Serial Tonal Derivations in Southern Taiwanese Diminutive Structure

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1 Introduction

This paper discusses the serial tone changes in diminutive structure of Southern Taiwanese. Southern Taiwanese refers to the accent spoken in the southern part of Taiwan, particularly, in Kaohsiung City and Tainan City. In Taiwanese, there is a diminutive suffix: -a, whose base tone is a high-falling tone, HM. The syllable in the pre-a position shows a two-step tone change, as in (1).

(1) Smooth tones: pre-a (Hr/Lr: high/low register. h/l: high/low pitch melody.)

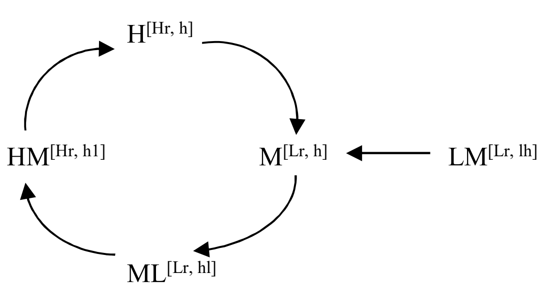
Base tones	$H^{[Hr, h]}$	$LM^{[Lr, lh]}$	$M^{[Lr, h]}$	$HM^{[Hr, hl]}$	$ML^{[Lr, hl]}$
Regular tone change	$M^{[Lr, h]}$	$M^{[Lr, h]}$	$ML^{[Lr, hl]}$	$H^{[Hr, h]}$	$HM^{[Hr, hl]}$
Extra tone change	$MH^{[Lr, lh]}$			$H^{[Hr, h]}$	

The table in (1) shows that for the pre-a tone, regular tone sandhi applies first and then an extra tone change follows. Classic OT (Prince and Smolensky 1993/2004) is a parallel version of grammar, which allows no serial derivation. I will argue in this paper that Harmonic Serialism (McCarthy 2008, 2010, 2016), which is a serial version of OT, better accounts for the pre-a two-step tone change in Southern Taiwanese.

2 Regular tone sandhi

Tone sandhi is a common phenomenon among Chinese dialects. An isolated syllable usually carries a base tone in the output, but undergoes tone change in connected speech. In Taiwanese, each base tone has a corresponding sandhi form. The regular tone sandhi in this language shows a series of chain shifts, as illustrated in (2). Namely, LM maps to M, M maps to ML, ML maps to HM, HM maps to H, and then H maps to M. Examples are given in (3).

(2) Tonal chain shifts (cf. also Chen 1987, 2000; Hsiao 1991, 1995).



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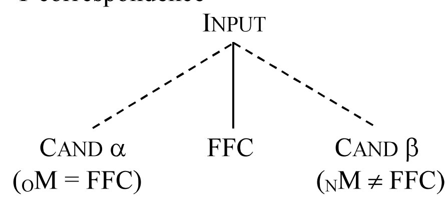
(3) a. *hi*LM *ti*LM 'fish pond' ⟶ *hi*M *ti*LM
b. *kim*H *tseng*H 'gold brick' ⟶ *kim*M *tseng*H
c. *tau*M *p^{h}ue*LM 'bean skin' ⟶ *tau*ML *p^{h}ue*LM
d. *ts^{h}in*ML *t^{h}au*LM 'weigh' ⟶ *ts^{h}in*HM *t^{h}au*LM
e. *kau*HM *t^{h}au*LM 'dog's head' ⟶ *kau*H *t^{h}au*LM

Hsiao (2015) employees the theory of Comparative Markedness (McCarthy 2003) to explain the regular tone sandhi. This theory distinguishes two kinds of markedness violations: old markedness violations and new markedness violations. Old markedness violations are shared with the fully faithful candidate, FFC. New markedness violations are not shared with the fully faithful candidate, FFC. Comparative markedness is rooted in two notions, t-correspondence and violation locus. The t-correspondence relates two output candidates through a transitivized correspondence by way of a shared input, as illustrated by the schema in (4).

(4) T-correspondence



The violation locus refers to the spot in an output candidate where a markedness constraint is violated. Hsiao (2015) posits two versions of the markedness constraint *T, namely, *$_{\text{O}}$T and *$_{\text{N}}$T, whose locus functions are given in (5a) and (5b).

(5) Tonal violation loci (Hsiao 2015: 146)
a.*$_{\text{O}}$T$_i$ (CAND, FFC, ℜt): Let LOC$_i$(CAND) = {c_1, c_2, c_3, ...} and let LOC$_i$(FFC) = {f_1, f_2, f_3, ...}. For each c_m that has a t-correspondent among f$_n$, assign one violation mark.
b. *$_{\text{N}}$T$_i$ (CAND, FFC, ℜt): Let LOC$_i$(CAND) = {c_1, c_2, c_3, ...} and let LOC$_i$(FFC) = {f_1, f_2, f_3, ...}. For each c_m that lacks a t-correspondent among f_n, assign one violation mark.

In terms of comparative markedness, a language may tolerate marked structures that are inherited from the input, but ban the same structures that are invented in the output. This is referred to as grandfathering effect. The grandfathering effect is governed by the ranking where *$_{\text{N}}$T dominates faith and faith dominates *$_{\text{O}}$T. On the other hand, a reversal of grandfathering effects is also possible. A language may prohibit marked structures that are inherited from the input but allow the same structures that are newly created. This is referred to as anti-grandfathering effect. Hsiao (2015) observes that in Taiwanese anti-grandfathering effects block the emergence of non-derived tones; particularly, the sandhi position, or the non-final position, forbids a base tone but allows a sandhi tone of the same value. The anti-grandfathering effect is governed by the ranking where *$_{\text{O}}$T dominates faith and faith dominates *$_{\text{N}}$T.

Another concept used to account for the tonal chain shifts is local conjunction (Smolensky 1993, 1995). The purpose of local conjunction is to prohibit the "worst of the worst", known as WOW effects. A conjoined constraint is violated only when both of its members are violated. The combined effects add up to a single constraint that dominates the unconjoined members individually. Conjunction of markedness and faithfulness constraints indicates that an inactive or suspended markedness member is activated when the faithfulness member is violated. The combination of anti-grandfathering effects and WOW effects makes possible the constraint rankings in (6) to govern the tonal chain shifts.

(6) Constraint rankings for the chain shifts (Hsiao 2015: 150-153)
a. *$_{\text{O}}$T, IDENT-REG&IDENT-CONTR, LINEARITY >> *$_{\text{N}}$T (LM → M)
b. *$_{\text{O}}$T, IDENT-REG&IDENT-CONTR, LINEARITY >> *$_{\text{N}}$H&IDENT-REG >> *$_{\text{N}}$T (H → M)
c. *$_{\text{O}}$T, IDENT-REG&IDENT-CONTR, LINEARITY >> *$_{\text{N}}$ML&IDENT-REG >> *$_{\text{N}}$T (ML → HM)

d. $*_{O}$T, IDENT-REG&IDENT-CONTR, LINEARITY >> $*_{N}$M&IDENT-CONTR >> $*_{N}$T (M →ML)
e. $*_{O}$T, IDENT-REG&IDENT-CONTR, LINEARITY >> $*_{N}$HM&IDENT-CONTR >> $*_{N}$T (HM→ H)

I do not plan to go into the details of the grammar, but the crucial point is that each tone shift changes either the register feature or the contour feature, but not both, (cf. Hsiao 2015, for further discussion). For the convenience of discussion, I will use the term TCS in the following section as a cover constraint which represents the set of constraints governing the tonal chain shifts.

The tonal chain shifts operate in sandhi position, i.e., the non-final position. Given a pair of base tones, the left tone surfaces with its sandhi form, but the right tone retains its base form. The retention of the rightmost tone is governed by the constraint in (8), and the partial constraint ranking can be posited as (9).

(7) B → S / ___ B (B: base tone. S: sandhi tone)

(8) IDENT-R (Hsiao 2000)
Assign a violation mark for every rightmost tone which does not retain its base form in the output.

(9) Right retention
IDENT-R >> $*_{O}$T

3 Diminutive tone changes

With the idea of the tonal chain shifts in mind, we can now look at the tone changes in pre-*a* position. There is a two-step tonal derivation in the pre-*a* position. That is, tone shift and high spreading. Consider the data in (10-14). The (a)-set contains the isolated base tones. In the (b)-set, the left syllables undergo tone shifts. And in the (c)-set, extra high spreading is triggered.

(10) a. *hi***LM** 'fish' b. *hi***M** *ti*LM 'fish pond' c. *hi***MH**-*a*HM 'small fish'

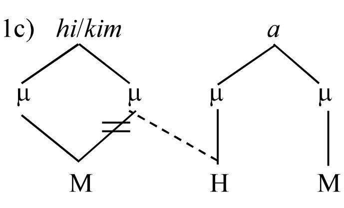
(11) a. *kim***H** 'gold' b. *kim***M** *tseng*H 'gold brick' c. *kim***MH**-*a*HM 'small gold'

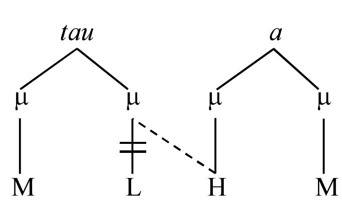
(12) a. *tau***M** 'bean' b. *tau***ML** *p^{h}ue*LM 'bean skin' c. *tau***MH**-*a*HM 'small beans'

(13) a. *kau***HM** 'dog' b. *kau***H** *t^{h}au*LM 'dog's head' c. *kau***H**-*a*HM 'small dogs'

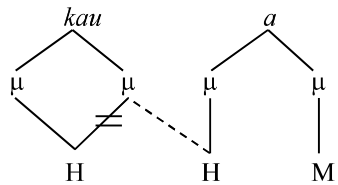
(14) a. *ts^{h}in***ML** 'scale' b. *ts^{h}in***HM** *t^{h}au*LM 'weigh' c. *ts^{h}in***H**-*a*HM 'small scales'

The high spreading is illustrated in (15-18).

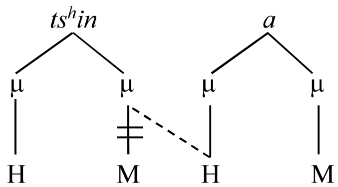
(15) = (10c/11c)


(16) = (12c)


(17) = (13c)



(18) = (14c)



The classic OT maps between underlying and surface forms without intermediate derivations, and thus disallows serial tonal changes. In this section, I argue that Harmonic Serialism (McCarthy 2008, 2010, 2016) better accounts for the two-step tonal derivation in the pre-*a* position. Harmonic Serialism is a serial version of OT. This theory allows the output chosen by EVAL to be a new input for GEN, until the chosen output is identical with the latest input to GEN. Namely, the GEN-to-EVAL-to-GEN loop continues until convergence. Derivations in Harmonic Serialism (hereafter, HS) have to show steady harmonic improvement until convergence. And specifically, GEN is limited to making just one change at a time. The schema in (19) demonstrates an example of derivation for (14).

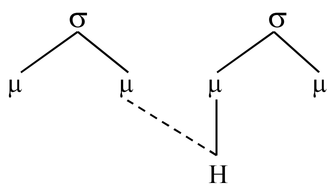
(19) Derivation for (14) in HS

/ML/
↓
GEN
↓
M, ML, LM, HM — Step 1
↓
EVAL
↓
HM
↓
GEN
↓
HM, H — Step 2
↓
EVAL
↓
H
Convergence

In (19), the input tone is ML; step 1 operates tone shift and selects HM as an intermediate output. HM then enters as the input for step 2. In step 2, high spreading applies and selects H as the optimal output, which converges in the next step. It should be noted that H is not qualified as a candidate in step 1, since it changes both register and contour features. According to Harmonic Serialism, the candidates generated by GEN in each step are limited to making just one change. I propose the alignment constraint in (20) to govern the high spreading. This constraint requires that a H melody be left-aligned to an adjacent nonhead mora. The schema in (21) illustrates this point.

(20) ALIGN-L(H, $\mu^{\text{-HD}}$)
Assign a violation mark for every H tone melody whose left edge does not coincide with the left edge of a preceding adjacent non-head mora ($\mu^{\text{-HD}}$).

(21)



The constraint ranking is given in (22).

(22) Constraint Ranking
IDENT-R >> TCS >> ALIGN-L(H, $\mu^{\text{-HD}}$)

The tableaux in (23-27) show how the serial derivations work.

(23) a. HS analysis of /*ts*^{h}*in*ML–*a*HM/ → *ts*^{h}*in*HM–*a*HM — Step 1

	IDENT-R	TCS	ALIGN-L(H, $\mu^{\text{-HD}}$)
a. *ts*^{h}*in*LM–*a*HM		*!	*
b. *ts*^{h}*in*M–*a*HM		*!	*
c. *ts*^{h}*in*ML–*a*HM		*!	*
☞d. *ts*^{h}*in*HM–*a*HM			*
e. *ts*^{h}*in*ML–*a*H	*!	*	*

b. HS analysis of /*ts*^{h}*in*HM–*a*HM/ → *ts*^{h}*in*H–*a*HM — Step 2

	IDENT-R	TCS	ALIGN-L(H, $\mu^{\text{-HD}}$)
☞a. *ts*^{h}*in*H–*a*HM			
b. *ts*^{h}*in*HM–*a*HM			*!

c. Step 3: Convergence

(24) a. HS analysis of /*tau*M–*a*HM/ → *tau*ML–*a*HM — Step 1

	IDENT-R	TCS	ALIGN-L(H, $\mu^{\text{-HD}}$)
a. *tau*LM–*a*HM		*!	*
b. *tau*M–*a*HM		*!	*
☞c. *tau*ML–*a*HM			*
d. *tau*H–*a*HM		*!	
e. *tau*ML–*a*H	*!	*	*

b. HS analysis of /*tau*ML–*a*HM/ → *tau*MH–*a*HM — Step 2

	IDENT-R	TCS	ALIGN-L(H, $\mu^{\text{-HD}}$)
a. *tau*M–*a*HM			*!
b. *tau*ML–*a*HM			*!
☞c. *tau*MH–*a*HM			

c. Step 3: Convergence

(25) a. HS analysis of /*kim*H–*a*HM/ → *kim*M–*a*HM — Step 1

	IDENT-R	TCS	ALIGN-L(H, μ-HD)
☞a. *kim*M–*a*HM			*
b. *kim*H–*a*HM		*!	
c. *kim*HM–*a*HM		*!	*
d. *kim*H–*a*H	*!	*	

b. HS analysis of /*kim*M–*a*HM/ → *kim*MH–*a*HM — Step 2

	IDENT-R	TCS	ALIGN-L(H, μ-HD)
a. *kim*M–*a*HM			*!
b. *kim*ML–*a*HM			*!
☞c. *kim*MH–*a*HM			

c. Step 3: Convergence

(26) a. HS analysis of /*hi*LM–*a*HM/ → *hi*M–*a*HM — Step 1

	IDENT-R	TCS	ALIGN-L(H, μ-HD)
☞a. *hi*M–*a*HM			*
b. *hi*LM–*a*HM		*!	*
c. *hi*ML–*a*HM		*!	*
d. *hi*LM–*a*H	*!	*	*

b. HS analysis of /*hi*M–*a*HM/ → *hi*MH–*a*HM — Step 2

	IDENT-R	TCS	ALIGN-L(H, μ-HD)
a. *hi*M–*a*HM			*!
b. *hi*ML–*a*HM			*!
☞c. *hi*MH–*a*HM			

c. Step 3: Convergence

(27) a. HS analysis of /*kau*HM–*a*HM/ → *kau*H–*a*HM — Step 1

	IDENT-R	TCS	ALIGN-L(H, μ-HD)
☞a. *kau*H–*a*HM			*
b. *kau*HM–*a*HM		*!	*
c. *kau*ML–*a*HM		*!	*
d. *kau*HM–*a*H	*!	*	*

b. HS analysis of /*kau*H–*a*HM/ → *kau*H–*a*HM — Step 2 (Convergence)

	IDENT-R	TCS	ALIGN-L(H, μ-HD)
☞a. *kau*H–*a*HM			
b. *kau*HM–*a*HM			*!

In tableau (23), step 1 maps ML to HM by TCS. But in step 2, the derived HM is irrelevant to TCS, and thus the constraint ALIGN-L(H, μ-HD) favors H over HM. Convergence is achieved in step 3. In tableau (24), step 1 maps M to ML by TCS. But in step 2, the derived ML is irrelevant to TCS, and thus ALIGN-L(H, μ-HD) favors MH over the others. Again, convergence is achieved in step 3. In tableau (25), step 1 maps H to M by TCS. But in step 2, the derived M is irrelevant to TCS, and thus ALIGN-L(H, μ-HD) favors MH over the others. In tableau (26), step 1 maps LM to M by TCS. But in step 2, the derived M is also irrelevant to TCS, and thus ALIGN-L(H, μ-HD) favors MH over the others. In tableau (27), step 1 maps HM to H by TCS. The derived H then converges in step 2. At this point, Harmonic Serialism successfully predicts the serial tonal derivations.

4 On an alternative analysis

A possible analysis may be as follows. Tonal chain shifts are skipped in diminutive structure, where the base tone is directly subject to High-spreading. In this case, Harmonic Serialism is not needed, but parallel OT can do the job, as shown in tableaux (28-30).

(28) POT analysis of /*tau*M–*a*HM/ → *tau*MH–*a*HM

	IDENT-R	ALIGN-L(H, μ^{-HD})
a. *tau*M–*a*HM		*!
☞b. *tau*MH–*a*HM		

(29) POT analysis of /*hi*LM–*a*HM/ → *hi*LH–*a*HM

	IDENT-R	ALIGN-L(H, μ^{-HD})
a. *hi*LM–*a*HM		*!
☞b. *hi*LH–*a*HM		

(30) POT analysis of /*kau*HM–*a*HM/ → *kau*H–*a*HM

	IDENT-R	ALIGN-L(H, μ^{-HD})
a. *kau*HM–*a*HM		*!
☞b. *kau*H–*a*HM		

However, tableaux (31) and (32) show that such alternative analysis may result in incorrect predictions.

(31) Incorrect POT prediction of /*kim*H–*a*HM/ → *kim*H–*a*HM

	IDENT-R	ALIGN-L(H, μ^{-HD})	DEP
✖ a. *kim*H–*a*HM			
(☞)b. *kim*MH–*a*HM			*!

(32) Incorrect POT prediction of /*ts^{h}in*ML–*a*HM/ → *ts^{h}in*MH–*a*HM

	IDENT-R	ALIGN-L(H, μ^{-HD})	DEP
a. *ts^{h}in*ML–*a*HM		*!	
✖ b. *ts^{h}in*MH–*a*HM			
(☞)b. *ts^{h}in*H–*a*HM		*!	

The internal grammar also shows that tonal chain shifts are not absent in diminutive structures. Some examples are shown in (33-35). In (33), the leftmost *hi*LM in the diminutive compound undergoes tone shift. In (34), the leftmost *ne*H in the diminutive reduplication also undergoes tone shift. In (35), the dimunitive infix -*a* undergoes tone shift itself.

(33) Diminutive compound
*hi*LM-*wan*LM-*a*HM 'small fish ball' → *hi*M-*wan*MH-*a*HM

(34) Diminutive reduplication (baby talk)
*ne*H-*ne*H-*a*HM 'small breast' → *ne*M-*ne*MH-*a*HM

(35) Diminutive infixation
*niao*H-*a*HM-*kĩã*HM 'small kitty' → *niao*MH-*a*H-*kĩã*HM

5 Summary

In summary, this paper has presented evidence for serial tonal derivations in diminutive structures. There is a two-step tonal derivation in the pre-*a* position, i.e., a tone shift and then high spreading. I propose the constraint ALIGN-L(H, μ^{-HD}) to govern the high tone spreading. This constraint requires the H melody of –*a* to spread to its neighboring nonhead mora on the left. I also comment on a possible alternative analysis, which skips tonal chain shifts in diminutive structures and allows direct application of high spreading. Such alternative analysis appeals to parallel OT, which however may render incorrect predictions. I have also shown that tonal chain shifts are not absent in diminutive structures. In fact, they are found in diminutive compound, reduplication and infixation. I argue that Harmonic Serialism successfully predicts the serial tonal derivations, and is able to draw generalizations on the intermediate tone representations.

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