllables and trisyllables. Sometimes the Chahar pronunciation had fewer syllables than the Chinese, in most cases due to the deletion or reduction of vowels.[20]

For words where the root contained only one vowel quality, in all cases the suffixed forms contained the expected harmonic vowel. This is illustrated with a nonpharyngeal root in (29) and a pharyngeal root in (30).

(29) goːg   goːg-oːr
elder.brother elder.brother-INS
哥哥; Speaker 16

(30) xɔːr   xɔːr-ɔːŋ
number number-RFL
号码; Speaker 17

If disyllabic words contained different vowels belonging to the same harmony class, they likewise received appropriate suffixes. This is illustrated with a non-pharyngeal word in (31) and a

---

[19]As a reminder, the vacillating items are counted as 0.5 tokens, so the count of 2 actually represents 4 utterances.

[20]In a few cases it was due to variation in the forms being borrowed. For instance, in 30 the Chinese prompt 号码 instead evoked a word borrowed from the shorter, roughly synonymous Chinese form 号.

pharyngeal word in (32).

(31) pʰiŋgwə: pʰiŋgwə:-gə:r
apple   apple-INST
苹果; Speaker 16

(32) ɕɛntsʰaɨ   ɕɛntsʰaɨ-gaːr
pickled.vegetables pickled.vegetables-INS
咸菜; Speaker 17

8.2.1   Rounding Conflicts

Table 5 summarizes rounding harmony properties of the Chahar vowels according to standard accounts of the native phonology.

Table 5: Standard Account of Chahar Rounding Harmony

	Non-Phar.	Phar.
Triggers [+round]	o, oː	ɔ, ɔː, œ, œː
Triggers [-round]	ə, əː, eː əi	a, aː, ɛ, ɛː aɨ, ʊa
Blocks [+round] and triggers [-round]	u, uː, yː ui	ʊ, ʊː
Transparent	i, iː	ɨ, ɨː

Unround-round sequences, as in Halh, uniformly followed the "compound-like" pattern, i.e. the suffixes always harmonized with the rightmost syllable in the root. Of 18 tokens of this type (drawn from 9 lexical items), all 18 received rounded suffixes as in (33) below.

(33) tjɛnnɔː   tjɛnnɔː-gɔːr   18 tokens, 9 items
computer computer-INS
电脑; Speaker 16

It happened that all the items collected contained the pharyngeal rounding trigger [ɔ] rather than the rarer non-pharyngeal rounding trigger [o].

As for Round-Unround sequences, there were four roots in this category. Three followed the "compound-like" pattern (34).

41

(34) tʃɔːɕaːŋ   tʃɔːɕaːn-aːs   3 tokens, 3 items
     photograph photograph-ABL
     照相; Speaker 17

The fourth root followed the "transparent" pattern (36).

(35) tʃɔːʃiː   tʃɔːʃiː-gɔːr   2 tokens, 1 item
     supermarket supermarket-INS
     超市; Speaker 16

The root in (35) is the only one of the four whose rightmost vowel[21] is transparent to rounding harmony in the native lexicon.

In sum, the data on rounding disharmony from Chahar frequently but not universally display the "compound-like" pattern.

8.2.2   Pharyngeal conflicts

All roots containing a non-pharyngeal vowel followed by a pharyngeal vowel displayed the "compound-like" pattern, taking pharyngeal suffixes as illustrated in (36)

(36) suːɢjɔːr suːɢjɔːr-ɔːr 6 items, 16 tokens
     plastic   plastic-INS
     塑料; Speaker 16

Roots containing a pharyngeal vowel followed by a non-pharyngeal vowel displayed the "compound-like" pattern in some cases and the "transparent" pattern in others. Example (37) shows the compound-like pattern.

(37) pantʃʰəː pantʃʰəː-gəːr 3 items, 4 tokens
     bus   bus
     班车; Speaker 18

Example (38) shows the transparent pattern.

---

[21]There is some doubt about the nature of this vowel in the data: is it really the Chahar /ɨː/ (the pharyngeal counterpart of /iː/), or is it a derivative of Chinese /ʐ̩/ with unique properties, as in Horchin? It makes little difference to the present analysis, however, given that the Horchin marginal phoneme /ʐ̩/ is also transparent to rounding harmony.

(38) **ta:jin ta:jin-a:r** 2 items, 2 tokens
   print print-INS
   打印; Speaker 16

Among the above items, one particular root, "TV show" in (39) below, received a compound-like treatment from one speaker and a transparent treatment from another speaker (the third speaker rejected the word.)

(39) a. **tjɛnʃtɕy: tjɛnʃtɕy:-ge:s** 1 item, 1 token
      TV.show TV.show-ABL
      电视剧; Speaker 16

   b. **tjɛnʃtɕy: tjɛnʃtɕy:-ga:s** 1 item, 1 token
      TV.show TV.show-ABL
      电视剧; Speaker 18

The number of pharyngeal-nonpharyngeal sequences in the Chahar dataset is small enough that it is hard to identify a pattern. However, the Horchin dataset is larger, and it will be seen that the Chahar data conforms to the same patterns.

8.3   Horchin

The data presented for Horchin was collected from 58 lexical items as presented to 3 speakers. Disregarding repetitions, they produced a total of 147 suffixed tokens out of a possible 174 (58x3), or 84%. The dataset included mostly disyllables, with a few monosyllables and trisyllables. The Horchin pronunciations of Chinese loans differ from Chahar in both predictable and unpredictable ways. Monosyllabic words took the expected type of suffix. This is illustrated with a non-pharyngeal word in (40) and a pharyngeal word in (41)

(40) **tʃʰə:s   tʃʰə:s-ə:r**
   eggplant eggplant-INS
   茄子; Speaker 14

Several of the monosyllabic words collected were verbs, which still took appropriately har-monized suffixes, as in (41).

(41) tjɛnxwa taː-n   taː-x-aːr
      telephone call-DUR telephone call-FUT-INS
      电话 + 打"is making a phone call"; "by making a phone call"; Speaker 14

The gloss and translation of (41) may require some further explanation. Horchin /tjenxwa: ta:-/ "to make a phone call" is an object-verb construction. The Chinese expression from which it is borrowed has the opposite word order, /ta²¹⁴ tjæn⁵³xwa⁵³/. Horchin has borrowed this two-word expression as a set, but reversed the word order to conform to Mongolian's OV structure. Incidentally, Chinese /ta²¹⁴/ does not literally mean "call" in all contexts, but since the word has not been borrowed into Horchin as an independent verb, it can be appropriately glossed as "call" here.[22]

Disyllabic and trisyllabic roots where all vowels belonged to the same harmony class uni-formly took the expected harmonic suffixes as well, as shown in (42) and (43).

(42) ɕɛnsɛː   ɕɛnsɛː-gaːr
      pickled.vegetables pickled.vegetables-INS
      咸菜; Speaker 13

(43) pʰiŋgwəː pʰiŋgwəː-gəːr
      apple   apple-INS
      苹果; Speaker 13

Table 6: Standard Account of Horchin Rounding Harmony

	Non-Phar.	Phar.
Triggers [+round]	--	ɔ, ɔː, œ, œː
Triggers [-round]	ə, əː, y, yː	a, aː, ɛ, ɛː, ʊa, ʊɛ, ʊ*, ʊː*
Blocks [+round] and triggers [-round]	--	--
Transparent	i, iː, u, uː	

*=only occurs in initial syllables

8.3.1 Rounding conflicts

For Unround-Round sequences, i.e. those roots where only the rightmost syllable was a rounding harmony trigger, in all cases the suffix vowel was rounded. There were 9 items of this type, all with [ɔː] or [aʊ] as the rightmost vowel. This set is represented in (44).

(44) mjɛmpɔː mjɛmpɔː-gɔːr 9 items, 24 tokens
 bread bread-INS
 面包; Speaker 13

Therefore, Unround-Round sequences in Horchin clearly followed the compound-like pattern.

For Round-Unround sequences, both the compound-like pattern and the transparent pattern were observed. There were five lexical items in this set, out of which four displayed the compound-like pattern as shown in 45.

(45) tʃɔːɕaŋ tʃɔːɕaŋ-aːr 4 items, 9 tokens
 photograph photograph-INS
 照相; Speaker 14

The four roots following the compound pattern all had [a] or [ɛ] as the rightmost vowel. Only one root displayed the transparent pattern:

(46) tʃʰaʊʃʐ̩ː tʃʰaʊʃʐ̩ː-gɔːs 1 item, 1 token
 supermarket supermarket-ABL
 超市; Speaker 15

---

[22]The same syntactic pattern can be observed in "to date someone" and "to take a photograph" (see Appendix under Verb-Complement Combinations). A different pattern, whereby Horchin speakers treat /ta²¹⁴/ and its complement as a single verb root, can be seen with"to print" and "to take a taxi" (see Appendix). The presence of both patterns suggest a sophisticated transfer of certain nuances of Chinese morphology, which cannot be fully discussed here due to lack of space.

Although this subset of the data is small, and the syllabic fricative /ʐ̩/ is unusual as a vocalic segment, the results appear roughly similar to Halh: where the rightmost vowel in a loan root is a non-high, pharyngeal vowel, it blocks rounding harmony. Where the rightmost vowel is a high vowel, it is transparent to rounding harmony.

(47) tʃʰaʊʃʐ̩ː   tʃʰaʊʃʐ̩ː-gaːr   1 item, 1 token
     supermarket supermarket-INS
     超市; Speaker 14

Pharyngeal conflicts

For Nonpharyngeal-Pharyngeal sequences, the compound-like pattern occurred in every case.

(48) ɕiːgwaː   ɕiːgwaː-gaːr   10 items, 20 tokens
     watermelon watermelon-INS
     西瓜; Speaker 14

(49) gwəːtʰjɔːr   gwəːtʰjɔːr-ɔːr
     fried.dough fried.dough-INS
     果条; Speaker 14

For Pharyngeal-Nonpharyngeal sequences, both the compound-like and the transparent pattern were observed. There were ten compound-like tokens corresponding to five different lexical items.

(50) pantʃʰəː pantʃʰəː-gəːr 5 items, 10 tokens
     bus   bus-INS
     班车; Speaker 13

Another 22 tokens showed the transparent pattern.

(51) tjɛnjiŋ tjɛnjiŋ-aːs 11 items, 22 tokens
     movie   movie-ABL
     电影; Speaker 13

The roots which displayed the transparent pattern all had one of the following as their right-most vowel: [yː] [iː] [ən] [əŋ] [ʐ̩ː] [in] [iŋ]. The roots which displayed the compound pattern all had one of these as the rightmost vowel: [əː] [yː] [uː].

8.4   Summary of Results

Harmony alternations in suffixes were robust, even when the roots were recent loanwords. This was most clearly apparent from roots that did not violate vowel harmony.

Vowel harmony did not universally apply within loan roots; there were many internally disharmonic root pronunciations in the data.

Among the internally disharmonic loan roots, two suffixing patterns emerged, which are provisionally labeled the "compound-like" and "transparent" patterns. The former resembled native compound roots, in that suffixes agreed with the rightmost syllable in the root, regardless of preceding vowels. The latter resembled native monomorphemic roots containing transparent vowels in the last syllable, in that suffixes agreed with an earlier syllable, ignoring intervening vowels.

9 Discussion

9.1 Productivity within and across morphemes

This study included a number of borrowed roots whose composition happened not to violate any rules of vowel harmony. For such roots, speakers consistently attached suffixes with the appropriate harmonic vowel. This indicates that Mongolian vowel harmony is applying productively to loanwords.

At the same time, many of the roots were themselves pronounced disharmonically. This could be interpreted as evidence of vowel harmony *not* applying to loanwords. Indeed, similar data for Turkish led Clements & Sezer (1982) to conclude that Turkish vowel harmony spread only from roots to suffixes, never within roots, and furthermore to generalize that "the burden of proof is on the linguist who wishes to demonstrate that roots are governed by vowel harmony at all" (p.226).

Of course, non-application in roots is an unsatisfactory end to the discussion, given that the overwhelming majority of roots in Mongolian (and most other vowel harmony languages) do follow the rules.

However, supposing that Mongolian vowel harmony is a morphophonological rather than a purely phonological or "automatic" process (Haspelmath & Sims, 2010), then the presence of disharmonic roots need not impinge on the conclusion that vowel harmony is fully productive in Mongolian.

Indeed, the contrast between regular harmony across morphemes and irregularities within morphemes should be seen as part of the prevailing pattern among vowel harmony languages: harmony does not necessarily apply on-line to root morphemes.

In a study like the present one, where the object of inquiry is what speakers are doing on-line when they generate suffixed forms based on memorized root lexemes, it is both possible

and necessary to make a distinction between constraints that are active in speech production, and constraints that (diachronically and stochastically) shape the lexicon. The fact that most roots in Mongolian conform to vowel harmony is a case of the latter. The fact that suffixed forms collected in this study conformed to vowel harmony is a case of the former.

9.2   Effect of stress, length and position in the word

Stress maps to vowel length in Russian loans, but not Chinese loans. In Chinese loans in Horchin, vowel length of the Mongolian form seems to be determined by syllable structure. Open syllables get long vowels, closed syllables get short vowels. In Chinese loans in Chahar, the pattern is similar, except that nasal finals seem to behave like open syllables instead of closed.

In neither case does source language prominence appear to have an effect on vowel harmony triggering. Stressed syllables from Russian, post-borrowing, do not consistently trigger harmony in either preceding (within-root) or following (suffix) syllables. Full-toned syllables from Chinese, post-borrowing, do not consistently trigger harmony in either preceding (within-root) or following (suffix) syllables. This evidence runs counter to claims made by Svantesson et al. (2005) and Lubsangdorji (2004) that stressed vowels determine the harmony class of loanwords. The experiment tested these claims by collecting pronunciations of a large number of loan roots with similar stress patterns and different vowel sequences. It turned out that the first syllable of a root almost never assimilated to the harmony class of the second syllable, despite the second syllable being stressed in the source. Svantesson et al. 2005's key example, Mongolian [pɔgɔːŋ] from Russian [ˌvaˈgon], was verified during this study, but turns out to have been an exceptional case.

Furthermore, source-stressed syllables often failed to trigger harmony even in suffixes directly adjacent to them, as discussed below.

9.3 "Compound-like" and "Transparent" patterns in loan roots

The "compound-like" (suffixes follow the final syllable in the root) and "transparent" (suffixes follow an earlier syllable in the root) patterns both surfaced when suffixes were added to disharmonic roots. Which pattern a word followed appeared to depend on the vowel qualities in the root. The "transparent" analysis is supported by the fact that any vowels that were transparent in the native lexicon behaved transparently in loanwords (most of the data here is from Halh and Horchin /iː/). Interestingly, several vowels that are not transparent in the native lexicon turned out to be transparent in loanwords (Halh /eː/, Chahar /iː/, Horchin /yː/). This pattern was quite consistent. If these vowels are allowed to be transparent to harmony, this permits the conclusion mentioned above, that vowel harmony is applying regularly across the root-suffix boundary.

9.4 Implications for traditional formulations of Mongolian vowel harmony

9.4.1 Directionality of harmony

Vowel harmony operates productively in a rightward direction only. Leftward assimilation may occur as a stochastic, diachronic process in the lexicon. In this respect, the results support the traditional analysis of Mongolian vowel harmony.

9.4.2 Origin on the first syllable of the root

Vowel harmony as a productive, synchronic process clearly does not originate from the first syllable of the root in any of the dialects investigated; instead, it originates from the syllable immediately adjacent to the root-suffix boundary. This is contrary to almost all existing descriptions of Mongolian vowel harmony.

9.4.3 Triggers and vowel classes

Some vowels are transparent in loanwords which had not been identified as transparent based on the native phonology. In native words, Halh /eː/ for instance never co-occurs with pharyngeal words, so its transparencey is not apparent.

Because all of the "new" transparent vowels in this dataset belong to the non-pharyngeal class, it is tempting to revise the analysis of Mongolian vowel harmony such that only pharyngeal vowels can trigger harmony, and non-pharyngeal vowels surface by default in the absence of triggers. However, this analysis cannot be sustained, because Chahar and Horchin /əː/ (non-pharyngeal, historically equivalent to Halh /eː/) were definitely not transparent in the loan data.

Phonetically speaking, the natural class which best accounts for the new transparent group may be either high vowels or front vowels. As seen in Section 5.4, Halh /eː/ is phonetically much higher than Chahar and Horchin /eː/, even though they all belong to the phonological class of low vowels according to distinctive feature analyses of each dialect. The combination of phonetic divergence with emerging differences in harmony behavior of /eː/ and /əː/ implies that there may be a strong phonetic basis for the synchronic application of vowel harmony in Mongolian. This merits further investigation, especially since the present study does not include much data on other non-pharyngeal vowels, such as /uː/ and /oː/.

9.5 Conclusions

Results do not bear out the prediction of leftward assimilation from stressed syllables. Instead, the assimilation patterns described above for Mandarin loans actually apply to both Mandarin and Russian loans: vowel qualities are usually preserved even if the result is disharmonic. Furthermore, syllables which were stressed in the source language sometimes failed to trigger harmony even on following suffixes (the "transparent" pattern referred to above.) Therefore,

the hypothesis that stress in a loan source maps to harmony trigger in Mongolian is not supported, and the traditional analysis of harmony as spreading rightward only was upheld.

Results do call into question the traditional analysis of vowel harmony as spreading from initial syllables only. The prevalence of disharmonic roots post-adaptation, combined with the robust productivity of root-suffix harmony, suggest that descriptions of the native phonology need to be modified to better incorporate morphological boundaries.

Finally, the results suggest interesting new directions of research. A closer look at cross-dialect variation and diachronic changes in vowel harmony systems, combined with productivity studies like this one, could shed light on the acoustic and articulatory bases for Mongolian vowel harmony.

References

Archangeli, D. B., & Pulleyblank, D. G. (1994). *Grounded phonology*. MIT Press.

Baljinnyam, N. (2008). *The dictionary of foreign words with Mongolian-Russian-English parallels.* Ulaanbaatar: National University of Mongolia Press, 2nd ed.

Bayancogtu (2002). *A study of the Horchin dialect (Qorcin aman ayalgun-u sudulul).* Inner Mongolia University Press.

Berko, J. (1958). The child's learning of English morphology. *Word*, *14*, 150–177.

Bosson, J. E. (1964). *Modern Mongolian: a primer and reader.* No. 38 in Uralic and Altaic Series. Bloomington: Indiana University.

Chao, Y. (1968). *A grammar of spoken Chinese.* Berkeley: University of California Press.

Clements, G. N. (1980). *Vowel harmony in nonlinear generative phonology.* Indiana University Linguistics Club.
URL http://www.ai.mit.edu/projects/dm/featgeom/Clements-76-80.pdf

Clements, G. N., & Sezer, E. (1982). Vowel and consonant disharmony in Turkish. In *The structure of phonological representations*, vol. 2, (p. 213–255). Dordrecht: Foris Publications.

Duanmu, S. (2007). *The phonology of standard Chinese.* Oxford University Press, USA.

Dupoux, E., Kakehi, K., Hirose, Y., Pallier, C., & Mehler, J. (1999). Epenthetic vowels in Japanese: A perceptual illusion? *Journal of Experimental Psychology: Human Perception and Performance*, *25*(6), 1568.

Harnud, H. (2009). *Experimental investigations in Mongolian phonetics.* Shenyang: Liaoning Minzu Press.

Haspelmath, M., & Sims, A. D. (2010). *Understanding Morphology.* Understanding Language. Hodder Education, 2nd ed.

Iivonen, A., & Harnud, H. (2005). Acoustical comparison of the monophthong systems in finnish, mongolian and udmurt. *Journal of the International Phonetic Association*, *35*(01), 59–71.

Jacobs, H., & Gussenhoven, C. (2000). Loan phonology: perception, salience, the lexicon and OT. In J. Dekkers, F. van der Leeuw, & J. van de Weijer (Eds.) *Optimality Theory: Phonology, syntax, and acquisition*, (p. 193–209).

Janhunen, J. A. (2012). *Mongolian.* Amsterdam: John Benjamins.

Jones, D., & Ward, D. (1969). *The Phonetics of Russian.* Cambridge University Press.

Kang, Y. (2010). Tutorial overview: Suprasegmental adaptation in loanwords. *Lingua*, *120*(9), 2295–2310.

LaCharité, D., & Paradis, C. (2005). Category preservation and proximity versus phonetic approximation in loanword adaptation. *Linguistic Inquiry, 36*(2), 223–258.

LaCross, A. B. (2011). *The Role of Language-Specific Phonology: Tracking Linguistic Variables in Khalkha Mongolian.* PhD dissertation, University of Arizona.

Lewis, M. P., Simons, G. F., & Fennig, C. D. (Eds.) (2013). *Ethnologue: Languages of the World, Seventeenth Edition.* Dallas, Texas: SIL International.
URL Onlineversion:http://www.ethnologue.com/

Lubsangdorji, J. (2004). The phonetics of foreignisms coming from Russian into present-day Mongolian ('Mongolization'). *Mongolica Pragensia*, (p. 91–112).

Norjin (1998). *Standard Chahar Mongolian.* Hohhot: Inner Mongolia People's Press.

Peng, S., Chan, M. K. M., Tseng, C., Huang, T., Lee, O. J., & Beckman, M. (2005). Towards a pan-Mandarin system for prosodic transcription. In S. A. Jun (Ed.) *Prosodic typology: The phonology of intonation and phrasing*, (p. 230–270). Oxford University Press, USA.

Peperkamp, S., & Dupoux, E. (2003). Reinterpreting loanword adaptations: the role of perception. In *Proceedings of the 15th International Congress of Phonetic Sciences*, vol. 367, (p. 370).

Poppe, N. (1970). *Mongolian language handbook.* Center for Applied Linguistics.

Secenbagatur, Hasgerel, Tuyag-a, Jirannige, B., & Wu, Y. (Eds.) (2005). *Introduction to Mongolian dialectology.* Hohhot: Inner Mongolia People's Press.

Svantesson, J. (1985). Vowel harmony shift in Mongolian. *Lingua, 67*(4), 283–327.

Svantesson, J., Tsendina, A., Karlsson, A., & Franzén, V. (2005). *The phonology of Mongolian.* Oxford University Press, USA.

Walker, R. (1997). Mongolian stress, licensing, and factorial typology. Manuscript, University of California, Santa Cruz (ROA-172-0197).
URL http://roa.rutgers.edu/files/172-0197/172-0197-WALKER-0-1.PDF

Yip, M. (2006). The symbiosis between perception and grammar in loanword phonology. *Lingua, 116*(7), 950–975.

10 Appendix

10.1 List of abbreviations

DX   derivational suffix
ABL   ablative
INS   instrumental
DUR   durative
RFL   reflexive
PROF   professional
C.PRF   perfective converb
CAUS   causative
POSS   possessive
DPST   direct past

10.2 Data tables

Table 7: Recent Russian Loans in Halh Mongolian

Gloss	Speaker 03	Speaker 07	Speaker 09	Speaker 10	Orthography	Russian
archaeology	arʲxɮɔ:g arʲxɮɔ:g-ɔ:r	arʲxɮɔ:g arʲxɮɔ:g-ɔ:r	arʲxĭɮɔ:g arʲxĭɮɔ:g-tʃʰ-ɔ:s arʲxĭɮɔ:g-tʃʰ-ɔ:r	arʲxɮɔ:g-tʃĭt arʲxɮɔ:g-tʃĭt-ɔ:s arʲxɮɔ:g-tʃĭt-ɔ:r	arheologi(â), arheolog[č]	arxʲiˌaˈlɔgʲijə, arˌxʲiˈɔləg̊
aspirin	aspʰri:ŋ aspʰri:n-a:r	aspʰri:ŋ aspʰĭri:n-a:r aspʰri:n-a:r	aspʰĭri:n aspʰĭri:n-a:s aspʰĭri:n-a:r	aspʰri:ŋ aspʰri:n-a:s aspʰri:n-a:r	aspirin	aˌspʲiˈrʲin
Buddhism	pʊti:tsăm pʊti:tsm-a:r	pʊti:sĭm pʊti:sm-a:r	pʊtŏti:zăm --	-- --	buddizm	ˌbuˈdʲizm
calorie	kʰaɮɔ:r kʰaɮɔ:r-ɔ:r	kʰaɮɔ:r kʰaɮɔ:r-ɔ:r	xɔɮŏstri:ŋ xɔɮŏstri:n-ɔ:s xɔɮŏstri:n-a:r	-- --	kalori(â)	ˌkaˈlɔrʲijə
capitalism	kʰaɸtɮi:tsăm kʰaɸtɮi:tsăm-a:r	kʰaɸtɮi:sm kʰaɸtɮi:sm-ɔ:r	kʰaɸtʰɮi:săm kʰaɸtʰɮi:sm-a:s kʰaɸtʰɮi:sm-a:r	-- xaɸtɮi:sm-a:r kʰaɸtɮi:sm-a:s	kapitalizm	kəpʲiˌtaˈlʲizm
car horn	signa:ɮ signa:ɮ-a:r	signa:ɮ signa:ɮ-a:r	signa:ɮ signa:ɮ-a:r signa:ɮ-a:s	signa:ɮ signa:ɮn-a:s signa:ɮ-a:r	signal	ˌsʲigˈnal
chocolate	ʃxɮa:t ʃxɮa:t-a:r	ʃkʰɮa:t ʃkʰɮa:t-a:r	ʃkʰɮa:t ʃkʰɮa:ta:s ʃkʰɮa:ta:r	ʃikʰɮa:t ʃikʰɮa:t-a:r ʃikʰɮa:tn-a:s	šokolad	ʃəˌkaˈlad̥

Gloss	Speaker 03	Speaker 07	Speaker 09	Speaker 10	Orthography	Russian
company	kʰampʰaːŋ kʰampʰaːn-aːr	kʰɔmpʰɔːŋ kʰɔmpʰɔːn-ɔːr	kʰɔmpʰaːn-iː ɬɔːgɔː[23] ɬɔːgɔːn-ɔːs ɬɔːgɔː-gɔːr	kʰampʰaːn-ʊt-iːn ɬɔːgɔː[24] ɬɔːgɔː-gɔːr ɬɔːgɔːn-ɔːs	kompani(â)	ˌkamˈpanʲijə
cube	kʰuːp kʰuːp-eːr	kʰuːp kʰuːp-eːr	kʰwatraːtʰ kʰwatraːtʰ-aːs kʰwatraːtʰ-aːr	kʰuːp kʰuːp-eːr kʰuːpn-eːs	kub	ˈkuɓ
cursor	kʰursɔːr kʰursɔːr-ɔːr	kʰʊrsɔːr kʰʊrsɔːr-ɔːr	kʰʊrsɔːr kʰʊrsɔːr-ɔːr kʰʊrsɔːr-ɔːs	kʰʊrsɔːr kʰʊrsɔːr-ɔːr kʰʊrsɔːrn-ɔːs	kursor	ˌkurˈsɔr
dump truck	samsmɔːɮ samsmɔːɮ-ɔːr	sɔnsmɔːɮ sɔnsmɔːɮ-ɔːr	sɔmsm̃ɔːɮ sɔmsm̃ɔːɮ-ɔːs	-- --	samosval	səˌmasˈval
ecology	ikʰɮɔːg ikʰɮɔːg-ɔːr	ikʰɮɔːg ikʰɮɔːg-ɔːr	ikʰɮɔːg ikʰɮɔːg-ɔːs ikʰɮɔːg-ɔːr	-- --	èkologi(â), èkolog[č]	ˌiˈkɔləg
equator	ikʰwaːtʰăr ikʰwaːtʰăr-ɔːr	ikʰwaːtʰɔːr ikʰwaːtʰɔːr-ɔːr	ikʰwaːtʰăr ikʰwaːtʰr-aːs ikʰwaːtʰr-ɔːr	-- --	èkvator	ˌɛkˈvatər
euro (currency)	jɔβrɔː jɔβrɔː-gɔːr	jɔβrɔː jɔβrɔː-gɔːr	jɔːβrɔː jɔːβrɔːn-ɔːs jɔːβrɔː-gɔːr	jɔβrɔː jɔβrɔː-gɔːs jɔβrɔː-gɔːr	evro	ˈjɛvrə [25]
format	pʰarmaːtʰ pʰarmaːtʰ-aːr	ɸɔrmɔːtʰ ɸɔrmɔːtʰ-ɔːr	ɸɔrmaːtʰ ɸɔrmaːtʰ-aːr ɸɔrmɔːtʰ-ɔːr	ɸarmaːtʰ ɸarmaːtʰ-aːr ɸarmaːtʰn-aːs	format	ˌfarˈmat

---

[23]"company logo"
[24]"logos of companies"
[25]Note the different stress placement in Russian [ɻivˈrɔpə] "Europe".

Gloss	Speaker 03	Speaker 07	Speaker 09	Speaker 10	Orthography	Russian
fountain	pʰantʰaːm pʰantʰaːm-aːr	pʰantaːm pʰantaːm-aːr	ɸontʰaːn ɸontʰaːn-aːs ɸontʰaːn-aːr	ɸantʰaːŋ ɸantʰaːn-aːs ɸantʰaːn-aːr	fontan	ˌfanˈtan
hobby	xɔːpiː xɔːpiː-gɔːr	xɔːpiː xɔːpiː-gɔːr	xɔːpiː xɔːpiːn-ɔːs xɔːpiː-gɔːr	xɔːpiː xɔːpiːn-ɔːs xɔːpiː-gɔːr	hobbi	ˈxɔbʲi
hockey	xɔkʰeː xɔkʰeː-gɔːr	xɔkʰeː xɔkʰeː-gɔːr	xɔkʰiː xɔkʰiːn-ɔːs xɔkʰiː-gɔːr	xɔkʰiː xɔkʰiː-gɔːr xɔkʰiːn-ɔːs	hokkej	ˌxaˈkʲɛj
housing order	ɔːrtŏr ɔːrtŏr-ɔːr	ɔːrtŏrɔːr ɔːrtŏr-ɔːr	ɔːrtŏr ɔːrtŏr-ɔːs ɔːrtŏr-ɔːr	-- --	order	ˈɔrdʲir
jacket	pʰitʃaːkʰ pʰitʃaːkʰ-aːr	pitʃaːkʰ pitʃaːkʰ-aːr	pitʃaːkʰ pitʃaːkʰ-aːs pitʃaːkʰ-aːr	pʰitătʃaːkʰ pʰitătʃaːkʰn-aːs pʰitătʃaːkʰ-aːr	pidžak	ˌpʲidˈʒak
laboratory	ɮapărtʰɔːr ɮapărtʰ-ɔːr	ɮapărtʰɔːr ɮapărtʰɔːr-ɔːr	ɮapŏrtʰɔːr ɮapŏrtʰɔːr-ɔːs ɮapŏrtʰɔːr-ɔːs	ɮapărtʰ-ɔːr ɮapărtʰɔːr-ɔːs	laboratori(â)	ləbəˌraˈtɔrʲijə
mannequin	manʲkʰeːŋ manʲkʰeːn-aːr	mɔnʲkʰɔːŋ mɔnʲkʰɔːn-ɔːr	makʰʲeːtʰ makʰʲeːtʰn-aːs makʰʲeːtʰ-aːr	makʰeːtʰ makʰeːtʰn-aːs makʰeːtʰ-aːr	maneken	məˌnʲiˈkʲɛn
mayonnaise	mainăts maints-aːr	mainʊːts mainʊːts-aːr	mainʊːs mainʊːsaːr mainʊːsaːs	mainʊːts mainʊːtsn-aːs mainʊːts-aːr	majonez	məjaˈnɛʐ
merino	mirnʊːs mirnʊːs-aːr	mirnʊːs mirnʊːs-aːr	-- --	-- --	merinos	mʲiˌrʲiˈnɔs
milk can	pʰitʰaːŋ pʰitʰaːn-aːr	pʰitʰɔːŋ pʰitʰɔːn-ɔːr	pʰitʰɔːŋ pʰitʰɔːn-ɔːs pʰitʰɔːn-ɔːr	pʰitʰaːŋ pʰitaːn-aːr pʰitaːn-aːs	bidon	ˌbʲiˈdɔn

Gloss	Speaker 03	Speaker 07	Speaker 09	Speaker 10	Orthography	Russian
model	mɔtʲeːʐ	mɔteːʐ	mɔteːʐ	--	model'	ˌmaˈdɛlʲ
	mɔtʲeːʐ-ɔːr	mɔteːʐ-ɔːr	mɔteːʐn-aːs	--		
			mɔteːʐ-ɔːr			
modem	mɔtʲeːm	mɔteːm	mɔteːm	mɔteːm	modem	ˌmaˈdɛm
	mɔtʲeːm-ɔːr	mɔteːm-ɔːr	mɔteːm-aːs	mɔteːm-ɔːr		
			mɔteːm-ɔːr	mɔteːm-ɔːs		
normal	narmaːʐ	nɔrmɔːʐ	narmaːʐʲ	--	normal'(no)	ˌnarˈmalʲnə
	narmaːʐ-aːr	nɔrmɔːʐ-ɔːr	narmaːʐʲ-aːs	--		
			narmaːʐʲ-aːr			
notary	natʰrʲaːtʰ	nɔtʰrʲɔːtʰ	nɔtʰraːtʰ	natʰrʲaːtʰ	notariat	nəˌtaˈrʲi.at
	natʰrʲaːtʰ-aːr	nɔtʰrʲɔːtʰ-ɔːr	nɔtʰraːtʰ-aːr	natʰrʲaːtʰ-aːs		
			nɔtʰraːtʰ-aːs			
omelet	ɔːmʲʐeːtʰ	ɔmʐĭtʰ	ɔmʐʲeːtʰ	ɔmʐʲeːtʰ	omlet	ˌamˈlʲɛt
	ɔːmʲʐeːtʰ-ɔːr	ɔmʐĭtʰ-ɔːr	ɔmʐʲeːtʰn-aːs	ɔmʐʲeːtʰn-ɔːs		
			ɔmʐʲeːtʰ-ɔːr	ɔmʐʲeːtʰ-ɔːr		
Oscar (award)	ɔːskʰɔ̆r	ɔːskʰaːr	ɔːskʰaːr-iːŋ	ɔːskʰr-iːŋ	oskar	ˈɔskər
			ʃagnăʐ[26]	ʃagnăʐ[27]		
	ɔːskʰɔ̆r-ɔːr	ɔːskʰaːr-aːr	ɔːskʰaːr-aːs	ɔːskʰr-ɔːs		
			ɔːskʰaːr-aːr	ɔːskʰr-ɔːr		
paleontology	pʰaʐʲĭntʐɔːg	paʐĭntʰʐɔːg	--	--	paleontologi(â), paleontolog[č]	pəlʲi.ənˌtaˈlɔgʲijə, pəlʲiˌanˈtɔləg
	pʰaʐʲĭntʐɔːg-ɔːr	paʐĭntʰʐɔːg-ɔːr	--	--		
pawnshop	ʐampaːrt	ʐampaːrt	ʐampaːrt	ʐampaːrt	lombard	ˌlamˈbard̥
	ʐampaːrt-aːr	ʐampaːrt-aːr	ʐampaːrt-aːs	ʐampaːrt-naːs		
			ʐampaːrt-aːr	ʐampaːrt-aːr		
pharmacy	aɸtʰeːkʰ	aɸtʰiːkʰ	aɸtʰʲeːkʰ	aɸtʰʲeːkʰ	aptek(a)	ˌapˈtʲɛkə

[26]"Oscar-GEN prize"
[27]Same gloss as Speaker 09.

Gloss	Speaker 03	Speaker 07	Speaker 09	Speaker 10	Orthography	Russian
	aɸtʰe:kʰ-a:r	aɸtʰi:kʰ-a:r	aɸtʰje:kʰ-a:s aɸtʰje:kʰ-a:r	aɸtʰje:kʰ-a:r aɸtʰje:kʰn-a:s		
pop music	istʰra:t istʰra:t-a:r	istʰra:t istʰra:t-a:r	istʰra:t stʰra:t-a:s stʰra:t-a:r	istʰra:t istʰra:t-a:s istʰra:t-a:r	èstrad(a)	ˌɛsˈtradə
programmer	pʰarăgra:mistʰ pʰarăgra:mistʰ-a:r	pʰarăgra:mi:stʰ pʰarăgra:mi:stʰ-a:r	pʰargra:mi:stʰ pʰargra:mi:stʰ-a:s pʰargra:mi:stʰ-a:r	pʰarăgra:mi:stʰ pʰarăgra:mi:stʰ-a:s pʰarăgra:mi:stʰ-a:r	programmist	prəˌgraˈmist
rental agency	pʰarkʰɔ:tʰ pʰarkʰɔ:tʰ-ɔ:r	pʰarkʰa:tʰ pʰarkʰa:tʰ-a:r	parkʰa:tʰ parkʰa:tʰn-a:s parkʰa:tʰ-a:r	xʊβtsʰŏs pʰarkʰa:tʰ xʊβtsʰŏs pʰarkʰa:tʰ-a:r xʊβtsʰŏs pʰarkʰa:tʰn-a:s	prokat	ˌpraˈkat
saxophone	sakʰspʰɔ:ŋ sakʰspʰɔ:n-ɔ:r	sakʰspʰʊ:ŋ sakʰspʰɔ:n-ɔ:r	sɔkʰsŏɸɔ:ŋ sɔkʰsŏɸɔ:n-ɔ:r sɔkʰsɔɸɔ:n-ɔ:s	saxsɸɔ:ŋ saxsɸɔ:n-ɔ:s saxsɸɔ:n-ɔ:r	saksofon	səkˌsaˈfɔn
spark plug[28]	siɸtʃʰe: siɸtʃʰe:-ge:r	siɸtʃʰe: siɸtʃʰe:-ge:r	-- --	-- siβtʃʰe:n-e:s siβtʃʰe:-ge:r	sveča	ˌsvʲiˈtʃa
temperature	tʰirmɔ:mi:tʰĭr tʰirmɔ:mi:tʰr-ɔ:r	tʲampʰărtʰʊ:r tʲampʰărtʰʊ:r-a:r	tʰjampʰra:tʰʊ:r tʰjampʰra:tʰʊ:r-a:s tʰjampʰra:tʰʊ:r-a:r	tʰjampʰărtʰʊ:r tʰjampʰărtʰʊ:r-a:r tʰjampʰărtʰʊ:rn-a:s	temperatur(a)	tʲimpʲiˌraˈturə
train car	βɔgɔ:ŋ βɔgɔ:n-ɔ:r	βɔgɔ:ŋ βɔgɔ:n-ɔ:r	βɔgɔ:ŋ βɔgɔ:n-ɔ:r βɔgɔ:n-ɔ:s	pɔgɔ:ŋ pɔgɔ:n-ɔ:r pɔgɔ:n-ɔ:s	vagon	ˌvaˈgɔn

Gloss	Speaker 03	Speaker 07	Speaker 09	Speaker 10	Orthography	Russian
veterinarian	tsɔːtʰeːxneːg-tʃʰ tsɔːtʰeːxneːg-tʃʰ- eːr	tsɔːtʰeːxnĕg-tʃʰ tsɔːtʰeːxnĕg-tʃʰ- eːr	-- --	-- --	zootehnik[č]	ˌza.aˈtʲɛxnʲik

---

[28]Russian 'candle; spark plug'

Table 8: Recent Chinese Loans in Horchin Mongolian

Gloss	Speaker 13	Speaker 14	Speaker 15	Orthography	Chinese
Group 1: Disyllabic Nouns					
apple	pʰiŋgwə: pʰiŋgwə:-gə:r	piŋgwə: piŋgwə:-gə:r	pʰiŋgwə: pʰiŋgwə:-gə:r	苹果	pʰiŋ.kwo:
aunt (paternal)	gu:gu: gu:gu:-gə:s	gu:gu: gu:gu:-ge:r	gu:gu: gu:gu:-gə:s	姑姑	ku:.ku:
Ba Meng (placename)	pa:məŋ pa:məŋ-a:r	pa:məŋ pa:məŋ-a:r	-- --	巴盟	pa:.məŋ
bitter melon	kʰugwa: kʰugwa:-ga:r	kʰu:gwa: kʰu:gwa:-ga:r	-- --	苦瓜	kʰu:.kwa:
boyfriend/girlfriend	twi:ɕaŋ twi:ɕaŋ-a:s	twi:ɕaŋ twi:ɕaŋ-a:r	twi:ɕaŋ twi:ɕaŋ-a:r	对象	twei.ɕaŋ
bread (Western style)	mjɛmpɔ: mjɛmpɔ:-gɔ:r	mjɛmpɔ: mjɛmpɔ:-gɔ:r	mjɛmpɔ: mjɛmpɔ:-gɔ:s	面包	mjæn.pau
brother (elder)	gə:gə: gə:gə:-gə:s	-- --	-- --	哥哥	kɤ:.kɤ:
buckwheat noodles	tɕʰɔ:mjɛn tɕʰɔ:mjɛn-a:r	tɕʰaʊ mjɛn tɕʰaʊ mjɛn-a:r	-- --	荞面	tɕʰau.mjæn
bus	pantʃʰə: pantʃʰə:-gə:r	pantʃʰə: pantʃʰə:-gə:r	pantʃʰə: pantʃʰə:-gə:s	班车	pæn.tʂʰɤ:
carpenter	mu:tɕaŋ mu:tɕaŋ-a:s	mʊ:tɕaŋ mʊ:tɕaŋ-a:r	-- --	木匠	mu:.tɕaŋ
chest freezer	piŋgwi: piŋgwi:-gə:s	piŋgwi: piŋgwi:-ga:r	piŋgwi: piŋgwi:-gə:s	冰柜	piŋ.kʰwei
city bus	guŋtɕɔ: guŋtɕɔ:-gɔ:r	guŋtɕɔ: guŋtɕɔ:-gɔ:r	-- --	公交	kwuŋ.tɕau

Gloss	Speaker 13	Speaker 14	Speaker 15	Orthography	Chinese
computer	tjɛnnaʊ	tjɛnnɔː	tjɛnnɔː	电脑	tjæn.nau
	tjɛnnaʊ-gɔːr	tjɛnnɔː-gɔːr	tjɛnnɔː-gɔːs		
eggplant	tɕʰəːs	tʃʰəːs	--	茄子	tɕʰeː.tsz
	tɕʰəːs-əːr	tʃʰəːs-əːr	--		
English (language)	jiŋjyː	jiŋjyː	jiŋjyː	英语	jəŋ.yː
	jiŋjyː-gəːr	jiŋjyː-gəːr	jiŋjyː-gəːr		
foreign teacher	wɛːtɕɔː	wɛːtɕɔː	--	外教	wai.tɕau
	wɛːtɕɔː-gɔːs	wɛːtɕɔː-gɔːr	--		
fried dough	gwəːtjaʊ	gwəːtʰjɔːr	--	果条	kwəː.tʰjau
	gwəːtjaʊ-gɔːr	gwəːtʰjɔːr-ɔːr	--		
German (language)	təːjyː	təːjyː	--	德语	tɤː.yː
	təːjyː-gəːr	təːjyː-gəːr	--		
Germany	təːgwəː	təːgwəː	--	德国	tɤː.kwoː
	təːgwəː-gəːr	təːgwəː-gəːr	--		
ice cream bar	ɕwɛːgɔː	ɕwɛːgɔː	ɕwɛːgɔː	雪糕	ɕweː.kau
	ɕwɛːgɔː-gɔːr	ɕwɛːgɔː-gɔːr	ɕwɛːgɔː-gɔːr		
Korean (language)	--	xanjyː	--	韩语	xæn.yː
	--	xanjyː-gaːr	--		
milk powder	nɛːfən	nɛːfən	nɛːfən	奶粉	nai.fən
	nɛːfən-aːr	nɛːfən-aːr	nɛːfn-aːr		
mobile phone	ʃəutɕiː	ʃəutɕiː	ʃəutɕiː	手机	ʂəu.tɕiː
	ʃəutɕiː-gəːr	ʃəutɕi-gəːr	ʃəutɕiː-gəːr		
moon cake	yɛːpiŋ	jəːpəŋ	yɛːpiŋ	月饼	ɥeː.piŋ
	yɛːpiŋ-aːr	jəːpəŋ-əːr	yɛːpiŋ-aːr		
movie	tjɛnjiŋ	tjɛnjiŋ	tjɛnjiŋ	电影	tjæn.jəŋ
	tjɛnjiŋ-aːs	tjɛnjiŋ-aːr	tjɛnjiŋ-aːs		

Gloss	Speaker 13	Speaker 14	Speaker 15	Orthography	Chinese
North Korea	-- --	tʃʰaʊɕɛn tʃʰaʊɕɛn-aːr	-- --	朝鲜	ʈʂʰau.ɕæn
number	xɔːmaː xɔːmaː-gaːr	xɔːmaː xɔːmaː-gaːr	xɔːr xɔːr-ɔːr	号码	xau.maː
oat noodles	jʊːmjɛn jʊːmjɛn-aːr	jəumjɛn jəumjɛn-aːr	-- --	莜面	jəu.mjæn
peanut	xwaːʃəŋ xwaːʃəŋ-aːr	xwaːʃəŋ xwaːʃəŋ-aːr	xwaːʃəŋ xwaːʃəŋ-aːr	花生	xwaː.ʂəŋ
photocopy	fuːjin fuːjin-əːt	fuːjin fuːjin-x-əːr	-- --	复印	fuː.in
photograph	tʃaʊɕaŋ tʃaʊɕaŋ-aːs	tʃɔːɕaŋ tʃɔːɕaŋ-aːr	tʃɔːɕaŋ tʃɔːɕaŋ-aːs	照相	ʈʂau.ɕaŋ
pickled vegetables	ɕɛnsɛ ɕɛnsɛ-gaːr	ɕɛnsɛ ɕɛnsɛ-gaːr	ɕɛnsɛ ɕɛnsɛ-gaːs	咸菜	ɕæn.tsʰai
pillow	tɕintʰu tɕintu-gəːr	tʃɛntʰu tʃɛntʰu-gəːr	-- --	枕头	ʈʂən.tʰəu
plastic	suːljɔːr suːljɔːr-ɔːr	sʊːljɔːr sʊːljɔːr-ɔːr	suːljɔˤː suːljɔˤː-gɔːs	塑料	swuː.ljau
print	taːjin taːjin-aːt	taːjin taːjin-x-aːr	taːjin taːjin-aːt	打印	taː.in
refrigerator	piŋɕaŋ piŋɕaŋ-aːr	piŋɕaŋ piŋɕaŋ-aːr	piŋɕaŋ piŋɕaŋ-aːs	冰箱	piŋ.ɕaŋ
scan	sɔːmjaʊ sɔːmjaʊ-x sɔːmjaʊ-nɔː sɔːmjaʊ-gɔːt	sɔːmjɔː sɔːmjɔː-x-ɔːr	sɔːmjaʊ sɔːmjaʊ-gɔːt	扫描	sau.mjau
short-sleeved shirt	twanɕʊː	twanɕɪr	twanɕʊːs	短袖	twan.ɕəu

Gloss	Speaker 13	Speaker 14	Speaker 15	Orthography	Chinese
	twançʊ:-ga:r	twançĭr-a:r	twançʊ˺:ga:r twançʊ:-ga:r		
South Korea	xaŋgwə: xaŋgwə:-gə:r	xaŋgwə: xaŋgwə:-gə:r	-- --	韩国	xan.kwo:
soymilk	təutɕaŋ təutɕaŋ-a:r	təutɕaŋ təutɕaŋ-a:r	-- --	豆浆	təu.tɕaŋ
supermarket	-- --	tʃʰaʊʃʐ̩ tʃʰaʊʃʐ̩-ga:r	tʃʰaʊʃʐ̩: tʃʰaʊʃʐ̩:-gɔ:s	超市	tʂʰau.ʂʐ̩:
tank (military)	tʰaŋkʰə: tʰaŋkʰə:-gə:r	tʰaŋkʰə: tʰaŋkʰə:-gə:r	-- --	坦克	tʰan.kʰɤ:
taxi	-- --	ta:ti:-x ta:ti:-x-a:r	-- --	打的	ta:.tji:
toothpaste	ja:gɔ: ja:gɔ:-gɔ:r	ja:gɔ: ja:gɔ:-gɔ:r	ja:gɔ: ja:gɔ:-gɔ:s	牙膏	ja:.kau
train	xwə:tʃʰə: xwə:tʃʰə:-gə:r	xwə:tʃʰə: xwətʃʰə:-gə:r	xwə:tʃʰə: xwə:tʃʰə:-gə:r	火车	xwo:.tʂʰɤ:
umbrella	y:san y:san-a:r	y:san y:san-a:r	san san-a:r	雨伞	y:.sæn
uncle (maternal)	tʃu:tʃu: tʃu:tʃu:-gə:s	tʃu:tʃu: tʃu:tʃu:-gə:r	tʃu:tʃu: --	舅舅	tɕəu.tɕəu
uncle (paternal)	ʃu:ʃu: ʃu:ʃu:-gə:s	ʃu:ʃu: ʃu:ʃu:-gə:r	ʃu:ʃu: ʃu:ʃu:-gə:s	叔叔	ʂwu:.ʂwu:
USA	məigwə: məigwə:-gə:r	məigwə: məigwə:-gə:r	məigwə: məigwə:-gə:s	美国	məi.kwo:
wallet	tɕʰɛmpɔ: tɕʰɛmpɔ:-gɔ:s	tɕʰɛmpɔ:r tɕʰɛmpɔ:r-ɔ:r	tɕʰɛmpɔ˺: tɕʰɛmpɔ:-gɔ:r	钱包	tɕʰæn.pau

Gloss	Speaker 13	Speaker 14	Speaker 15	Orthography	Chinese
watermelon	ɕiːgwaː	ɕiːgwaː	ɕiːgwaː	西瓜	ɕiː.kwaː
	ɕiːgwa-gaːr	ɕiːgwaː-gaːr	ɕiːgwaː-gaːr		
wool blanket/rug	mɔːtʰans	mɔːtʰans	mɔːtʰans	毛毯子	mau.tæn.tsz
	mɔːtʰans-aːr	mɔːtʰans-aːr	mɔːtʰans-aːr		
Xi Meng (placename)	ɕiːmən	ɕiːmən	--	锡盟	ɕiː.mən
	ɕiːmən-əːr	ɕiːmən-əːr	--		
Group 2: Trisyllabic Nouns					
tomato	ʃʐ̩ːs	jaŋʃɕʰɪ̆s	jaŋʃʐ̩s ʃʐ̩ːs	西红柿	ɕiː.xwuŋ.ʂʐ̩ː
	ʃʐ̩ːs-əːr	jaŋʃɕʰɪ̆s-aːr	ʃʐ̩ːs-əːr jaŋʃʐ̩s-aːr		
TV show	tjɛnʃʐ̩tɕyː-gaːs	tjɛnʃʐ̩tɕyː	tjɛnʃʐ̩tɕyː	电视剧	tjæn.ʂʐ̩ː.tɕyː
	tjɛnʃʐ̩tɕyː-gaːs	tjɛnʃʐ̩tɕyː-gaːr	tjɛnʃʐ̩tɕyː-gəːs		
vegetable market	--	tsʰɛːʃʐ̩tʃʰaŋ	tsʰɛːʃtʃʰaŋ	菜市场	tsʰai.ʂʐ̩ː.tʂʰaŋ
	--	tsʰɛːʃʐ̩tʃʰaŋ-aːr	tsʰɛːʃtʃʰaŋ-aːs		
Group 3: Monosyllabic Verbs with Complements					
date someone	--	twiːɕaŋ gɔː-x	--	搞对象	kau twei.ɕaŋ
	twəiɕaŋ gɔː-nɔː	twiːɕaŋ gɔː-x-ɔːr	twiːɕaŋ gɔː-gɔːt		
make a phone call	--	tjɛnxwaː taː-n	--	打电话	taː tjæn.xwaː
	tjɛnxwaː taː-naː	tjɛnxwaː taː-x-aːr	tjɛnxwaː taː-gaːt		
take a photo	--	tʃɔːɕaŋ tʃɔː-x	--	照照相	tʂau tʂau.ɕaŋ
	tʃɔːɕaŋ tʃɔː-nɔː	tʃɔːɕaŋ tʃɔː-x-ɔːr	tʃɔːgɔːt		

Table 9: Recent Chinese Loans in Chahar Mongolian

Gloss	Speaker 16	Speaker 17	Speaker 18	Orthography	Chinese
		Group 1: Disyllabic Nouns			
apple	pʰiŋgwə: pʰiŋgwə:-gə:r	-- --	pʰiŋgwə: pʰiŋgwə:-gə:r pʰiŋgwə:-gə:s	苹果	pʰiŋ.kwo:
aunt (paternal)	gu:gu: gu:gu:-gə:r	-- --	-- --	姑姑	ku:.ku:
Ba Meng (placename)	-- --	-- --	pa:mə̆ŋ-ni:x²⁹ pa:mə̆ŋn-a:s	巴盟	pa:.məŋ
boyfriend/girlfriend	twi:ɕaŋ ty:ɕana:s	twe:ɕaŋ twe:ɕan-a:s	twe:ɕaŋ twe:ɕan-a:s	对象	twei.ɕaŋ
bread (Western style)	mjɛmpɔ: mjɛmpɔ:-gɔ:r	mjɛmpɔ:-gɔ:r mjɛmpɔ:-gɔ:r	mjɛmpɔ: mjɛmpɔ:n-ɔ:s	面包	mjæn.pau
brother (elder)	go:g go:g-o:r	go:g go:g-o:r	go:g go:-go:r go:-go:s	哥哥	kɤ:.kɤ:
bus	pantʃʰə: pantʃʰə:-gə:r	-- --	pantʃʰə:n-t³⁰ pantʃʰə:-gə:r pantʃʰə:n-ə:s	班车	pæn.tʂʰɤ:
carpenter	mʊtʃaŋ mʊtʃan-a:r	-- --	mʊtʃaŋ mʊtʃa:n-a:r mʊtʃa:n-a:s	木匠	mu:.tɕaŋ
chest freezer	piŋgwe: piŋgwe:-gə:r	pi:ŋgwe: pi:ŋgwe:-gə:ŋ	piŋgwe: piŋgwe:-gə:s	冰柜	piŋ.kʰwei
city bus	gontɕɔ: gontɕɔ:-gɔ:r	goŋtɕaʊ goŋtɕaʊ-ga:r	gontɕɔ: gontɕɔ:-gɔ:r	公交	kwuŋ.tɕau

²⁹"Of Ba Meng"
³⁰bus-LOC

Gloss	Speaker 16	Speaker 17	Speaker 18	Orthography	Chinese
computer	tjɛnnɔː tjɛnnɔː-gɔːr	tjɛnnɔː tjɛnnɔː-gɔːr	-- tjɛnnɔː-gɔːr tjɛnnɔː-nɔːs	电脑	tjæn.nau
eggplant	tʃʰəːs tʃʰəːs-əːr	-- --	-- --	茄子	tɕʰeː.tsz
foreign teacher	waɨtɕɔː waɨtɕɔː-gɔːr	-- --	-- --	外教	wai.tɕau
fried dough	gwəːtʰjɔːr gwəːtʰjɔːr-ɔːr	-- --	-- --	果条	kwəː.tʰjau
ice cream bar	ɕwɛːgɔː ɕwɛːgɔː-gɔːr	ɕwɛːgɔː ɕwɛːgɔː-gɔːr	ɕwɛːgɔː ɕwɛːgɔː-gɔːr	雪糕	ɕwe.kau
milk powder	nɛːfɔ̆ŋ nɛːfn-aːr	-- naɨfn-aːr	-- naɨfn-aːr	奶粉	nai.fən
mobile phone	ʃuːtɕi ʃuːtɕi-gəːr	ʃuːtɕi ʃuːtɕi-gəːr ʃuːtɕi-gəːŋ	ʃəutɕi ʃəutɕi-gəːs	手机	ʂəu.tɕi
moon cake	jəːwɔ̆ŋ jəːwneːr	jəːwɔ̆ŋ jəːwɔ̆n-əːr	jəːwɔ̆ŋ jəːwɔ̆n-əːs	月饼	ɥeː.piŋ
movie	-- --	tjɛnjiŋ --	tjɛnjiŋ --	电影	tjæn.jəŋ
number	xɔːmaːr xɔːmaːr-aːr	xɔːr tjɛŋxwaː xɔːr-ɔːŋ[31]	xɔːr --	号码	xau.maː
oat noodles	jɔːmjɛn jɔːmjɛn-aːr	jɔːmɔ̆ŋ gʊrɨ̆ɮ jɔːmɔ̆ŋ gʊrɨ̆ɮ-aːr	jɔːmjɔ̆ŋ gʊrɨ̆ɮ jɔːmjɔ̆ŋ gʊrɨ̆ɮ	莜面	jəu.mjæn
peanut	xwaːʃɔ̆ŋ	xwaːʃɔ̆ŋ	xwaːʃɔ̆ŋ, ɭʊːxwaːʃɔ̆ŋ	花生	xwaː.ʂəŋ

---

[31]telephone number-RFL

Gloss	Speaker 16	Speaker 17	Speaker 18	Orthography	Chinese
	xwaːʃn-aːr	xwaːʃn-aːŋ	xwaːʃn-aːs xwaːʃə̃ŋ-gaːr		
photocopy	fuːjiŋ fuːjin-əːr fuːjin-əːs	fuːjiŋ xiː-nəː[32] --	fuːjiŋ --	复印	fuː.in
photograph	tʃʊːɕaŋ tʃʊːɕan-aːr	tʃɔːɕaŋ tʃɔːɕa-n-aːs	-- --	照相	ʈʂau.ɕaŋ
pickled vegetables	ɕɛntsʰaɨ-gaːr ɕɛntsʰɛː ɕɛntsʰaɨ	ɕɛntsʰaɨ ɕɛntsʰaɨ-gaːr ɕɛntsʰaɨ-gaːŋ	ɕɛntsʰaɨ ɕɛntsʰaɨ-gaːr	咸菜	ɕæn.tsʰai
pillow	tɕintʰuː tɕintʰuː-gəːr	tɕintʰuː tɕintʰuː	tɕintʰuː (?) tɕintʰuː-gəːr tɕintʰuː-gəːs (?)	枕头	ʈʂən.tʰəu
plastic	suːʈʂjɔːr suːʈʂjɔːr-ɔːr	suːʈʂjɔːr suːʈʂjɔːr-ɔːr	suːʈʂjɔːr-ɔːr suːʈʂjɔːr-ɔːr	塑料	swuː.ljau
print	taːjiŋ taːjin-aːr taːjin-aːs	-- --	-- --	打印	taː.in
refrigerator	pinɕaːŋ pinɕaːn-aːr	pinɕan-ɨː pinɕan-t-aːŋ	pinɕan-aːs pinɕan tɔtɚr pinɕan-nɨːx	冰箱	piŋ.ɕaŋ
scan	sɔːmjɔː sɔːmjɔː-gɔːr	-- --	-- --	扫描	sau.mjau
short-sleeved shirt	twanɕʊːr twanɕʊːr-aːr	twanɕʊːr twanɕʊːr-aːr	twanɕʊːr twanɕʊːr-aːŋ	短袖	twan.ɕəu
soymilk	tʊːtʃaːŋ tʊːtʃaːn-aːr	tʊːtɕaŋ tʊːtɕan-aːr	tʊːtɕaŋ tʊːtɕan-aːs	豆浆	təu.tɕaŋ
supermarket	tʃʰɔːʃɪː	tʃʰɔːʃɪ̆-t	tʃʰɔːʃɪt	超市	ʈʂʰau.ʂʐ̩ː

[32]photocopy make-PRES "(someone is) making a photocopy"

Gloss	Speaker 16	Speaker 17	Speaker 18	Orthography	Chinese
	tʃʰɔːʃɪː-gɔːr	tʃʰɔːʃn-aːs	*tʃʰɔːʃɪ-nɔːs tʃʰɔːʃɪ-gɔːs		
tank (military)	tʰaŋkʰəː tʰaŋkʰəː-gəːr	-- --	tʰaŋkʰ --	坦克	tʰan.kʰɤː
toothpaste	jaːgʊː-gaːr jaːgɔː jaːgʊː	jaːgɔː jaːgɔː-gɔːr	jaːgɔː jaːgɔː-gɔːr	牙膏	jaː.kau
train	-- --	-- --	xwətʃʰəː xwətʃʰəː-gəːr	火车	xwoː.tʂʰɤː
umbrella	-- --	-- saŋ-gɨː[33]	sam saŋ-gɨː[34]	雨伞	yː.sæn
uncle (maternal)	tʃuːtʃuː tʃuːtʃuː-gəːr	-- --	-- --	舅舅	tɕəu.tɕəu
uncle (paternal)	ʃuːʃuː ʃuːʃuː-gəːr	-- --	-- --	叔叔	ʂwuː.ʂwuː
wallet	tɕʰɛmpɔːr tɕʰɛmpɔːr-ɔːr	-- --	tɕʰɛmpɔˑː tɕʰɛmpɔː tɕʰɛmpɔːr tɕʰɛmpɔˑn-ɔːs	钱包	tɕʰæn.pau
watermelon	ɕiːgwaː ɕiːgwaː-gaːr	ɕiːgwaː ɕiːgwaː-gaːr	ɕiːgwaː ɕiːgwaː-gaːs ɕiːgwɔː-gɔːs	西瓜	ɕiː.kwaː
wool blanket/rug	tʰans tʰans-aːr	-- --	-- --	毛毯子	mau.tæn.tsz
Xi Meng (placename)	ɕiːmə̆ŋ ɕiːmn-əːr	-- --	ɕiːmənt ɕiːmən-əːs ɕiːmən-əːr	锡盟	ɕiː.məŋ
Group 2: Trisyllabic Nouns					
tomato	ɕixuŋʃɪ (?)	--	ɕixʊŋʃɪː	西红柿	ɕiː.xwuŋ.ʂzː

[33]umbrella-ACC "the umbrella"
[34]Same gloss as Speaker 17

Gloss	Speaker 16	Speaker 17	Speaker 18	Orthography	Chinese
	ɕixuŋʃɪ-gə:r (?)	--	ɕixʊŋʃɪ:-ga:r		
TV show	tjɛnʃtɕy:	--	tjɛnʃtɕy: utʃ-ʐ̩ə:	电视剧	tjæn.ʂʐ̩:.tɕy:
	tjɛnʃtɕy:-gə:s	--	tjɛnʃtɕy:-ga:s		
			tjɛnʃtɕy:-ga:r		
vegetable market	tsʰaiʃtʃʰaŋ	--	tsʰaiʃtʃʰan-t	菜市场	tsʰai.ʂʐ̩:.tʂʰaŋ
	tsʰaiʃtʃʰan-a:r	--	tsʰaiʃtʃʰan-t		
Group 3: Monosyllabic Verbs with Complements					
date someone	twi:ɕa:ŋ gɔ:-x	twe:ɕaŋ gɔ:-tʃi:n	--	搞对象	kau twei.ɕaŋ
	--	--	twe:ɕaŋ gɔ:-nɔ:		
make a phone call	--	--	--	打电话	ta: tjæn.xwa:
	--	tjɛŋxwa: ta:-na:	tjɛnxwa ta:-na:		
take a photo	tʃʊ:ɕa:ŋ tʃɔ:-ʐ̩-x	--	tʃɔ:ɕaŋ tʃɔ:ʐ̩-ŏn	照照相	tʂau tʂau.ɕaŋ
	tʃɔ:ɕa:ŋ tʃɔ:-ʐ̩-nɔ:	tʃɔ:ɕaŋ tʃɔ:-nɔ:	--		