

Adjacent vs. separated placement of preposition and noun as a factor in noun inflection: The cases of Bosnian-Croatian-Serbian *pazuho* ‘armpit’

Wayles Browne

Cornell University, Ithaca, New York, U.S.A.

For Axel Holvoet

Abstract. The alternations *k~c*, *g~z*, and *x~s* occurring before *i* in Bosnian-Croatian-Serbian (BCS) noun declension stem from the Second Palatalization of Velars, but are no longer phonologically conditioned. In the dative-locative singular of nouns with nominative in *-a*, they are favored or hindered by a combination of morphological criteria. In the dative-instrumental-locative plural of masculine nouns, they are almost exceptionless. In the same three cases of neuter nouns they occur more when the noun is directly after a preposition, less when other words intervene between the preposition and the noun, a phenomenon that has not previously been remarked in the literature. We exemplify it with the noun *pazuho* ‘armpit’.

Keywords: Bosnian-Croatian-Serbian, declension, consonant alternation, second palatalization, declension, adjacency, separation

1 Origin of the Bosnian-Croatian-Serbian *k~c*, *g~z*, and *x~s* alternation in declension

The early Slavic Second Palatalization of Velars was, at the beginning, a phonetically conditioned change. By the action of the earlier First Palatalization of Velars, velars before old front vowels became palatals. Thereafter, monophthongization of the earlier diphthong **oi* produced new front vowels (**i* in

some environments, *ě in others), and velar consonants *k, *g, *x that found themselves before the new *i or *ě moved frontward in the mouth to yield *c, *dz (later > *z), and *s/*š respectively. Since there were other sources of these output consonants (the Third Palatalization of Velars), they were phonemically different from the velars. We can say that the change created alternations *k~c*, *g~z*, and *x~s* (or, in West Slavic, *x~š*). These alternations immediately became morphologized in one sense of the word, because they served to additionally characterize particular morphological forms in verbal conjugation (imperatives of velar-final verb stems) and in declension (e.g. dative and locative singulars of *-a* stem nouns; nominative and locative plurals of *-o* stem nouns). Thus **rǫka* ‘hand, arm’ had a DL sg **rǫcě*, where the *-ě* was the main carrier of the meaning ‘DL sg’ but the stem-final *-c* also marked the DL sg form. The masculine *-o* stem **potokъ* ‘stream’ had a NOM pl. **potoci* and a LOC pl. **potocěxъ*; the *-i* meant ‘NOM pl masc.’ but the *c* was an additional indicator of it.

As early Slavic developed into West South Slavic and further into Štokavski Serbo-Croatian (hereafter BCS), the effects of the Second Palatalization became morphologized in another sense. Adjectives, whose short-declension case-number-gender forms had previously been identical to those of *-o* stem and *-a* stem nouns, continued to take the same endings but no longer showed the alternations of velars. Thus **tixъ* ‘quiet’ in the NOM pl masculine was no longer **tisi* but *tih¹*, although the noun ‘stream’ has continued to have the NOM pl masc. *potoci*. Therefore it has now become important what part of speech the word belongs to.

Also, BCS has removed the differentiation of “hard” and “soft” endings (those used after non-palatal stem-final consonants and palatal ones, respectively), apart from the *o~e* alternation which we will see below. A result of this is that the *-a* stem DL sg and the *-o* stem LOC pl came to end in *-i* and *-ih*, respectively, rather than varying between *-ě* and *-i*, *-ěh* and *-ih*. Subsequently, the dative, instrumental, and locative plural forms syncretized and their shared ending is *-ima*. All this is without consequences for the consonant alternations. *K* can still alternate with *c* before the *-i* and *-ima* endings, *g* with *z*, and *h* with *s*. See Tables 1, 2, and 3.

1 From now on we use the BCS spelling *h* rather than the more general Slavic *x* for the voiceless velar continuant.

	West South Slavic		>	BCS	
	hard	soft			
NOM	*-a (*-ka)	*-a		NOM	-a (-ka)
ACC	*-ǫ (*-kǫ)	*-ǫ		ACC	-u (-ku)
GEN	*-y (*-ky)	*-ę		GEN	-ē (-kē)
DAT	*-ě (*-cě)	*-i		DAT	-i (-ci)
LOC	*-ě (*-cě)	*-i		LOC	-i (-ci)
INS	*-ojǫ (*-kojǫ)	*-ejǫ		INS	-ōm (-kōm)

TABLE 1. *-a* stem nouns in the singular: from West South Slavic to BCS, showing whether *k* alternates or not before the endings

	West South Slavic		>	BCS	
	hard	soft			
NOM	*-i (*-ci)	*-i		NOM	-i (-ci)
ACC	*-y (*-ky)	*-ę		ACC	-e (-ke)
GEN	*-ь (*-kь)	*-ь		GEN	-ā (-kā)
DAT	*-омь (*-komь)	*-емь		DAT	-ima (-cima)
LOC	*-ěхь (*-cěхь)	*-іхь		LOC	-ima (-cima)
INS	*-y (*-ky)	*-i		INS	-ima (-cima)

TABLE 2. *-o* stem masculine nouns in the plural: from West South Slavic to BCS, showing whether *k* (and *g*, and *x*) alternates or not before the endings

	West South Slavic		>	BCS	
	hard	soft			
NOM	*-a (*-ka)	*-a		NOM	-a (-ka)
ACC	*-a (*-ka)	*-a		ACC	-a (-ka)
GEN	*-ь (*-kь)	*-ь		GEN	-ā (-kā)
DAT	*-омь (*-komь)	*-емь		DAT	-ima (-cima)
LOC	*-ěхь (*-cěхь)	*-іхь		LOC	-ima (-cima)
INS	*-y (*-ky)	*-i		INS	-ima (-cima)

TABLE 3. *-o* stem neuter nouns in the plural: from West South Slavic to BCS, showing whether *k* (and *g*, and *x*) alternates or not before the endings

2 Limitations on the alternation

Can still alternate; but do they? In present-day BCS, masculine nouns with stem-final velars almost always show the consonant alternations before NOM pl *-i* and the syncretized DIL pl ending *-ima*. Thus *potok*: *potoci*, *potocima*; *suprug* ‘spouse’: *supruzi*, *supruzima*; *Čeh* ‘Czech’: *Česi*, *Česima*. Only a few nouns fail to alternate before these endings. For example, *kok* ‘coccus bacillus’ has *koki*, *kokima*, rather than **koci*, **kocima*; *Bask* ‘Basque’ has *Baski*, *Baskima*, and not **Basci*, **Bascima* (Browne 1993, 313f.; Brown[e] & Alt 2004, 1.3.1.2.2). True, there are now numerous masculine nouns in whose declension stem-final velars don’t “get a chance” to alternate; most monosyllabic stems, like *rok* ‘deadline’, *drug* ‘comrade, friend’, *kruh* ‘bread [Croatian]’, add the formant *-ov-* before their plural endings (thus making the *duga množina* ‘long plural’), thus *rok-ov-i*, *rok-ov-ima*, *drug-ov-i*, *drug-ov-ima*, *kruh-ov-i*, *kruh-ov-ima*, so that there is no longer contact between a velar and the *i* of the endings.

On the other hand, the alternation in the DL sg of *-a* stem nouns (feminine, plus a smaller number of masculines) is subject to numerous morphological and phonological conditions, and a sketch of these (Browne 1993, 313f.; Brown[e] & Alt 2004, 1.3.1.2.3) may be of interest to morphologists as a sample of criteria that morphological descriptions may need to take account of.

Stem-final velars that are not part of a consonant cluster favor the alternation; velars in some clusters also alternate, but other clusters escape the alternation. Thus *ruka* ‘hand, arm’: DL sg *ruci*; *djevojka* ‘girl’: *djevojci*; but there is usually no alternation in *mačka* ‘cat’: *mački*.

Stem-final velars in personal names do not alternate, while those in geographical names often do. Thus *Dubravka* ‘woman’s name’: DL *Dubravki* and not **Dubravci*; but *Banova Jaruga* ‘Governor’s Ravine [village in Croatia]’: *Banovoj Jaruzi*, where *Banova* is a possessive adjective.

Stem-final velars in *-a* stem hypocoristics do not alternate. Of course, many hypocoristics are formed from personal names, and as personal names themselves come under the preceding criterion: *Đoka* is a hypocoristic from *Đorđe* ‘George’, and has DL *Đoki*, not **Đoci*. But the common noun *sestra* ‘sister’ has a hypocoristic *seka* ‘sis’, and this also fails to alternate: DL *seki*, not **seci*.

Stem-final velars in feminatives (feminine counterparts to masculine human nouns) fail to alternate. One of the most used feminative-forming suffixes is *-ka*, e.g. masc. *Japanac* ‘Japanese’, fem. *Japanka*; masc. *Sarajlija* ‘Sarajevo

resident', fem. *Sarajka*. (As we see, adding *-ka* often requires dropping a suffix that was present in the masculine: *-ac*, *-lija*, and others.) *-Ka* feminatives have DL in *-ki*, not in *-ci*: *Japanki*, *Sarajki*. A resident of *Beograd* 'Belgrade' is masc. *Beograđanin*, fem. *Beograđanka*, and the fem. DL is *Beograđanki*. However there is a skyscraper in the city bearing the name *Beograđanka*, and, not being a feminative, its DL is alternatively *Beograđanki* and *Beograđanci*.

Nouns ending in the string *-ika* are particularly likely to alternate in the DL sg: *lingvistika* 'linguistics', *lingvistici*; *Amerika*, *Americi*; *Lika* 'region in Croatia', *Lici* (though *Liki* also occurs). However the principle that hypocoristics avoid the alternation is stronger, e.g. *čika* 'uncle; hypocoristic in speaking to an older man', *čiki* and not **čici*.

Of the three velars, "k most readily alternates, then g, with h least susceptible" (Browne 1993, 314). BCS has relatively fewer words with *h* at the end of the stem as compared with other Slavic languages, since this consonant was lost in the history of many BCS dialects. A few examples are: *muha* 'fly', DL *muhi* or theoretically also *musi* (but in Serbian *muva*, DL *muvi*); *svrha* 'purpose', DL *svrsi* or more rarely *svrhi* (sometimes even both in the same text); *epoha* 'epoch, era', *eposi* and more frequently *epohi*.

3 The alternation in neuter nouns

The above treatment has cited *-a* stem nouns (feminines and a smaller number of masculines) and former *-o* stem masculine nouns ("former" since in early Slavic the masculines took on the ending *-b* instead of *-o*, and in modern Slavic languages the ending is zero, so that all such nouns end in a consonant). An astute reader may wonder about the status of the consonant alternation in neuter nouns. Neuter nouns in BCS, as in other Slavic languages, have nominative plurals not in *-i* but rather in *-a*, so there would be no conditions for the *k~c*, *g~z*, and *h~s* alternations in the nominative. But BCS nevertheless has the same *-ima* ending for the DIL pl neuter as for the masculine. Are there alternations before it?

In fact, there are not as many neuter nouns in BCS as there are masculines and feminines. Even in early Slavic, some *-o* stem neuters became masculines (Illič-Svityč 1963; Derksen 2011) and therefore switched from NOM sg in *-o* to NOM sg in *-b*. In BCS, the neuter gender is closed; no new words can join it except for words made with already-existing neuter suffixes such as *-stvo*, *-je*.

There was a very small number of inherited Slavic words ending in velar + *o*. One immediately thinks of *uho* ‘ear’ and *oko* ‘eye’, but these two words have suppletive plural stems (*uši* and *oči* rather than **uha* and **oka*). Other velar + *-o* words that can be reconstructed for Common Slavic are **bolgo* ‘good(s)’, **brjuxo* ‘stomach’, **jъgo* ‘yoke’, **melko* ‘milk’, **věko* ‘lid, eyelid’, **(j)ablъko* ‘apple’, **vojъsko* ‘army’, and **lyko* ‘bast fiber’. Of these, BCS has *blago* ‘treasure’, *ml(ij)eko* ‘milk’, and archaic *igo* ‘yoke’ (now usually *jaram*) as neuter nouns; their plural forms seem not to be in use. **brjuxo* and **věko* have gone out of use, replaced by *trbuh/stomak* and *v(j)eđa/kapak* respectively. ‘Apple’, ‘army’ and ‘bast’ have become feminine: *jabuka*, *vojska*, *lika*. (Cf. Matasović 2016; Kopečný 1981; Sadnik & Aitzetmüller 1955 under the respective words.)

Modern BCS has two neuter nouns with a velar-final stem that are used both in the singular and in the plural. These are *klupko* ‘skein of yarn’ and *pazuho*² ‘armpit; fork or crotch of a plant or tree’³. Their NOM pl forms, as one expects for neuter nouns, are *klupka* and *pazuha*. Their DIL pl forms show up as both *klupcima* and *klupkima*, *pazusima* and *pazuhima*. Marković (2013, 136), while recognizing the sameness of the *-ima* ending for masculines and for neuters, says “The sibilized forms of neut. nouns are somewhat more marked than the non-sibilized” (*Sibilizirani oblici imenica sr: roda ponešto su obilježeni od nesibiliziranih.*)⁴ without going into the conditions favoring the use of one form or the other.

In fact, within the masculine declension there is a close connection between the NOM pl and the DIL pl forms. The DIL cannot ‘make decisions’ on its own; the NOM pl is its ‘role model’. If the NOM pl undergoes the *k~c*, *g~z*, and *h~s* alternations, as happens in the great majority of velar-final stems in the plural, then so does the DIL pl. So if *Čeh* ‘Czech’ has NOM pl *Česi*, DIL will imitate this: *Česima*. In the small minority of instances where the alternation fails in the NOM pl, it also fails in the DIL: *Baski*, *Baskima*; *koki*, *kokima*.

2 *Pazuho* has undergone a change opposite to that of ‘apple’, ‘army’ and ‘bast’; it is feminine in Old Church Slavonic (*pazuxa* ‘bosom, armpit’) and in most of the other languages, but has become neuter in BCS.

3 Marković (2013, 136) cites *klupko* with doublet DLI pl forms *klupcima*, *klupkima*, also *blago* ‘treasure’ with *blazima* and *blagima* and *ruho* ‘clothing’ with *rusima* and *ruhima*, but the latter two words seem not to be really used in the plural.

4 Sibilization is another term for the *k~c*, *g~z*, and *h~s* alternations.

However, in the neuter declension, the NOM pl, which ends in *-a* without any alternations, has no such ‘trend-setting’ role. The DIL is free to ‘choose’ whether to alternate or not.

4 A parallel ‘role-model’ phenomenon in the singular

A similar relationship exists in the masculine and neuter singular declensions, but the two genders change places. The INS sg ending is, to a first approximation, *-om* ~ *-em*, where *-om* occurs after non-palatals and *-em* after palatals and *c*. Thus *grad* ‘city’ masc. has INS sg *gradom*, while *kralj* ‘king’ masc. has INS sg *kraljem*. But among the masculines some words have aberrant behavior: those ending in *-ar* appear with both endings, so that *ribar* ‘fisherman’ can have *ribarom* or *ribarem*. “*-om* tends to be kept in foreign words and names (*Kiš-om* [Danilo Kiš, the Yugoslav writer of Hungarian descent]) and in words with *e* in the preceding syllable: *padež-om* ‘case’” (Browne 1993, 320). The masculine INS sg forms can vary in this way because the NOM sg has a zero ending and does not influence them. Among the neuters, however, the NOM sg ending *-o* ~ *-e* is itself regulated by position after a non-palatal or palatal (including *c*) stem-final consonant, so that *slovo* ‘letter of the alphabet’ has *-o* after *v*, while *polje* ‘field’ and *lice* ‘face’ have *-e* after *lj* and *c*. The neuter INS sg emulates the NOM sg faithfully: *-o* requires *-om*, and *-e* requires *-em*, leaving no room for variations. (This statement does not apply to those neuters which add a string *-en-* or *-et-* in the oblique cases, such as *ime* ‘name’ and *drvo* ‘tree’; here the NOM sg cannot be a role model, and such words have *-om* after the *n* or *t*, as INS sg *imenom*, *drvetom*.)

5 Factors in the alternation among neuter DIL plurals

Corpus studies suggest a conditioning factor not previously observed: whether a noun is adjacent to a governing preposition (notation in Tables 4 and 5: PN) or separated from a preposition by one or more intervening words (noted as P...N). If the noun is used without any preposition at all, we write noP (i.e. no preposition). Searching for *klupcima/klupkima* is difficult, since there is interference from two pluralia-tantum place names *Klupci*, DIL *Klupcima*. But *pazusima* and *pazuhima* are not confusable with any other lexical item.

In the hrWaC 2.1 corpus (from Croatian web pages, accessed via clarin.si on 20 January 2021) we find:

	PN	P... N	noP	total
<i>pazusima</i>	84 (94%)	43 (86%)	9 (90%)	136 (91%)
<i>pazuhima</i>	5 (6%)	7 (14%)	1 (10%)	13 (9%)
total	89 (100%)	50 (100%)	10 (100%)	149 (100%)

TABLE 4. Alternating and non-alternating forms of *pazuho* in the hrWaC 2.1 corpus

That is, placement next to a preposition strongly favors the alternation, as in (1); placement at some distance from a governing preposition still has the alternation more often than not, but is somewhat more conducive to a lack of alternation, as in (2). Usage with no preposition, as in (3), is rarer, but clearly favors the alternation. We conclude that *pazusima*, showing the alternation, is still the most-used form in Croatian material, but that the probability of the non-alternating form *pazuhima* increases noticeably with distance from the preposition.

- (1) [*U koži ima preko 2 milijuna žlijezda znojnica,*
najviše pod pazusima, na stopalima i dlanovima.
 most under armpit.INS.PL.N on sole.LOC.PL.N and palm.LOC.PL.M
 ‘[On one’s skin there are over 2 million sweat glands,] mostly in the
 armpits, on the soles of one’s feet and the palms of one’s hands.’ (hrWaC 2.1)]
- (2) ... (*povredu na vratu, leđima, nadlakticama,*
 injury on neck.LOC.SG.M back.LOC.PL.N upper.arm.LOC.PL.F
pazuhima, genitalijama, unutrašnjoj strani
 armpit.LOC.PL.N genitals.LOC.PL.F inner side.LOC.SG.F
bedara i stražnjici...
 thigh.GEN.PL.N and rear.LOC.SG.F
 ‘... (an injury on one’s neck, back, upper arms, armpits, genitals, the
 inner side of one’s thighs, one’s rear)...’ (ibid.)
- (3) ...*pa zašto ne biste svojim pazusima*
 so why not would.2.PL REFL.POSS armpit.DAT.PL.N
dali malo zraka?
 give little air
 ‘...so why wouldn’t you give your armpits a bit of air?’ (ibid.)

Searching the Korpus savremenog srpskog jezika at <http://korpus.matf.bg.ac.rs/> gave only 6 examples of *pazusima* and none of *pazuhima*. Wishing to have Serbian material represented in our data, on 30 August 2020 we did a Google search for пазусима and је in Cyrillic (the word је ‘is’ or ‘her’, written in Cyrillic, is added to the search to make sure we would get Serbian and not Russian, Ukrainian, Macedonian or any other Cyrillic-script language) and for пазухима and је. The results were confirmatory of our previous conclusion. When the noun is in contact with a preposition, the alternation is favored; when other words intervene, the non-alternating form not only gains in probability but has three times the frequency of the alternating one. Even before doing statistical tests for significance, the differences are striking. (The use with no preposition is too infrequent to draw any conclusion.)

	PN	P...N	noP	total
<i>пазусима</i>	26 (62%)	10 (25%)	1 (25%)	37 (43%)
<i>пазухима</i>	16 (38%)	30 (75%)	3 (75%)	49 (57%)
total	42 (100%)	40 (100%)	4 (100%)	86 (100%)

TABLE 5. Alternating and non-alternating forms of *pazuho* in Serbian (Google search)

Mr. Stephen Parry, M.S., of the Cornell Statistical Consulting Unit, Cornell University, has kindly run tests of significance, using R statistical software, and states: “A chi-squared test of association was initially conducted on Table 4. We found a statistically insignificant association between whether the consonant was changed or not and the position of the noun relative to the preposition ($\chi^2(2)=2.846$, $p=0.2409$). Because the assumptions of the chi-square test were not fully met (namely the assumption that no more than 20% of the expected frequencies can be less than 5), we also ran a Fisher’s exact test for a robustness check, which also yielded an insignificant result ($p=0.1715$). A chi-square analysis was also run on the first two columns of Table 4, which also yielded a statistically insignificant result ($\chi^2(1)=1.889$, $p=0.1694$); the Fisher’s exact test yielded a similar conclusion ($p=0.1178$).

A similar analysis was done on Table 5. First a chi-square test was run on the whole table and yielded a statistically significant result ($\chi^2(2)=11.939$, $p=0.0026$); the Fisher's exact test yielded a similar conclusion ($p=0.0016$). When we focused on just the first two columns of Table 5, we also found that there was a statistically significant association between whether the consonant was changed or not depending on the position of the noun ($\chi^2(1)=9.881$, $p=0.0017$); the Fisher's exact test yielded a similar conclusion ($p=0.0009$)."

6 Conclusion

Thus we see that adjacency vs. separation, or contact vs. distant placement, between a governing preposition and a noun is one more factor that must be reckoned with in predicting the inflectional form which the noun will take. Examples from elsewhere in the Slavic world or any of the world's languages will be welcomed.

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List of Abbreviations

BCS Bosnian-Croatian-Serbian, NOM nominative, ACC accusative, GEN genitive, DAT dative, LOC locative, INS instrumental, DL dative-locative, DIL dative-locative-instrumental, SG singular, PL plural, M or masc masculine, F or fem feminine, N or neut neuter, REFL reflexive, POSS possessive.

Data Sources

hrWaC (Croatian Web) accessed at clarin.si with the queries

<https://www.clarin.si/noske/all.cgi/first?iquery=pazuhima&corpname=hrwac&corpus-search-form=true>

<https://www.clarin.si/noske/all.cgi/first?iquery=pazusima&corpname=hrwac&corpus-search-form=true>

Korpus savremenog srpskog jezika at <http://korpus.matf.bg.ac.rs/>

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