Nominal Declension is Different: A Case Study of Czech Palatalization on Morphological Boundaries

Intro. *Palatalization* (*pal*) is a phonological process which synchronically takes place at the morphological boundaries in Czech. It results from a contact of a *palatalizer* (palatalizing object, PAL) and an *undergoer* (palatalized object). The choice of the PAL determines to what shape the undergoer changes. The following discussion is based on Czech data summarized in Table 1, which represents 5 different *pal* patterns across 3 different domains: the first contains derivational suffixes which create nouns (DerN), the second contains suffixes from the verbal conjugation (VC), and the third shows suffixes from the nominal declension (DecN). The list of suffixes is not exhaustive but demonstrates adequately the typology of Czech *pal*. (One *pal*-type is left out due to space constraints: PAL3 caused by a participial suffix ***-en***: *vo*[z]*y* "carriage" ~ *vo*[z]*it* "carry" ~ *vo*[ʒ]***en*** "be carried".)

Table 1: *Pal* patterns in Czech	**DerN (+ vocative.SG.MASC.ANIM)**			**VC**			**DecN**	
	PAL0	**PAL1**	**PAL2**	**PAL0**	**PAL1**	**PAL2**	**PAL1***	**PAL2***
	-ek/0k bearer-of-property	***-ice*** female-animal-name	***-ě/-e*** young-animal-name	**0**-theme-class	**i**-theme-class	**ě**-theme-class	**-i** NOM.PL. MASC.ANIM.	**-ě/-e** LOC.SG.FEM
				-u 1.SG.IND. PRESENT	theme ***-i-***	theme ***-ě-***		
SIB [s z]	X **pa[s]** – **pá[s]ek** "waist" – "belt"	X **pe[s]** – **p[s]ice** "dog"	X **hu[s]a** – **hou[s]e** "goose"	X **ne[s]u** – **ne[s]l** "I bear" – "borne"	X **vo[z]y** – **vo[z]il** "carriage" –"carried"	X **sl[z]a** – **sl[z]el** "tear" – "shed tears"	X **lo[s]** – **lo[s]i** "moose"	X **ka[s]a** – **ka[s]e** "till"
LAB [p b v f]	X **výro[b]a** – **výro[b]ek** "production" – "product"	X **sla[v]ík** – **sla[v]ice** "nightingale"	✓[bj] **čá[p]** – **čá[pj]ě** "stork"	X **ko[p]u** – **ko[p]al** "I kick" – "kicked"	X **le[p]** – **le[p]il** "glue" –"glued"	✓[vj] **šedi[v]ý** – **šedi[vj]ěl** "grey" – "turned grey"	X **čá[p]** – **čá[p]i** "reindeer"	✓[pj] **pum[p]a** – **pum[pj]ě** "gas station"
COR [t d n r$_2$]	X **doda[t]** – **doda[t]ek** "supply" – "supplement"	✓[n] **slo[n]** – **slo[n]ice** "elephant"	✓[c] **slo[n]** – **slů[n]ě** "elephant"	X **ple[t]u** – **ple[t]l** "I knit" – "knitted"	✓[c] **pla[t]** – **pla[c]il** "sallary" – "paid"	✓[c] **le[t]** – **le[c]ěl** "flight" – "flown"	✓[n] **slo[n]** – **slo[ɲ]i** "elephant"	✓[c] **cha[t]a** – **cha[c]ě** "cottage"
	X **veče[r]** – **večí[r]ek** "evening" – "party"	✓[r] **tyg[r]** – **tyg[ɾ]ice** "tiger"	✓[r] **ku[r]** – **ku[ɾ]e** "hen/cock"	X **be[r]u** – **b[r]al** "I take" – "taken"	✓[r] **tvo[r]** – **tvo[ɾ]il** "creature" – "created"	✓[r] **veče[r]** – **veče[ɾ]el** "dinner" – "had dinner"	✓[r] **kap[r]** – **kap[ɾ]l** "carp"	✓[r] **no[r]a** – **no[ɾ]e** "den"
COR [r$_1$]	✓[r] **(v)nit[r]o** – **vnit[ɾ]ek** "interior" – "interior"			✓[r] **pá[r]u** – **pá[ɾ]al** "I tear" – "torn"				
VEL [k g x] + LAR [h]	✓[ʒ] **vystří[h]at** – **výstři[ʒ]ek** "cut out" – "cut-out"	✓[tʃ] **dra[k]** – **dra[tʃ]ice** "dragon"	✓[tʃ] **ptá[k]** – **ptá[tʃ]e** "bird"	✓[tʃ] **pláč[tʃ]u** – **pla[k]al** "I cry" – "cried"	✓[ʒ] **váh[h]a** – **vá[ʒ]il** "weight" – "weighed"	✓[tʃ] **křič[k]** – **křič[tʃ]el** "scream" – "screamed"	✓[z] **dru[h]** – **dru[z]i** "partner"	✓[ts̄] **lou[k]a** – **lou[ts̄]e** "meadow"

Data discussion. In Table 1, we observe that in Czech, *pal* either fully changes the place of articulation of the undergoer to coronal or, in the case of LABs, approximates their articulation to coronal via glide-insertion. Based on the scope of the *pal* effects, the palatalizers are sorted: PAL0 has the smallest scope, as it causes only the *pal* of VEL+LAR and a subset of COR [r]; PAL2, on the other hand, has the largest scope, as it causes the *pal* of all phonemes except SIBs. When comparing DerN with VC, we find that different palatalizing suffixes yield the same effect: PAL0 in DerN equals PAL0 in VC, PAL1 in DerN equals PAL1 in VC and finally PAL2 in DerN equals PAL2 in VC. However, when comparing the DecN with DerN or VC, the forms do not fully align. While we find a match in the COR [t d n r$_2$] and LAB lines, the effect of the palatalizers in the VEL+LAR line differs. In DerN and VC, we get [t͡ʃ ʃ ʒ], but in DecN we get [t͡s ʃ z] (thus, PAL1 ≠ PAL1* and PAL2 ≠ PAL2*). This implies that DerN and VC form a natural class where the effect of *pal* is uniform, while DecN forms a separate class. This observation redirects us to morphology, as DerN, DecN and VC are morphologically defined. Firstly, it seems that *pal* is conditioned by morphological context, which implies that morphology may have a direct impact on phonology. Secondly, since phonology is not able to interpret morphological features such as case in modular grammar [R7], it follows that the type of the PAL is selected already in the morphological module, and phonology simply follows the selection which is, therefore, independent of the phonological conditions. This may also explain how morphemes containing non-front (or even no) vowels cause *pal*. Building on this idea, if a PAL is a self-standing morphological object selected prior to phonology, any morpheme may or may not cause the *pal*. To conclude, this implies for Czech that: (i) whether and how morphemes palatalize is determined by morphology rather than phonology; (ii) DecN differs from DerN and VC implying that there are 2 morphologically conditioned subtypes of *pal*: PAL1* and PAL2* in DecN vs PAL0, PAL1 and PAL2 in DerN/VC.

Analysis. Having the typology of Czech *pal* in mind, the time comes to propose a phonological representation of the five *pal* patterns (PAL0, PAL1, PAL2, PAL1* and PAL2*). Within the *Element Theory* framework [R1][R2][R5][R6][R9], the palatalizing effect is traditionally attributed to the element |I|. Following this, an interesting puzzle of VEL+LAR arises. We can see in Table 1 that [k]/[h] change into [t͡s]/[z] or [t͡ʃ]/[ʒ] depending on the morphological context (DecN vs DerN/VC). Assuming that, the element |I| causes *pal* alone, how can these four coronals (characterized traditionally by the element |A|) result from *pal* caused by |I|? Our hypothesis is as follows: if |I| can cause the appearance of |A| within

the undergoer, it implies that |A| is included in the phonological structure of |I|. By adjusting the observations of Element Theory and by applying a phonological model where elements are *merged* into an arboreal structure similar to syntax [R5], we predict that |A| must be merged *prior to* |I| whenever |I| is inserted. Comparing the palatalizability of SIBs, LABs and CORs enables us to determine the position of the element |U| with respect to |A| and |I| in the functional sequence (fseq). Since SIBs are immune to *pal* in most cases (except PAL3), it follows that |I| stands at the highest position in the fseq, |U| is placed under |I| (since LABs are the second most resistant phonemes to *pal*) and finally, at the bottom, we find the element |A|, corresponding to CORs. Based on this, we aim to represent the phonological structure of both the palatalizers and phonemes by using the fseq |I| > |U| > |A|. However, using just those three elements is not sufficient to represent all phonemes in Czech. We have not addressed the representation of VEL+LAR which seems to be the most easily palatalizable and the COR [r] which divides into two groups based on its palatalizability (see Table 1). To solve this issue, we propose splitting the fseq |I| > |U| > |A|. Following the *Element Theory*, elements |I|, |A|, |U| do not represent only one group of phonemes, but two: |I| corresponds to sibilants & some coronals, |U| to labials & velars, and |A| to some coronals & laryngeals. This mirrors the dual life of elements, based on cross-linguistically observed relations in the phoneme-inventory. In our study, we represent this duality differently by splitting the original fseq $|I|_{SIB+COR[r]} > |U|_{LAB+VEL} > |A|_{COR+LAR}$ into a new fseq: $|I_2|_{SIB} > |U_2|_{LAB} > |A_2|_{COR} > |I_1|_{COR[r]} > |U_1|_{VEL} > |A_1|_{LAR}$. The phonological relation between version1 and version2 elements which is now broken is then reestablished with *syncretism* and *Superset Principle* [R8] which are adopted by phonology from syntax together with the *merge*-operation and the notion of *fseq*. Table 2 contains a list of representations of phonemes which is based on the new fseq and shows also our proposal for the palatalizers PAL0-2.

Table 2	SIB [s z]	$[_{I2P}\ I_2$	$[_{U2P}\ U_2$	$[_{A2P}\ A_2$	$[_{I1P}\ I_1$	$[_{U1P}\ U_1$	$[_{A1P}\ A_1$	$[_{CP}\ \Delta C\ ]]]]]]]$
	LAB [p b f v m]		$[_{U2P}\ U_2$	$[_{A2P}\ A_2\ ]]$		$[_{U1P}\ U_1$	$[_{A1P}\ A_1$	$[_{CP}\ \Delta C\ ]]]$
	COR [t d n r_2]			$[_{A2P}\ A_2$	$[_{I1P}\ I_1$	$[_{U1P}\ U_1$	$[_{A1P}\ A_1$	$[_{CP}\ \Delta C\ ]]]]]$
	COR [r_1]				$[_{I1P}\ I_1$	$[_{U1P}\ U_1$	$[_{A1P}\ A_1$	$[_{CP}\ \Delta C\ ]]]]$
	VEL [k g x] + LAR [ɦ]					$[_{U1P}\ U_1$	$[_{A1P}\ A_1$	$[_{CP}\ \Delta C\ ]]]$
PAL2 PALATALIZES ANYTHING EXCEPT SIB		**$[_{I2P}\ I_2$**	**$[_{U2P}\ U_2$**	**$[_{A2P}\ A_2$**				**[Ø]]]]**
PAL1 PALATALIZES ANYTHING EXCEPT SIB & LAB			**$[_{U2P}\ U_2$**	**$[_{A2P}\ A_2$**				**[Ø]]]**
PAL0 PALATALIZES ANYTHING EXCEPT SIB & LAB & COR				**$[_{A2P}\ A_2$**				**[Ø]]**

If we apply PAL0 to VEL+LAR or COR [r_1], they undergo *pal* because these phonemes do not include $|A_2|$. Conversely, if we apply PAL0 to CORs, LABs or SIBs, they do not undergo *pal* because they already contain $|A_2|$. Returning to the various *pal* effects, the PALs in DecN cannot be fundamentally different from those in DerN/VC, because, as mentioned earlier, the *pal* effect is uniform for the CORs and LABs (i.e., if any PAL manages to palatalize CORs and LABs, the result of *pal* is uniform). Therefore, the PALs in DecN are named similarly to those in DerN/VC, with the addition of a star (PAL1* and PAL2*). In this paper, we propose the representation of PAL1* and PAL2* in Table 3 as follows:

Table 3	**PAL2*** PALATALIZES ANYTHING EXCEPT SIB	**$[_{I2P}\ I_2$**	**$[_{U2P}\ U_2$**	**$[_{A2P}\ A_2$**	**$[_{I1P}\ I_1$**		**[Ø]]]]**
	PAL1* PALATALIZES ANYTHING EXCEPT SIB & LAB		**$[_{U2P}\ U_2$**	**$[_{A2P}\ A_2$**	**$[_{I1P}\ I_1$**		**[Ø]]]**

Conclusion. Adjusting Element Theory and following tree-phonology, we propose to represent phoneme inventories and palatalization patterns in a completely new way, while still emphasizing the importance of morphology, which, when taken into account, reveals that palatalization in Czech is different in the nominal declension compared to other morphological contexts.

References. [R1] Backley (2011). *An Introduction to Element Theory*. **[R2]** Cavirani et al. (2024). On the morphophonology of Czech adjectives. *NanoDays* 2024. **[R3]** Kochetov (2011). Palatalization. In: *The Blackwell Companion to Phonology*. **[R4]** Krämer et al. (2016). Perspectives on palatalization. *Glossa*. **[R5]** Nasukawa (2017). Extending the Application of Merge to Elements in Phonological Representations. *Journal of the Phonetic Society of Japan*. **[R6]** Onuma et al. (2020). Velar softening without precedence relations. In: *Morpheme-internal Recursion in Phonology*. **[R7]** Scheer (2012). *Direct Interface and One-Channel Translation*. **[R8]** Starke (2009). Nanosyntax: A short primer to a new approach to language. *Nordlyd*. **[R9]** Zdziebko (2015). A General Nonlinear Affixation Approach to Polish Palatalizations. *Studies in Polish Linguistics*.