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Palatal assibilation before [w]? The case of Armenian, Saka, and Luwian[1]

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ABSTRACT: Three branches of Indo-European —Luwian, Armenian, and East Iranian (Khotanese) Saka— seem have to undergone asssibilation of PIE palatal-prevelar stops before [w], a development contrasting with the general outcome of these stops in Armenian and Saka, and with their apparent outcome before [- front] vocalic segments in Luwian. So far, no principled phonetic or phonological explanations for this behavior have been proposed. I show that the developments in Saka and Armenican can be accounted for in terms of a crosslinguistic tendency for the high-vocalic labiovelar glide *w*, whether full segment *w* or nonsegmental offglide ^{w}, to assimilate to a following *y* or front vowel by becoming labiopalatal segmental *ɥ* or offglide ^{ɥ}, which following a common trend is unrounded to *y* or ^{y} and then palatalizes and assibilates the preceding stop. This account is not applicable to Luwian for which a general assimilation of palatal-prevelar before non-low vowels seems the best solution. The similarity between Armenian and Saka on one hand and Luwian on the other, thus, is accidental, and we must conclude that similar outcomes can be produced by very different historical developments.

KEYWORDS: palatalization; assibilation; labiovelar glide; labiopalatal; PIE palatal-prevelars.

[1] I am grateful to Craig Melchert for feedback on an earlier draft and for providing me with references for a third possible example of the change of **ḱw* to Luwian *tsw*.

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1. Introduction

Three different, geographically not connected branches of Indo-European —Luwian, Armenian, and East Iranian (Khotanese) Saka[2]— seem to offer evidence for asssibilation of PIE palatal-prevelar stops before [w], a development that contrasts with the general outcome of these stops in Armenian and East Iranian Saka, and with the outcome of these stops before [- front] vocalic segments in Luwian. So far, detailed and principled phonetic or phonological explanations for this behavior have not been proposed. The purpose of this paper is to provide such explanations.

Section 2 presents a brief summary of relevant data, and Section 3 summarizes earlier attempts at an explanation. A new, phonetically motivated account for the developments in Armenian and Saka is presented in Section 4, followed by a similar account for Luwian in Section 5. Section 6 presents a summary of the findings. (In the discussion, focus will be on voiceless stops. In Armenian and Saka, the voiced and (originally) aspirated voiced stops behave in the same way as the voiceless ones. In Luwian, the development of voiced and voiced aspirated stops is somewhat uncertain; see Melchert 2012.)

2. Relevant data

This section presents data showing that in Armenian, Saka, and Luwian the cluster **ḱw* stands out by undergoing changes different from the developments of singleton **ḱ*.

2.1. Armenian and Saka

The general Armenian outcome of PIE voiceless palatal-prevelar stops is *s*, see (1). By contrast, the cluster **ḱw* is reflected as *š*; see (2).

(1)	PIE	Armenian	
	**ḱērd-*	*sirt*	‘heart’
	**deḱm(t)*	*tas*	‘ten’

(2)	PIE	Armenian	
	**ḱ(u)won-*	*šun*	‘dog’
	**h₁eḱwos*	*ēš*	‘horse’ (→ ‘donkey’)

For Saka (and most of Iranian) the general outcome of PIE **ḱ* is *s*; see (3).[3] By contrast, the Saka outcome of **ḱw* is *ś(ś)* [š]; see (4).

(3)	PIE	Saka	
	ḱmtom	*sadä*	‘hundred‘
	deḱm(t)	*dasau, daso*	‘ten’

[2] The Modern East Iranian language Wakhi has a similar development.

[3] Old Persian generally has *θ*; all of Iranian has *š* before obstruent, which in Saka becomes retroflex *ṣ*.

(4)	PIE	Saka	
	**ḱwoitos*	*śśīyä*	‘white‘
	**h$_1$eḱwos*	*aśśä*	‘horse’

2.2. Luwian

The general distribution of the reflexes of PIE **ḱ* is the following. Before front vowels the outcome is an assibilated stop, here transcribed as *ts*;[4] see (5a). Before earlier [- front] vowels and non-syllabic consonants we seem to find velar *k* as in (5b). Remarkably, however, before the [- front] glide *w*, the outcome is *ts* and not the expected *k*; see (6).[5] Moreover, the outcome *ts* also occurs before the reflexes of PIE syllabic sonorants; see (7). The situation, thus, is more complex than in Armenian and Saka.[6]

(5)		PIE	Luwian	
	a.	**ḱeyo*	*ziya-ri*	‘lies (in bed)’
	b.	**ḱoto-*	*kata-*	‘enmity’
		**ḱorh$_2$u* ‘horn’	*KARKAMIŠ*	(a horned god)
		**ḱru-nt-*	*k(u)runtiya*	‘of horn’

(6)	PIE	Luwian	
	**ḱ(u)won*	*tsu(w)ani* [tswani]	‘dog’
	**h$_1$eḱwos*	*atsu(w)a* [atswa]	‘horse’[7]

(7)	PIE	Luwian	
	**ḱr̥ng-*	*tsurnid* [tsornid]	‘horn’
	**ḱm̥to*	*tsanta* [tsanta]	‘down’

3. Earlier accounts

With a few exceptions, earlier accounts for the special developments of **ḱw* either simply state the facts without further explanation or offer guesses as to what may be involved. For Luwian, however, Melchert (2012) offers an attempt at accounting for the attested developments.

3.1. Armenian

Like many others, Meillet (1936: 12) merely states the fact that **ḱw* shows a special development to *š*, without attempting an explanation. However, he refers to Osthoff (1901: 223) for an “ingenious” proposal.

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[4] The usual Anatolianist transcription is *z*.

[5] In the syllabary employed for Luwian, *CwV* is written as *Cu-V*. To avoid confusion, Luwian examples will be cited in (quasi-)phonetic transcription in the rest of this paper.

[6] The data are from Melchert (2012), with modified transcription.

[7] A third possible example of this development is <ḫazzuwanni> [hatswani] ‘garlic’ from PIE **h$_2$eḱu-* ‘sharp’; see Simon (2015, 2016). (The interpretation *tsw* is Melchert’s, p.c. 22 June 2022.)

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Osthoff's extensive discussion (1901: 199-278) is indeed quite far-fetched, based on the assumption that the PIE word for 'dog' is derived from the word for 'cattle', PIE **peḱu/pku-*, and that the initial cluster **pḱ* underwent a special development to Arm. *š*. Even if the semantic part of the proposal were to be accepted, Osthoff's proposal does not give a phonetically-grounded explanation of the supposed change of **pḱ* to *š*. Most important, it fails to explain the fact that **ḱw* has the same outcome *š* in the word for 'horse'.

The most recent proposal, by Beekes (2003: 201, following Kortlandt 1980) is that **ḱw* changed to **cʷ* and further to **sʷ*, which then turned into *š*. However, Beekes provides no explanation as to why or how **sʷ* would have changed to *š*.

The closest to a satisfactory account is the suggestion in Hock (2021: 87) that Arm. *š* may result from a labiopalatal 'overlap between original palatal stop and labiovelar *w*', with reference to Hock (2009). But the details of the development are left undiscussed.

3.2. Saka

Perhaps the most common view on the Saka development of **ḱw* to *śś* is that it shows retention of an original palatal reflex of PIE **ḱ*; see e.g. Emmerick (1989: 21), Sims-Williams (1998: 136),[8] and Cantera (2017) (with references). This perspective, however, does not explain why the palatal feature should have been preserved just in this cluster.

Similarly, Skjærvø (2009: 51) implicitly proposes a retention of palatal articulation in Northeast Iranian and postulates that **ćw, *ǰw* "assimilated" to *ś* and *ź*; see also Korn (2016: 56) where a similar "assimilation" is postulated. However, no explanation is provided for the "assimilation" or what "assimilates" to what in the cluster **ćw*. And again, there is no explanation of why palatal articulation should have been retained in the cluster, but not elsewhere.

Lipp (2009: 315-316, note 161) assumes that **ḱw* changed to PIIr. *čw* and further to early Iranian *t͡šw*. This form, in turn, is said to have changed to [sφ], where [φ] designates a "voiceless, bilabial, and hence rounded" fricative, and that [sφ] "assimilated" to *śś* [š] in Saka. Again, no explanation is offered as to how this "assimilation" might have happened.

Kümmel (2008: § 4.2.3) derives Saka *śś* [š] from PIE **ḱw* via dental PIran. **t̪sw* > **s̪w* with the comment 'wegen Rundung?' ('because of rounding?'). However, he does not explain how a dental sibilant would become palatal before a [+ round] glide.

Another perspective compares the Saka development to the fact that Old Persian, on the other geographical extreme of early Iranian territory, also has a special outcome of **ḱw*, namely *s*, a reflex that differs from the *sp* found in the majority of Ira-

[8] Sims-Williams postulates a similar retention of palatal articulation for PIE **ḱr* > **ćr* > *śś* [ś] in *śśära* 'good'. However, as Kümmel (2016) shows, the form can be derived from **ḱrīra-* > pre-Saka **srira* (with the normal outcome of **ḱ*) via **ṣira* (with retroflex outcome of **sr*) > **ṣyira* (with palatalization before front vowel) > **śira*. Both retroflexion and palatalization are general, regular processes in the prehistory of Saka. There is, thus, no need to assume a special retention of palatal articulation before *r*.

nian; see e.g. Schmitt (1989: 27-28) and Sims-Williams (1998: 136), as well as example (8). As in Saka, the Old Persian outcome *s* differs from the usual fate of **ḱ* before non-obstruent, which in Old Persian is *θ*, as in *θata* '100' (vs. Avest. *satəm*). Note, however, that Old Persian also has the outcome *s* for the consonant cluster **sḱ*, as in **pr̥(ḱ)-skḗ-* > *p(a)r-sa-* 'ask, interrogate' (Avest. *pərəsa^{i}ti* 'asks'). The outcome *s* in *asa* 'horse' and *p(a)r-sa* 'ask', therefore, may be reflect the fact that both **ḱw* and **sḱ* are clusters and that such clusters developed to *s*, presumably via geminate **ss* < **ćć*, whereas singleton **ć* yielded *θ*. There is, thus, no reason for assuming a special connection between Saka and Old Persian. See also Korn (2016: 56) (with references).

(8) PIE *h$_1$eḱwos* Saka *aśśä* Old Pers. *asa* Avest. *aspa* 'horse'

As in the case of Arm. *š*, the closest to a satisfactory account is the suggestion in Hock (2021: 87) that Saka *śś* may result from a labiopalatal 'overlap between original palatal stop and labiovelar *w*', with reference to Hock (2009). But again, the details of the development are left undiscussed.

3.3. Luwian

A common view holds that the Luwian words for 'horse' and 'dog', which they read as *aswa* and *swani* respectively, are borrowings from "Mitanni"/Indo-Aryan and thus should not be accounted for as inherited from Proto-Indo-European; see e.g. Lipp (2009: 339) (with references). Melchert (2012) offers convincing counterarguments, showing that the borrowing-hypothesis rests on an incorrect analysis of the Luwian hieroglyphic sign 448 as *sù* rather thant *tsú*, and the two words therefore need to be read as *atswa* and *tswani*.

Melchert's own account (2012) argues that PIE **ḱ* was a front velar [k^{y}] and that the assibilation before *w* reflects 'the strong tendency of labiovelars to be palatalized' (reference to Hock 2009). Unfortunately, the proposal does not offer a detailed phonetic explanation of how the tendency of labiovelars to be palatalized would lead to the development of **ḱw* to *tsw*.

Melchert expressly restricts the assibilation of **ḱ* before [- front] vocalic segments to the context before nonsyllabic *w*, and he claims that it did not take place before *u*. The evidence for this claim presumably consists of the forms in (9).

(9) a. ?*ku-tu-pi-li* 'fire offering' (**ḱu-*)
b. *kumma* [komma] 'sacralized' (**ḱunmo* <**ḱwn̥-mo-*; compare Avest. *spənta*)

However, as Melchert argues convincingly, the <u> of these forms designates the vowel [o], whereas [u] is characterized by <ú>. So these forms (and he lists no other relevant forms) at best suggest that the change does not take place before [o]. Luwian *o*-vowels however, are not directly inherited from Proto-Indo-European but reflect special developments in Luwian; see Melchert (2020: 263) and also the discussion below. Original PIE **o*-vowels regularly changed to *a*-vowels (as in Hittite); see Melchert (1993: 249) and see the first two items in (5b) above. Moreover, Melchert himself considers (8a) of uncertain value, as indicated by the question mark preceding the lemma. Second, Melchert has now (p.c. 22 June 2022) withdrawn the pro-

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posed etymology for *komma* in (8b). Neither of these two forms, then, need to be considered in the following discussion.

As regards the assibilation before PIE syllabic sonorants in (7) (repeated for convenience), Melchert first of all notes that we have to accept that PIE syllabic sonorants have a dual outcome *Ṛ* > *ur* [or] or *ar,* even though it is not possible to determine a conditioning environment for the different outcomes.

(7)	PIE	Luwian	
	**ḱṛng-*	*tsornid*	'horn'
	**ḱm̥to*	*tsanta*	'down'

For *tsornid* he then argues as follows

> … we are allowed to suppose that the front velar stop led to a palatal onset of the anaptyctic vowel, which then caused the palatalization (affrication) of the front velar, after which it was absorbed in the affricate, leaving only the non-front nuclear vowel …

Example (10) presents an attempt at formulating Melchert's proposal.

(10)	PIE	*k^{y}ṛng-id-
	Ṛ > oR	*k^{y}orng-id
	Glide insertion	*k^{y}yorng-id-
	Assibilation	*tsyorng-id-
	y > Ø / C__	*tsorng-id-
	Final outcome	tsornid

Presumably, a similar account would apply for *tsanta* 'below' < **ḱm̥to*, except that this form shows the alternative outcome *aR*.

Most of the changes posited by Melchert are fairly reasonable, but concerns remain. One is the question of how Glide Insertion can be restricted to the context before *o* in *oR* < **Ṛ* and excluded from the context before *o* in forms like **ḱoto* (in [5b] above), whose outcome is *kata* 'enmity', without Glide Insertion and subsequent assibilation. A second concern applies to Melchert's claim that the change of **k^{y}w* to *tsw* can be explained in terms of 'the strong tendency of labiovelars to be palatalized'. True, my 2009 paper did indeed present a fair amount of crosslinguistic evidence for the interaction between front glides and back-rounded glides (whether segmental or release features); however, it is difficult to see how this interaction would account for the change of **ḱw* to *tsw.* One possible interaction between front and back-rounded glides could lead to the labiopalatalization of *w* to **ɥ* and further, by unrounding, to **y*. But as *atswa* 'horse' shows, the *w* has remained unchanged. Another possible interaction would lead to the labiopalatalization of the front offglide of [k^{y}] to [^{ɥ}]; and that front glide could be assumed to induce assibilation. However, why would a labiopalatal offglide promote assibilation before [- front] vocalic *w*, but a palatal/front offglide would not do so before [-front] vocalic *o*?

Melchert's account, thus, offers interesting ideas and proposals, but it does not fully work out the developments by which PIE **ḱ* was assibilated in Luwian and the conditions for these developments.

4. An explanation of the Armenian and Saka developments

A phonetically well-motivated explanation of the Armenian and Saka developments can be developed based on the demonstration in Hock (2009) that there is a crosslinguistic tendency for the high-vocalic glide *w*, whether full segment *w* or non-segmental offglide ^{w}, to assimilate to a following *y* or front vowel by becoming labiopalatal segmental *ɥ* or offglide ^{ɥ}. Following the well-known general tendency for front-rounded vocalic segments to be unrounded, the labiopalatal (off)glide may in turn change to front (off)glide and, as such, trigger palatalization. Such a development makes it possible to account for the fact that PIE labiovelars undergo palatalization in Greek (as well as Armenian and Albanian), whereas plain velars fail to undergo the change. See the Greek examples in (11).[9]

(11)	PIE	*k^{w}e 'and'	*kel- 'drive, incite'
	Labiopal.	*k^{ɥ}e	—
	Unrounding	*k^{y}e	—
	k^{y} > č	*če	—
	Final outcome	te	kelomai

Against this background the Saka outcome of PIE **ḱw* can be accounted for as follows. (The Armenian outcome can be explained along the same lines; however the intermediate stages between Proto-Indo-European and Armenian are considerably less well established. The following discussion therefore focuses on Saka.)

Comparative Indo-Iranian evidence shows that the PIE prevelar/palatals developed to palatal affricates, such as **ḱ* > **tś* or, phonetically more accurately, *ćś*.[10] Only this will account for the fact that the Sanskrit outcome of the voiceless affricate is the palatal sibilant *ś*, and that the voiced and voiced aspirate reflexes merged with the palatal stops *ǰ* and **ǰh* (> *h*) that resulted from the palatalization of PIE (labio)velars; see (12).

(12)	PIE	*h_1eḱwos	Skt.	*aśva-*	'horse'
		*ḱ(u)won-		*śvan-*	'dog'
		*ǵeus-		*ǰoṣ-*	'enjoy'
	like	*g^{w}ih$_3$w-		*ǰīv-*	'live'

Now, palatals, just like palatalized segments, are characterized by front-vocalic onglides and/or offglides.[11] And, important for present purposes, these glides may become segmentalized (Hock 2021: 118). See the examples in (13). Phonetically, therefore, the PIIr. outcome of **ḱ* would have been **$^{(y)}$ćś^{y}*.

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[9] As Craig Melchert reminds me (p.c. 12 June 2022), the same kind of development is found in Luwian **kwi* > *ti* 'who'.

[10] The symbol *ś* is used to differentiate the sibilant element of the affricate from the palatal sibilant *š*, which underwent very different developments.

[11] Kümmel (2007: 250-251) argues that palatals are articulatorily *not* palatalized. However, examples like (13a) show that they can undergo on- or offglide segmentalization just as much as palatalized segments. A more appropriate generalization, therefore, may be that palatals may be phonologically not palatalized, but articulatorily/auditorily are palatalized.

https://doi.org/10.1387/asju.25961

(13) a. Segmentalization next to palatal[12]
Southern Am. Engl. *mash* [mæʸš] > [mæ**y**š]
measure [meʸšər] > [me**y**žər]
b. Segmentalization next to palatalized segment
Lithuanian [pʸautʸi] > [p**y**auti]

Against this background it is possible to account for the development of **ḱw* to *śś* [ś] as follows. In the early cluster **ćśʸw*, labiovelar *w* became labiopalatal *ɥ* under the influence of the preceding front offglide [ʸ]. Subsequently, *ɥ* was unrounded to *y*. Finally, after **ćś* had changed to *s̻*[13] (via **t̻s̻*) a general process of palatalization led to the change of *s̻* to palatal *ś* before *y* (which subsequently was lost). See the summary in (14), where (14c) has to precede (14d), and (14d) and (14e) must precede (14g); the order of (14f) and (14g) could be reversed (with appropriate reformulation). Note that this account receives indirect support from the fact that **ḱy* had the same outcome *ś(ś)*, as in *(ś)śava* 'copper(-colored)' < PIE **ḱyeh₁-wo* (Mayrhofer 1986-1992: s.v. *śyāvá*).

(14) a.	PIE	*ḱ	*ḱw
b.	PIIr.	*ćś [ćśʸ]	*ćśw [ćśʸw]
c.	Labiopalatal.	—	*ćśɥ [ćśʸɥ]
d.	Unrounding	—	*ćśy
e.	Dentalization	*t̻s̻	*t̻s̻y
f.	Debuccalization	s̻	*s̻y
g.	Palatalization	—	śy
h.	Loss of post-C glide	—	ś

This account avoids the difficulty that the palatal outcome cannot be explained in terms of an interaction between *w* and dental *t̻s̻*. It also makes unnecessary the (unexplained) assumption that the palatal articulation of the Indo-Iranian outcome of PIE **ḱ* survived in Saka, but only in combination with a following *w*. The account does not explain the fact that the developments in (14) took place only in East Iranian Saka (and Wakhi) and not elsewhere in Iranian; but a similar set of developments must have taken place in Armenian and not in neighboring Indo-European languages. Geographical restriction, thus, is not an unusual phenomenon.

It is remarkable that Saka (and Wakhi) was spoken in a transition area between South and Central Asia in which a triple sibilant contrast between palatal *ś*, retroflex *ṣ*, and dental *s̻* is found (Hock 2015). Perhaps, then, language contact might account for the crucial step g. in the derivation of (14)? Note, however, that such a contact explanation is not available for Armenian.

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[12] A similar development apparently took place in Armenian, where the expected reflex of PIE **h₁ekwos* 'horse', **eš*, changed to **eyš* and, with contraction, to the attested *ēš*, with long vowel (Beekes 2003: 201, 203).

[13] For Saka, this sibilant is usually transcribed as *s*, suggesting an alveolar articulation (e.g. Kümmel 2008: § 4.1.3). However, given that it contrasts with both a retroflex sibilant *ṣ* and a palatal sibilant *ś*, dispersion theory (Liljencrants & Lindblom 1972) makes a dental articulation more likely.

5. Toward an account for the Luwian developments

Given that Luwian preserves the *w* of the PIE cluster **ḱw*, the account offered in the preceding section is not applicable for this language. It is therefore necessary to look for other kinds of accounts.

At this point, two scenarios look promising. In both cases, the forms in (9) above are left out of consideration. (In the derivations below, changes due to other, general developments are applied without further comment.)

One approach modifies Melchert's proposal by working out more of the missing details, as well as making certain assumptions. It starts with accepting Melchert's assumption that PIE syllabic sonorants changed to *o* + the nonsyllabic counterpart of the sonorant. Next, it adopts Melchert's proposal of *y*-epenthesis before **Ṛ* > *oR*. However, to exclude a similar insertion in forms like *ḱoto* 'enmity', which comes out as *kata* without assibilation and not as *tsata** (see [5b] above), it must assume that *y*-epenthesis took place in front of syllabic sonorants before they changed to *oR*. The next step postulates a rounding effect of *w* on the preceding front offglide of *kʸ*, resulting in a labiopalatal offglide ^{ɥ}. Being labiopalatal, this offglide is assumed to "escape" the next change, the "Depalatalization" of *kʸ* to *k* before [- front] vowels. After Depalatalization, however, the labiopalatal offglide is assumed to be unrounded to a front offglide; and subsequently any remaining *kʸ* is assibilated. See the derivations in (15).

(15) PIE	*h$_1$ekʸwos	*ḱr̥ng-	*ḱey-o	*ḱoto
	[h$_1$ekʸwos]	[kʸr̥ng]	[kʸeyo]	[kʸoto]
y-epenthesis	—	*kʸyr̥ng-	—	—
Ṛ > oR	—	*kʸyorng-	—	—
^{y} > ^{ɥ} / __ w	*akɥwa	—	—	—
Depalatal.	—	—	—	koto
Unrounding	*akʸwa	—	—	—
Pal./Assib.	atswa	tsorng-	tsiya(-ri)	—

While this account works, the restriction of *y*-epenthesis to the environment before syllabic sonorant (*Ṛ*) looks arbitrary. (Insertion before *o* could have been motivated by the fact that front offglides are auditorily more distinct before back rounded vowels than before front vowels and therefore more likely to become segmental; but as noted, that would falsely change **ḱoto* to something like *tsata**.) Moreover, this account requires the ad-hoc assumption that the labiopalatal offglide of [kɥ] prevented its participation in the general change of [kʸ] to [k] before [- front] vocalic segments, especially since [ɥ] is a predictable allophone of [^{y}] before [w] and thus should be expected to participate in the phonemic process of Depalatalization. Note further that this account needs to assume that *y*-epenthesis did not lead to the loss of the front offglide of *kʸ*. Examples like (13b) above show that the "inserted" segmental glide *y* results from segmentalization of the preceding offglide ^{y}, and that in the process the latter is effectively "lost".

The second account makes the reasonable assumption that there was an intermediate development of **Ṛ* > **əR* and that the specific realization of **ə* as *o* or *a* took place later in the derivation. (This makes it possible to account for *tsanta* as well as

https://doi.org/10.1387/asju.25961

tsorng-.) Further, this account assumes that "depalatalization" (i.e. the merger of **ḱ* [k^{y}] with **k*) was restricted to the position before *a*-vowels and nonsyllabic consonants, and that there was no *y*-insertion before **Ṛ* > **əR*. Under this account, [k^{y}] would remain before *w* as well as **əR* and could therefore undergo the same palatalization/assibilation to *ts* as before front vocalic segments. See the derivations in (16).

(16) PIE	*h$_1$ek^{y}wos	*ḱṛng-	*ḱṇto	*ḱey-o	*ḱoto
	[h$_1$ek^{y}wos]	[k^{y}ṛng]	[k^{y}ṇto]	[k^{y}eyo]	[k^{y}oto]
o > a	*ek^{y}wa	—	*k^{y}ṇta	*k^{y}eya	*k^{y}ata
Ṛ > əR	—	*k^{y}ərng-	*k^{y}ənta	—	—
Depalatal.	—	—	—	—	kata
Pal./Assib.	atswa	*tsərng-	*tsənta	tsiya(-ri)	—
ə > o/a	—	tsorng-	tsanta	—	—

Again, this account works; but the restriction of Depalatalization to before *a*-vowels may look suspicious. However, the alternative, a restriction of Depalatalization to before [- front] vocalic segments, may be problematic, too – in centum-languages like Latin there was no restriction on Depalatalization at all.

My preference is for the second account. The first one must make the problematic assumption that the labiopalatal offglide of [k^{ɥ}] before *w*, even though an allophonic variant of the palatal/front offglide of [k^{y}], behaved differently from the latter as far as the process of Depalatalization is concerned. Moreover, the restriction of *y*-epenthesis to before the outcome *oR* of PIE **Ṛ* seems arbitrary.

6. Conclusions

The developments of PIE **ḱw* to palatal *ś(ś)* or *š* in Saka and Armenian can receive a straightforward explanation as resulting from the crosslinguistically well-established "labiopalatal" interaction between front glides and back-rounded glides (whether segmental or suprasegmental). There is no need to assume a special preservation of palatality in this cluster, or an unmotivated "assimilation". As for the Luwian development to *tsw*, two explanations have been considered, with different degrees of confidence. The most likely of these does not involve labiopalatalization. The similarities between Saka and Armenian on one hand and Luwian on the other, therefore, are likely to be accidental. Evidently, similar results can be produced by very different historical developments.

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