Shift in Harmonic Serialism: Supplementary Materials

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Appendix A: A shift-based analysis of Kikuyu

This section provides an analysis of the Kikuyu tone distribution assuming underlyingly linked tones. While Kikuyu does not require underlyingly linked tones and floating tones are sufficient, we adopt the reasoning by McCarthy, Mullin & Smith (2012) which is that inputs with underlying tones must also conform to the surface generalizations. In Kikuyu, tones are distributed as an initial tonal plateau and final contour tone, with the middle syllables each hosting one tone. In a four-syllable form, the pattern thus appears as a continuous shift of the middle tones one syllable to the right, plus spreading of the tone from the initial syllable.

(1) Desired input-output mapping (McCarthy, Mullin & Smith 2012: 280)

L H L H → L H L H
patakasa → patakasa

McCarthy, Mullin & Smith (2012) show that this mapping cannot be obtained using their constraints even if we assume that Flop is a possible operation. The key point of their argument is that rightward shift of the second tone is not harmonically improving; that tone gets stuck at the second syllable. While McCarthy, Mullin & Smith consider a constraint against word-medial contour tones, they explicitly rule out an alignment-based version of such a constraint. We argue that no reference to contour tones is needed. Instead, a regular alignment constraint such as Align(T, R; PWd, R; σ) is sufficient to account for the pattern.

We begin by reviewing McCarthy, Mullin & Smith's constraints which we will use in what follows. The constraints in (2) make sure that input floating tones associate in a one-to-one way, except at the edges: the first two syllables are linked to the first tone, and the last syllable can have a contour tone. Association generally proceeds from left to right within a word, which is enforced by the two No-Skip constraints.

(2) Constraints from McCarthy, Mullin & Smith (2012: 273, 276)

(a) Have-Tone
Assign a violation mark for every syllable that is not associated with a tone.

(b) No-Skip(t)
Assign a violation mark for every unlinked tone that is preceded and followed (at any distance) by linked tones.

(c) No-Skip(s)
Assign a violation mark for every unlinked syllable that is preceded and followed (at any distance) by linked syllables.

(d) Align-L (≡ Link-Initial)
Assign a violation for every initial syllable that is not associated with a tone.

(e) Initial-Plateau
Assign a violation mark if the initial tone is linked to fewer than two syllables.

What is counterintuitive in this analysis is that while the association of floating tones proceeds from left to right, Kikuyu nevertheless shows evidence of alignment to the right edge of the word; we consider this an instance of the emergence of the unmarked, one of the hallmark predictions of constraint-based grammars. The constraint Align(T, R; PWd, R; σ), henceforth Al-R, as in (8) of the paper, is ranked below the constraints in (2). In addition, the constraint NoLongT (12) makes sure that spreading is limited to the initial plateau, but dispreferred otherwise.

At step 1, the initial tone spreads to the following syllable (3-a). The faithful candidate (b) violates InitialPlateau. Delinking of a middle tone (c) violates the two undominated NoSkip constraints, as well as Have-T.

(3) Kikuyu: Step 1

L H L H /patakasa/	Have-T	No-Sk(t)	No-Sk(s)	Al-L	InPlat	NoLongT	Al-R	Id
a. ☞ L H L H patakasa						*	** ** *	*
b. L H L H patakasa					*!		*** ** *	
c. L H L H patakasa	*!	*!	*!		*		*** *	*

At step 2, the second tone shifts (4-a). This happens because shift incurs one fewer violation mark of Align-R when compared to the faithful candidate (b). This is the point at which we depart from McCarthy, Mullin & Smith's analysis, which shows unexpected convergence. We use a fairly standard constraint Align-R to model the shifting pattern. Spreading (c) crucially violates NoLongT, which is also another well-established constraint.

(4) Kikuyu: Step 2

L H L H patakasa	Have-T	No-Sk(t)	No-Sk(s)	Al-L	InPlat	NoLongT	Al-R	Id
a. ☞ L H L H patakasa						*	** * *	**
b. L H L H patakasa						*	** ** *!	
c. L H L H patakasa						**!	** * *	*
d. L H L H patakasa		*!				*	** *	*

The shifting pattern continues at step 3, when the third tone flops to the final syllable (5-a), again due to Align-R. As before, NoLongT is also crucial to our analysis—excluding candidate (c). Long tones are limited to the initial two syllables but can occur elsewhere if the word has at least two more syllables than tones.

(5) Kikuyu: Step 3

L H L H patakasa	Have-T	No-Sk(t)	No-Sk(s)	Al-L	InPlat	NoLongT	Al-R	Id
a. ☞ L H L H patakasa						*	** *	**
b. L H L H patakasa						*	** * *!	
c. L H L H patakasa						**!	** *	*

At step 4, the derivation converges (6).

(6) Kikuyu: Step 4 (convergence)

L H L H patakasa	Have-T	No-Sk(t)	No-Sk(s)	Al-L	InPlat	NoLongT	Al-R	Id
a. ☞ L H L H patakasa						*	** *	
b. L H L H patakasa						**!	**	*
c. L H L H patakasa						*	** *	*!

We conclude that a shifting analysis of Kikuyu is indeed possible. Thus, the argument advanced by McCarthy, Mullin & Smith (2012) is no longer valid, and as such does not constitute support for excluding underlyingly linked tones from the Richness of the Base. Until further evidence is supplied, there is no reason to disallow input tonal associations.

Appendix B: A survey of segmental shift patterns

Table 1 shows a list of segmental shift patterns across languages. Segmental shift is varied and robustly attested in a number of unrelated languages.

Type	Language (family)	Description
Vowel harmony and reduction		
	Halkomelem (Salish)	Lowering shifts from suffix *a* to *é* (this paper)
	Esimbi (Bantu)	Height shifts from stem to prefix (Hyman 1988)
	Makonde (Bantu)	Lowering shifts from mid vowel to high vowel (Hyman 2011)
CV Rounding		
	Gitksan (Tsimshian)	Rounding shifts from C^w to *i* (Forbes & Schwan 2014)
	Lezgian (NE Caucasian)	Rounding shifts from final C^w to onset C (Fallon 1993)
Consonant place		
	Kinyarwanda (Bantu)	Place shifts from voiceless stop to nasal (Zorc & Nibagwire 2007)
	Shona (Bantu)	Place shifts from voiceless stop to nasal (Vaux p.c.)
	Tlachichilco Tepehua (Totonacan)	Place shifts from *q’* to velar stop (Hansson 2001)
	Colville/Nxilxcín (Salish)	Pharyngealization shifts to V́ (Mattina 1979)
	Spokan (Salish)	Pharyngealization shifts to V́ (Mattina 1979)
Retroflexion		
	Kalasha (Indo-European)	Retroflexion shifts between vowels (Arsenault & Kochetov 2017)
Nasality		
	Iny (Macro-Jê)	Nasality shifts from Ṽ to voiced stop (Ribeiro 2012)
Laryngeal		
	Tsimshian (Tsimshian)	Voicing shifts from coda to onset (Dunn 2015)
	Kashaya (Hokan)	Glottalization shifts from nasal to stop (Fallon 2002)

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TYPE	LANGUAGE (FAMILY)	DESCRIPTION
Laryngeal (continued)		
	Ayutla Mixe (Mixe-Zoque)	Glottalization shifts from nasal to voiceless stop (Romero-Méndez 2008)
	Secwepemctsín (Salish)	Glottalization shifts from glottalized sonorants to other sonorants (Blevins & Garrett 2004)
	Icelandic (Indo-European)	Spread glottis shifts between aspirated stop and voiceless sonorant (Ringen 1999)
	Gujarati (Indo-European)	Spread glottis shifts between aspirated stop and V̤ (Yoon 2003)
	Sanskrit (Indo-European)	Aspiration on voiced obstruents shifts from coda to onset (Borowsky & Mester 1983)

Table 1
Segmental shift patterns surveyed.

APPENDIX C: SIMULATIONS

In this section, we provide comments on the files used in the OT-Help 2.0 simulations described in Section 5 of the paper. The simulations consists of the following files: the input file (`tone.txt`), the constraints file (`tone.txt_CONSTRAINTS`) and the operations file (`tone.txt_OPERATIONS`). The files can be used by the OT-Help 2.0 software (Staubs et al. 2010), which can be downloaded at http://people.umass.edu/othelp.

Our inputs contain from 1 to 5 segments/syllables. We illustrate this with files specific to tone (H v. L), but the same is true for segmental features (where all Hs should be replaced with some feature, such as N, and all Ls should be replaced by its absence, such as O, in all files). All inputs have at most one H. The set of inputs is thus: H (i.e., a single H syllable), HL (i.e., H followed by L), HLL, HLLL, HLLLL, LH, LHL, LHLL, LHLLL, LLH, LLHL, LLHLL, LLLH, LLLHL, LLLLH, L, LL, LLL, LLLL, and LLLLL. This is a total of 20 inputs.

There are three operations: Remove H (defined in the file as H → L), Spread H (HL → HH or LH → HH) and flop (HL → LH or LH → HL). In the operation file, Flop can be turned on or off by modifying the variable `active` (yes → no).

There are also six constraints: ALIGN-R, NONFINALITY, NOLONGH, NOFLOP, MAX(H), and IDENT. The definitions are clear from the paper. OT-Help 2.0 limits inputs to a single string (ruling out multilevel representations) so MAX(H) is defined in the constraint file as a markedness constraint against strings consisting of only L. This creates additional violations, but nevertheless has no effect on the typology because of the restrictions on possible operations. See the OT-Help 2.0 documentation for further discussion on this matter (Mullin et al. 2010).

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