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DORSAL FRICATIVES IN UKRAINIAN

In this study we look closely at the set of dorsal fricatives in Ukrainian with the purpose to explain their distributional peculiarities and phonological behavior. The analysis focuses on certain phonetic characteristics and the phonological representation of the segments in question. Some other issues addressed in this study include the segmental strength which is calculated by the complexity of a segment and the presence of headed elements, the consonant-vowel interactions in which the segments in question participate and the impact of vowels on the distribution of back fricatives in Ukrainian. The main aim of this study is to propose and justify a particular phonological representation of the back fricatives in Ukrainian.

1. Introduction

The class of dorsal fricatives in Ukrainian illustrates certain complexity. While some researchers argue that the system of back fricatives is symmetrical (e.g. Rubach 1993; Czaplicki 2006), others come to a completely opposite conclusion (e.g. Bloch-Rozmej 2008). The proponents of the latter solution grant the glottal fricative [ɦ] a segmental status even though it is related to a strictly defined context. Generally, the distribution of the back fricatives poses some difficulty. For example, while both velar fricatives, i.e. the voiced [ɣ] and voiceless [x], have contextually predictable variants, [j] and [ç] respectively, the glottal fricative is immune to palatalization in that it is replaced by the voiced palatal fricative [j] in the palatalization context. Moreover, the glottal fricative does not have any voiceless counterpart and is banned from the word-final position where it is regularly replaced by the velar fricative [ɣ]. To complicate the whole picture even further, the latter fricative, i.e. [ɣ], is allowed only in the word-final position and never before a vowel unless the vowel is front in which case it occurs as the palatalized variant [j]. This study, therefore, aspires to provide a convincing explanation for the distributional peculiarities and the phonological behavior of the back fricatives in Ukrainian. Moreover, it aims to propose and justify a particular phonological representation

of the segments in question. More generally, the analysis focuses on certain phonetic characteristics and the intrasegmental representation of the fricatives. Additionally, the discussion addresses some other issues like the segmental strength which is calculated by the complexity of a segment and the presence of headed elements, the consonant-vowel interactions in which the segments in question participate and the impact of vowels on the distribution of back fricatives in Ukrainian.

2. Dorsal fricatives in Ukrainian

The consonantal system of Ukrainian includes three dorsal fricatives: the voiceless velar fricative [x], the voiced velar fricative [ɣ] and the voiced laryngeal/glottal fricative [ɦ] (Czaplicki 2006; Bloch-Rozmej 2008). Both [x] and [ɣ] possess palatalized and non-palatalized variants, [ç] and [j] respectively, in opposition to the voiced glottal fricative [ɦ] which remains immune to palatalization. The latter fricative, i.e. [ɦ], whose phonetic realization is described as ‘alternating between the breathy voiced phonation type and the constricted manner of articulation in the glottal region’ (Bloch-Rozmej 2008: 9), stands out from the set of dorsal fricatives. For example, in the palatalization context instead of being palatalized like the rest of the dorsal fricatives, it alternates with the voiced palatal fricative [j]. Moreover, it does not have any voiceless counterpart. Before we propose the explanation for some distributional peculiarities of the glottal fricative and, more generally, the asymmetry in the class of dorsal fricatives in Ukrainian, let us provide some data illustrating the distribution of Ukrainian dorsal fricatives. The examples have been adopted from Czaplicki (2006) and Dalewska-Greń (2002) after Bloch-Rozmej (2008: 10).

1. Distribution of dorsal fricatives in Ukrainian

- | | | | | |
|--------|-------------------|-----------------|-----------------|-----------------------|
| a. [x] | хата (chata) | <i>cottage</i> | пух (puch) | <i>down</i> |
| | хліб (chlib) | <i>bread</i> | птах (ptach) | <i>bird</i> |
| | храм (chram) | <i>temple</i> | усміх (usmich) | <i>smile</i> |
| | хутро (chutro) | <i>fur</i> | мух (much) | <i>fly/gen.pl.</i> |
| | пхати (pchaty) | <i>push</i> | комах (komach) | <i>insect/gen.pl.</i> |
| | муха (mucha) | <i>fly</i> | хмара (chmara) | <i>cloud</i> |
| | комаха (komacha) | <i>insect</i> | | |
| b. [ç] | хідник (chidnyk) | <i>pavement</i> | | |
| | хімік (chimik) | <i>chemist</i> | | |
| | хід (chid) | <i>walking</i> | | |
| | архів (archiv) | <i>archives</i> | | |
| c. [ɦ] | глина (hlyna) | <i>clay</i> | Бога (Boha) | <i>God/gen.sg.</i> |
| | глухий (hluchyj) | <i>deaf</i> | книга (knyha) | <i>book/nom.sg.</i> |
| | гострий (hostryj) | <i>sharp</i> | дорога (doroha) | <i>way/nom.sg.</i> |
| | гра (hra) | <i>game</i> | | |
| | гріб (hrib) | <i>grave</i> | | |

	гарно (harno)	<i>beautifully</i>		
	газета (gazeta)	<i>newspaper</i>		
d. [ɣ]	Бог (Boh)	<i>God</i>	берег (bereh)	<i>river bank/nom.sg.</i>
	друг (druh)	<i>friend</i>	пір (rih)	<i>horn/nom.sg.</i>
	стіг (stih)	<i>rick</i>	ваг (vah)	<i>weight/gen.pl.</i>
	доріг (dorih)	<i>way/gen.pl.</i>		
e. [j]	гілка (hilka)	<i>twig</i>	береги (berehy)	<i>river banks/nom.pl.</i>
	гігант (hihant)	<i>giant</i>	ноги (nohy)	<i>leg/nom.pl.</i>
	гірка (hirka)	<i>hill</i>		
	гість (histʹ)	<i>guest</i>		
	гідний (hidnyj)	<i>worthy</i>		

As can be seen in (1) above, the distribution of the palatal variants is quite regular and predictable. Velars become palatalized before the front vowel [i] as illustrated in (1b and e). This is a general pattern found cross-linguistically. To put it briefly, the appearance of the palatalized variants in the context of the following front vowel [i] is the result of spreading of the frontness element [I] from the front vowel to the preceding fricative. And since, as it is generally assumed, velars are expressions which are not headed by any resonant element, they easily undergo various processes including palatalization (Kijak *in press.*). In other words, the headed resonant [I] of the front vowel [i] gets interpreted over an extended stretch of the representation including the vowel and the preceding fricative. This is represented graphically in (2) below.

2. Palatalization of back fricatives in Ukrainian

a.			b.		
	O	N		O	N
	U ←	I		U ←	I
	H			H	
	x > ɕ	i		ɣ > j	i

Since at the constituency level each onset must be licensed by the following nucleus, the direction of [I] spreading is fully justified. What calls for an immediate explanation, however, is the representation of fricatives in (2). As it has been extensively argued (Kijak *in press.*), velars are specified by the non-headed resonant [U]. Note that this representation stands in a sharp opposition to the mainstream solution in which velars are devoid of any resonance elements. In other words, although velar consonants are most frequently structured as empty-headed, i.e. possessing no active prime defining their place of articulation, their phonological behavior, especially their close relationship with labials, points to the necessity of recognizing the element [U] in their melodic make-up. Now, since the resonant [U] in velars functions as a mere dependent (non-headed), it can be easily replaced by a neighboring headed element which is the case in the

palatalization depicted in (2) above. To sum up, the back fricatives in Ukrainian are represented by two elements, i.e. the non-headed resonant [U] and the noise element [H] responsible for friction (see Backley 2011: 124), hence [x] = [U H] and [χ] = [U H]. Finally, since final devoicing is not among the processes affecting the set of Ukrainian obstruents, it is assumed here that the laryngeal specification boils down to the opposition between voiceless and neutral obstruents. Following Backley (2011: 134), we adopt the representation of fricatives in which the element [H] functions as friction and additionally represents voicelessness if headed. In short, while the voiceless velar fricative is headed by the friction element [H], the neutral (voiced) variant is specified by the same element in the function of a dependent, i.e. non-headed [H]. A different conclusion is reached by Bloch-Rozmej (2008), who examines two possibilities: [H] as an active element responsible for voicelessness and [L] found in fully voiced segments. On the basis of the voicing effect found in some southwestern dialects of Ukrainian in which the voiceless [x] undergoes voicing in the neighborhood of a voiced consonant, she inclines towards the solution according to which Ukrainian obstruents are specified by the active voicedness element [L]. Since, however, voicing effect is a marginal phenomenon found in certain dialects only and final devoicing is absent from Ukrainian, we opt for the voiceless – neutral solution proposed above.¹

Let us return for a moment to the examples represented under (1) above. Even a cursory look at the context of the remaining fricatives, i.e. [x], [χ] and [ħ], reveals that they have a much more complex distribution than their palatalized variants discussed above. More specifically, the voiceless velar fricative can occur word-initially, medially and finally (1a). The voiced counterpart [χ] appears only word-finally (1d), whereas the laryngeal one [ħ] can be found both word-initially and intervocally (1c). The latter fricative, however, is banned from the word-final position where it is regularly replaced by [χ]. Moreover, the laryngeal fricative is never followed by [i], in this context it alternates with the palatalized fricative [j].

It becomes evident that such alternations mask a closer relationship between the voiced velar fricative (plain and palatal) and the glottal fricative. In order to illustrate the relationship between [χ]/[j] and [ħ], consider some common alternations between these fricatives in (3) (Czaplicki (2006:75)).

3. The alternations between the velar and glottal fricative

друг (druh)/друга (druha)	[χ]/[ħ]	<i>friend/gen.sg.</i>
ваг (vah)/вага (vaha)	[χ]/[ħ]	<i>weight/gen.pl./nom.sg.</i>
гірка (hirka)/гора (hora)	[j]/[ħ]	<i>mountain/dimin./nom.sg.</i>
гiсть (hist’)/гостья (host’a)	[j]/[ħ]	<i>guest/gen.sg.</i>

¹ The laryngeal specification of obstruents is not the main concern of the present study and thus it will not be pursued any further here. For the book-length analysis of the laryngeal specification in consonants see Cyran (2014).

In (3) the voiced velar/palatal fricative alternates with the voiced glottal fricative. Crucially, while the glottal fricative must be followed by a vowel, the velar one occurs only finally. Moreover, the palatalized velar (in the context before [i]) alternates with the glottal [ɦ] when it occurs before other (non-front) vowels. Intuitively the segments are related and their phonetic realization appears to be strictly connected with the context. On the other hand, both [ɦ] and [x], similarly to [ɣ] and [x], can be found in the identical context with the proviso that the former contrast only word-initially and the latter word-finally as in (4).

4. Contrastive distribution of Ukrainian dorsal fricatives (Bloch-Rozmej 2008: 12)

рай (haj) [ɦ] <i>woods</i>	vs.	хай (chaj) [x] <i>let</i>
but		
маг (mah) [ɣ] <i>magus</i>	vs.	мах (mach) [x] <i>taking</i>

It follows that [ɦ] and [x] cannot contrast word-finally because [ɦ] is banned from this position and in consequence it is replaced by [ɣ].

These observational facts have led Bloch-Rozmej (2008) to claim that the voiceless velar [x] is the weakest of all the dorsal fricatives as it enjoys distributional freedom. Furthermore, on the basis of the same distributional constraints, Bloch-Rozmej (2008) comes to the conclusion that the absence of the glottal fricative from the word-final position and the relatively unrestricted distribution of the velar fricatives (especially the voiceless one) should be ascribed to the difference in the head status supplemented with the laryngeal specification of the relevant segments. More precisely, the non-headed velars [x] and [ɣ] are free to take up the final position, whereas the headed glottal will be barred from the same context. Summing up, in Bloch-Rozmej (2008) the voiceless velar fricative [x] is the weakest of all dorsals as it is non-headed and lacks the elements for place and laryngeal specification. Although [ɣ] and [ɦ] contain the same number of elements, they differ in headedness in that the former, unlike the latter, is non-headed. And this, as Bloch-Rozmej (2008) argues, explains the reason why [ɣ] is reserved for the word-final position only – it is non-headed and hence less complex in opposition to [ɦ] which is headed and so a more complex expression. It follows that in her system headedness contributes to the general complexity of a segment which is calculated in terms of the number of elements, a segment contains. Be that as it may, this solution runs into difficulty in that it is not the least complex segment, i.e. [x], that is reserved for the prosodically weakest context (before the weak licenser – the empty nuclear position) but a more complex [ɣ]. Recall that the latter, unlike the former, is specified for the voicedness [L]. Thus, what calls for explanation is the reason why it is the more complex [ɣ], rather than the less complex [x], that is found in the word-final position only. In short, since a more complex [ɣ] is present before the final empty nucleus, it should, all the more, be found in a much stronger position, i.e. before the realized nucleus. This is, however, not the case here as in Ukrainian only

the voiceless velar fricative enjoys the distributional freedom (1a). Moreover, on the basis of the examples such as *глина* (hlyna) ‘clay’, it is claimed (Bloch-Rozmej 2008) that the internal empty nucleus, i.e. the one between the first two consonants, is a stronger licenser than the final one as the glottal fricative in *глина* (hlyna) is allowed before the internal empty nucleus but is banned before the empty nucleus at the end of the word. Finally, in order to explain the reason why the voiced glottal fricative [ɦ] remains immune to palatalization, i.e. why it changes into a palatal segment when subdued to the effect of the palatal prime, Bloch-Rozmej (2008: 16) has to fall back on physical explanation of the lack of glottal palatalization proposed by Czaplicki (2006: 79) who claims that it is physically impossible to articulate a laryngeal with simultaneous palatalization.

The alternative solution proposed here suggests a different explanation. It follows the intuitive impression, which has already been alluded to above, that the voiced velar/palatal fricative is strictly related to the glottal one. This impression is further deepened by the fact that both [ɣ] and [ɦ] in the forms under (1) above are replaced by the voiced velar plosive [g]² in the cognate forms in some Slavic languages, e.g. Polish and Russian (5).

5. The alternation between [ɣ]/[ɦ] and [g] in Ukrainian, Polish and Russian

a. <i>Ukrainian</i> [ɦ]	<i>Polish/Russian</i> [g]	
газета (hazeta)	gazeta	<i>newspaper</i>
гра (hra)	gra	<i>game</i>
гриб (hrib)	grób	<i>grave</i>
глина (hlyna)	glina	<i>clay</i>
глухий (hluchyj)	głuchy	<i>deaf</i>
Бога (Boha)	Boga	<i>God/gen.sg.</i>
дорога (doroha)	droga	<i>way/nom.sg.</i>
книга (knyha)	книга	<i>book/nom.sg.</i>
b. <i>Ukrainian</i> [ɣ]	<i>Polish/Russian</i> [k]	
Бог (Boh)	Bóg	<i>God/nom.sg.</i>
ваг (vah)	wag	<i>weight/gen.pl</i>
стіг (stih)	stóg	<i>rick</i>
берег (bereh)	brzeg	<i>river bank/nom.sg.</i>
ріг (rih)	róg	<i>horn/nom.sg.</i>
друг (druh)	друг	<i>friend</i>
c. <i>Ukrainian</i> [j]	<i>Polish</i> [g]/[j] ³	
гігант (hihant)	gigant	<i>giant</i>
береги (berehy)	brzegi	<i>river banks/nom.pl.</i>

² Since the final obstruent devoicing is an active process in both Polish and Russian, the word final voiced velar plosive is devoiced to [k] as in (5b) below.

³ The voiced velar plosive [g] is realized as the voiced palatalized plosive [j] before a front vowel in Polish.

ноги (nohy)	nogi	<i>leg/nom.pl.</i>
гірка (hirka)	górką	<i>hill</i>
гість (histʹ)	gość	<i>guest</i>
гідний (hidnyj)	godny	<i>worthy</i>

While the Ukrainian voiceless velar fricative [x] has numerous reflexes in Polish, i.e. [x], [k] or [f] as in, respectively, *Ukr.* [x]ata ~ *Pol.* [x]ata, ‘cottage’, *Ukr.* пта[x] ~ *Pol.* pta[k] ‘bird’, *Ukr.* [x]утро ~ *Pol.* [f]utro ‘fur’, the voiced velar/palatal and glottal fricatives are replaced by [g] in Polish and Russian. In other words, the forms with [g] in Polish and Russian are realized with [ɣ], [j] and [ɦ] in Ukrainian as evidenced by the examples in (5a-c) above.

Therefore, what we suggest here is that it is not only the voiced palatal fricative [j] which is a contextual variant of [ɣ] but also the voiced glottal fricative [ɦ]. This solution, however, stumbles across some immediate questions, e.g. what triggers the glottal realization, why [ɣ] is replaced by [ɦ] in a strictly defined context, and how these two related variants differ in their melodic make-up. It must be noted here that the idea of the contextual variants, i.e. that [ɦ] is the context specific realization of [ɣ], is not new. For example, both Rubach (1993) and Czaplicki (2006) treat [ɦ] as underlying [ɣ]. More specifically, the proposal concerning the status of the fricatives put forward in Czaplicki (2006) assumes that the lexical back fricatives in Ukrainian are [x] and [ɣ], whereas their palatalized variants as well as the glottal fricative are an outcome of phonological processing. We generally subscribe to this opinion but, at the same time, we disagree with the solution according to which the glottal fricative is derived from the underlying (lexical) velar fricative. This is because, as Bloch-Rozmej (2008: 15) rightly points out, Government Phonology in general and Element Theory in particular holds that ‘any phonetic segment that surfaces in the realization of forms, is the output of a unique phonological representation⁴’, hence the option that [ɦ] is derived from [ɣ] is not available in this theoretical framework. In Element Theory the phonetic realization of a segment depends on several factors including the category and status of elements which constitute the internal structure of a particular segment, and the metrical strength of the position to which it is attached (Bloch-Rozmej 2008: 15).

To repeat the point made earlier, the system of dorsal fricatives in Ukrainian is fully symmetrical in that there are two ‘main’ fricatives in this class: the voiceless velar fricative [x] and its neutral (voiced) counterpart [ɣ]. Both of them undergo a regular palatalization before the front vowel [i] which results in contextual variants [ç] and [j], respectively.⁵ Now, what we suggest here is

⁴ This idea has been questioned recently. It has been proposed that since elements are cognitive phonological objects, they may get a slightly different phonetic interpretation cross-linguistically or even within the same system (Gussmann 2002, 2007; Backley 2011 and Cyran 2014).

⁵ Note that in Ukrainian velars regularly alternate with postalveolars before the front mid vowel [e], e.g. *druh* [ɣ] > *druže* [ʒ] ‘friend/voc.’, *Javtuch* [x] > *Javtuše* [ʃ] ‘first name/voc.’ (Bloch-

that the glottal fricative [ɦ] is yet another contextual variant of [ɣ] which contains one additional element |A|. ⁶ It follows that the internal structure of the glottal fricative is relatively complex including three elements, i.e. |U A H|. Interestingly, the presence of |A| in the glottal fricative is actually predicted by some phonetic descriptions. For example, Ziłyński (1932) after Bloch-Rozmej (2008: 9) describes the glottal fricative as ‘the realization of a low vowel in a slow speech’ and adds that ‘there is hardly any noise heard, except for slight friction that resembles sighing’.

The source for the element |A| in the glottal fricative, we claim, is the following vowels [a] and [o] or liquids [l] and [r]. All of these segments are specified for the low resonant |A| (Backley 2011). It means that [ɦ] acquires the resonance element |A| from the following segment (a vowel and a liquid alike) and it never occurs before [i] as this vowel is specified for |I| and in this context [ɦ] regularly alternates with [j]. In other words, both [ɦ] and [j] are contextual variants of [ɣ] where the former occurs before a non-high vowel or liquid, while the latter before a high vowel. Moreover, since [ɦ] is a contextual variant of [ɣ] before |A| segments, it explains why it never occurs word-finally where instead we find [ɣ]. Now, the reason why [ɣ] is distributionally the most heavily constrained segment among the dorsal fricatives is that it is non-headed and as such the weakest and most susceptible to various modifications including palatalizations and lowering. The remaining fricatives, i.e. [x], [ç], [j] and [ɦ], are headed expressions. The internal structure proposed for all the dorsal fricatives discussed in this study is given in (6) below.

6. Intrasegmental structure of Ukrainian dorsal fricatives

[x]	U H	distributionally free
[ç]	<u>I</u> H	before front vowels
[ɣ]	U H	distributionally constrained
[j]	<u>I</u> H	before front vowels
[ɦ]	<u>A</u> U H	before A segments (non-high vowels and liquids)

Summing up, since velars are segments without a headed resonant, they can be easily modified by neighboring segments with headed resonants. In the case of palatalization, for example, the non-headed |U| is replaced by the headed |I| of the following vowel resulting in [ç] = (|I H|) and [j] = (|I H|). In a situation when the velar fricative [ɣ] is followed by a segment specified for the resonant |A|, this element adds to the internal structure of the velar in the function of the head. Now the reason why the element |A| is added to the structure of the voiced velar fricative and not to the voiceless one is that the latter, unlike the former, is

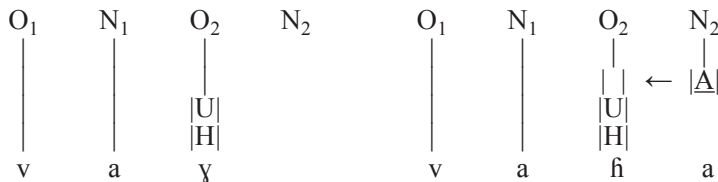
Rozmej 2008: 15). It may mean that in this case both elements of the front vowel [e], i.e. |I A|, are installed within the melodic plane of the velar fricative.

⁶ For example, in Backley’s (2011) model both dorsals and laryngeals are represented by the element |A|.

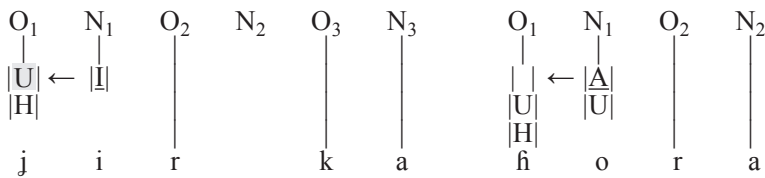
headed by the noise element $[\underline{H}]$. It is proposed here that the voiced velar fricative, as a segment without a head, is the weakest and hence seeks to be headed unless it occurs in the weak context, i.e. in the word-final position. Finally, simply because in languages which lack the front rounded vowels, the elements $[\underline{U}]$ and $[\underline{I}]$ do not sit comfortably together, the frontness element $[\underline{I}]$ replaces $[\underline{U}]$ in velar palatalization but in the case of the glottal fricative the element $[\underline{A}]$ is added up to the overall internal structure of the fricative. Both scenarios are illustrated schematically in (7) below.

7. Modifications of the voiced velar fricative $[\underline{y}]$

a. ваг (vah)/вага (vaha) $[\underline{y}]/[\underline{h}]$



b. гірка (hirka)/ропа (hora) $[\underline{j}]/[\underline{h}]$



The representations in (7) illustrate the distributional facts concerning the back fricatives in Ukrainian. The voiced velar fricative is the weakest one (least complex) as it contains just two headless elements, hence its distribution is reduced to the weak position only – word-finally before the empty nuclear slot N₂ in (7a). When followed by the front vowel $[i]$, the headless $[\underline{U}]$ of the velar fricative gets replaced by the incoming headed $[\underline{I}]$ from the following vowel (7b). As mentioned above, in the vocalic system lacking front rounded vowels, the elements $[\underline{U}]$ and $[\underline{I}]$ are not easily mingled within one segment, hence the non-headed element $[\underline{U}]$ is replaced by $[\underline{I}]$ of the vowel. Finally, when the voiced velar fricative is followed by a non-high vowel or a liquid, the resonant $[\underline{A}]$ adds to the internal composition of the preceding segment resulting in the glottal fricative (7a, b). It follows that being headless is the worst scenario of all which is allowed only in a prosodically weak position. In other words, the voiced velar fricative seeks to be headed otherwise it is doomed to be lost.

3. Conclusions

The class of back fricatives in Ukrainian is perfectly symmetrical and contains two velar spirants [x] and [ɣ]. They have several contextual variants which are fully predictable and regular. In the context of the following front vowel [i], they are interpreted as respectively [ç] and [j]. The palatalization has been explained as the spreading of the headed resonance element [I] which replaces the non-headed resonant [U] of the preceding velar fricative. The least complex and hence the weakest of all the back spirants is the voiced velar fricative [ɣ] which is proposed to be represented by two non-headed elements [U] and [H]. The intrasegmental structure of this spirant explains its heavily constrained distribution – it is allowed in the word-final position only as this is a prosodically recessive position. Moreover, being headless, the voiced velar fricative seeks to be headed. This assumption explains why it acquires the resonant [A] from the following non-high vowel or the [A]-specified liquid, which results in the glottal interpretation, i.e. [ɦ]. In other words, the voiced velar fricative [ɣ] has two main variants: [j] before the high front vowel [i] and [ɦ] in front of a non-high vowels and liquids. This solution is further confirmed by the cognate forms in related Slavic languages in which all three spirants, i.e. [ɣ], [j] and [ɦ], are replaced by the voiced velar plosive [g] as it is the case in Polish or Russian.

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