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The Diachronic Change of the Diminutives in Yuebei Tuhua: An Optimality-Theoretical Analysis with Partially Ordered Constraints*

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Previous studies of Chinese diminutives usually fail to connect language descriptions to linguistic theories, and fall into a dichotomy between synchrony and diachrony. In view of these, this study, based on the diminutives in Yuebei Tuhua (YBTH), targets for the gradualness of diachronic change in terms of partially ordered constraints (POC) under the framework of optimality theory (OT). It first reviews how YBTH diminutives are formed, and how they are analyzed under the OT framework, based on Cheng (2006) and Chung and Cheng (2007). Then, POC is applied to these YBTH diminutives, with special attention given to two issues, noncrucial ranking and debuccalization. This study shows that POC works well to capture not only the motivations in diachronic change, but also the optionality in language variation.

Keywords: diminutive, OT, partially ordered constraints, language variation, Yuebei

1. Introduction

Diminutives are widely observed in southeastern Chinese dialects. They always exist in various phonological shapes, and these synchronic alternations always highlight how diminutives vary through time. It is this characteristic that accounts for why the issue of Chinese diminutives has long been attractive in the literature (Liang 1989, Pan 1999, Peng 1991, Wu 2003, Xie 1991, among others). However, according to Tsao (2006) and Li (2007), most studies about diminutives focus mainly on descriptive data collections and fall into a synchrony/diachrony dichotomy. Little theoretical attention has been directed to how they vary over time. What's worse is that language variation receives less attention in both generative phonology and classical optimality theory (OT) because of their rigid theoretical assumptions (Coetzee and Pater 2008). Fortunately, as time goes by, Partially Ordered Constraints (POC), an OT sub-framework prompted by Kiparsky (1993) and developed in Anttila (1997, 2002a, 2002b, 2007) , allows constraints to be partially ranked and helps to bridge the gap between diachrony and synchrony in language research. Therefore, this study will make use of the framework of POC, and show how POC connects synchronic variation to diachronic change in the diminutives of Yuebei Tuhua (YBTH).

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This study is organized as follows. Section 2 addresses the formation and the diachronic order of YBTH diminutives. Section 3 reviews how OT is applied to YBTH diminutives, and how synchronic alternations are motivated by shifting constraint rankings, based on Cheng (2006) and Chung and Cheng (2007). Section 4 expresses the concept of POC, focusing on how POC copes with the issue of diachronic change. Section 5 articulates how POC is used to account for the diachronic change of YBTH diminutives. Special consideration is directed to such issues as noncrucial ranking and debuccalization. Section 6 concludes this study.

2. Diminutives in Yuebei Tuhua

A group of dialects, known as YBTH, is found in northern Guangdong and whose affinity is still unknown (Lin and Zhuang 2000, Zhao 2002, Zhuang 2004). YBTH is geographically encompassed and linguistically influenced by different Chinese dialects (Zhuang 2004). More specifically, YBTH shares linguistic characteristics of Hakka (Li 2000, Lin et al. 1995, Sagart 2001), Yue (Lin et al. 1995), Gan (Zhuang 1999), Southwest Mandarin (Zhuang 2004), and Xiangnan Tuhua and Guibei Pinghua (Wang 2001, Zhan et al. 2003).

Concerning the diminutives in YBTH, a great body of related research has shed light on this issue, such as Shao (1995), Xie (2000), Wu (2003), Zhao (2002), Zhuang (2004), Zhuang and Lin (2000). The diminutives in YBTH are formed in terms of tone and/or rime changes of the bases (i.e. words), and can be divided into three types in terms of the position of the glottal stop insertion (GSI): middle-GSI, final-GSI and no-GSI. As far as middle-GSI and final-GSI are concerned, a glottal stop is inserted into the syllable-medial or syllable-final position, creating a seemingly two-syllable diminutive or a diminutive closed by a glottal stop. No-GSI, as its name suggests, is formed without any glottal stop inserted. In addition, YBTH diminutives always accompany diminutive tones (DTs).[1] There are two types of DT formation in YBTH, convergence and splitting, the former giving rise to one single DT, the latter two DTs.[2] Examples of the three types of YBTH diminutives are given in (1-3).[3]

[1] Convergence and splitting are termed in Mandarin Chinese as "hebianshi" and "fenbianshi" respectively in Cao (2001, 2002). In convergence, all syllables bear the same DT, regardless of their citation tones (e.g. [55] in Tangxi and [ʔ45] in Lishui). In splitting, syllables of different citation tones have different DTs. However, citation tones and DTs may not exist in a one-to-one correspondence. Citation tones with similar features may have the same DT, and dialects have their own criteria for selecting appropriate DTs. For example, in Qingtian, [ʔ55] is used for Level tones, whereas [ʔ224] for non-Level tones. The same criterion is also utilized in Wenling (Li 1978). In Taishun, [44] and [213] are used as diminutive tones for Yin and Yang citation tones respectively.

[2] In the type of splitting, there are only two DTs. The two DTs are located in the upper and lower registers respectively, and register distinctions between them place reliance on the voicing values (i.e. [±voice]) of the onset obstruents in Middle Chinese.

[3] The twelve varieties of YBTH in this study are based on Zhuang (2004).

(1) Diminutives created by middle-GSI

Gloss \ Dialects		Convergence		Splitting		
		Shangyao	Zhoutian	Baisha	Lishi	Lashi
‘cover’	Base	kuy	kɔe	kʉ:	kwo:	kuy
	Dim.	$ku^{M}ʔɣ^{H}$	$kɔ^{L}ʔe^{M}$	$kʉ^{L}ʔʉ^{M}$	$kwo^{L}ʔo^{M}$	$ku^{L}ʔɣ^{M}$
‘spring’	Base	$ts^{h}on$	$tʃ^{h}un$	$ts^{h}un$	$ts^{h}ɐn$	$ts^{h}wɔn$
	Dim.	$ts^{h}o^{M}ʔn̩^{H}$	$tʃu^{L}ʔn̩^{M}$	$ts^{h}u^{L}ʔn̩^{M}$	$ts^{h}ɐ^{L}ʔn̩^{M}$	$ts^{h}wɔ^{L}ʔn̩^{M}$
‘goose’	Base	$ŋ^{g}ɔw$	ŋɔ:	ŋɔ:	gow	gɔw
	Dim.	$ŋ^{g}ɔ^{M}ʔw̩^{H}$	$ŋɔ^{L}ʔɔ^{M}$	$ŋɔ^{M}ʔɔ^{H}$	$go^{M}ʔw̩^{H}$	$gɔ^{M}ʔw̩^{H}$
‘money’	Base	$ts^{h}en$	$ts^{h}yɛn$	$ts^{h}ye:$	$ts^{h}ey$	$ts^{h}en$
	Dim	$ts^{h}e^{M}ʔn̩^{H}$	$ts^{h}yɛ^{L}ʔn̩^{M}$	$ts^{h}ye^{M}ʔe^{H}$	$ts^{h}e^{M}ʔɣ^{H}$	$ts^{h}e^{M}ʔn̩^{H}$

(2) Diminutives created by final-GSI

Gloss \ Dialects		Convergence				Splitting
		Meicun	Shitian	Guitou	Beixiang	None
‘cover’	Base	kwɤ	kwa	kvu	kwɛ	No dialects in final-GSI belong to the type of splitting.
	Dim.	$kwɤʔ^{ML}$	$kwaʔ^{ML}$	$kvuʔ^{ML}$	$kwɛʔ^{ML}$	
‘spring’	Base	$ts^{h}aŋ$	$ts^{h}wɛŋ$	$ts^{h}aŋ$	$tʃ^{h}aŋ$	
	Dim.	$ts^{h}aŋʔ^{ML}$	$ts^{h}wɛŋʔ^{ML}$	$ts^{h}aŋʔ^{ML}$	$tʃ^{h}aŋʔ^{ML}$	
‘goose’	Base	gɔw	ŋo:	gɔw	ŋɜw	
	Dim.	$gɔwʔ^{ML}$	$ŋo:ʔ^{ML}$	$gɔwʔ^{ML}$	$ŋɜwʔ^{ML}$	
‘money’	Base	$ts^{h}ɛŋ$	$ts^{h}iŋ$	$ts^{h}ɛn$	$tʃ^{h}i$	
	Dim.	$ts^{h}ɛŋʔ^{ML}$	$ts^{h}iŋʔ^{ML}$	$ts^{h}ɛnʔ^{ML}$	$tʃ^{h}iʔ^{ML}$	

(3) Diminutives created by no-GSI

Gloss \ Dialect	‘bucket’		‘orange’		‘grandma’		‘mother’	
	Base	Dim.	Base	Dim.	Base	Dim.	Base	Dim.
Wujing	ku	ku^{ML}	kã	$kã^{ML}$	$p^{h}o$	$p^{h}o^{HM}$	ŋyõ	$ŋyõ^{HM}$
Gloss \ Dialects	‘filter’		‘head’		‘grid’		‘mode’	
	Base	Dim.	Base	Dim.	Base	Dim.	Base	Dim.
Changjiang	sɛ	$sɛ^{H↗}$	$t^{h}ɛw$	$t^{h}ɛw^{H↗}$	kɛ	$kɛ^{H↗}$	$ts^{h}ɔŋ$	$ts^{h}ɔŋ^{H↗}$
Changlai	ʃi	$ʃi^{HL}$	ti	ti^{HL}		ka^{HL}	$ts^{h}aŋ$	$ts^{h}aŋ^{HL}$

Note that, in no-GSI, no glottal stop appears, so the semantic burden of being diminutives is taken over exclusively by the diminutive tones (i.e. HL and H↗). Moreover, among these YBTH diminutives exists a diachronic order (i.e. middle-GSI

→ final-GSI → no-GSI) (Zhuang 2004). Middle- and final-GSI are diachronically prior to no-GSI, for the loss of the glottal stop in no-GSI gives rise to high DTs (Hirata 1983, Chen 1992a). Middle-GSI is temporally earlier than final-GSI, which can be inferred from speakers' phonological performances. We will return to this issue in Section 5.

3. The OT analysis of the diminutives in Yuebei Tuhua: A review

The framework of optimality theory, proposed by Prince and Smolensky (1993) and McCarthy and Prince (1993), is a surface-oriented approach, in which Input, Generator, Evaluator and Optimal Output are essential components (Kager 1999, McCarthy 2002). For a given input, Generator, an output-producing device, emits an infinite number of logically possible output candidates. The set of output candidates are then evaluated for optimality by Evaluator, a harmony-estimating function executed through two kinds of intrinsically conflicting constraints, faithfulness and markedness, which are universal and violable. OT assumes that languages rank these constraints differently, and different rankings give rise to language differences.

At the heart of OT lies the force of faithfulness that competes against the force of markedness and requests morphologically related forms to be identical or similar. To be precise, a corresponding relation stands between input and output, and requires the output to be faithful to the input. Such a corresponding relation can also be extended to the identity between base and reduplicant and between morphologically-related output forms (i.e. Output-to-Output Correspondence, OOC) (Benua 1995, 1997, Kenstowicz 1994, McCarthy and Prince 1995, 1999, Steriade 1996). OOC aims to maximize the phonological identity between morphologically related output forms. This characteristic is definitely appropriate for diminutives because diminutives and their bases are morphologically related. It is this theoretical concept that inspires Cheng (2006) and Chung and Cheng (2007) to analyze YBTH diminutives by the OOC constraints in (4) under the constraint rankings in (5).

(4) MAX-BD: Every element of *Base* has a correspondent in *Diminutive*. ('No deletion of segments from *Base*')

DEP-BD: Every element of *Diminutive* has a correspondent in *Base*. ('No epenthesis of segments in *Diminutive*')

LINEAR-BD: *Base* is consistent with the precedence structure of *Diminutive*, and vice versa. ('No metathesis in *Diminutive*')

ANCHOR-BD: Any element at the left or right edge of *Base* has a correspondent at the left or right edge of *Diminutive*. ('No epenthesis or deletion at left or right edge of *Diminutive*')

CONTIG-BD: The portion of *Diminutive* standing in correspondence forms a contiguous string, as does the correspondent portion in *Base*. ('No medial epenthesis or deletion of segments in *Diminutive*')

SON-SEQ: Sonority rises from onset to nucleus, and falls from nucleus to coda.

MAX[ʔ][4]: Input glottal stop must have an output correspondent. ('No deletion of glottal stop')

(5) a. YBTH middle-GSI diminutives

MAX-BD, LINEAR-BD, SON-SEQ, MAX[ʔ], ANCHOR-BD(L/R) >>
CONTIG-BD, **DEP-BD**

b. YBTH final-GSI diminutives

MAX-BD, LINEARITY-BD, SON-SEQ, MAX[ʔ], ANCHOR-BD(L), **CONTIG-BD** >>
ANCHOR-BD(R), **DEP-BD**

c. YBTH no-GSI diminutives

MAX-BD, LINEARITY-BD, SON-SEQ, ANCHOR-BD(L/R), **CONTIG-BD**, **DEP-BD** >>
MAX[ʔ]

The tableaux (6-8) below show how the evaluation proceeds.[5] It is clear from these tableaux that the optimal outputs (6g), (7h) and (8a) do not violate any high-ranked constraints, even though all low-ranked constraints are violated. Hence, the optimal form in each type of YBTH diminutives can be correctly predicted by the same set of constraints with different constraint rankings.

[4] One constraint is slightly modified here. MAX[ʔ] is originally named MAX-IO in Cheng (2006) and Chung and Cheng (2007), but MAX-IO and MAX-BD have a functional overlap, except for the glottal stop. Therefore, MAX[ʔ] is used here, with its function specifically to the presence of the glottal stop.

[5] The tableaux are given here just for expository convenience. For more details, we refer readers to Chung and Cheng (2007).

(6) An illustrative example of constraint evaluation in middle-GSI

Input: /ts^{h}yee+ʔ/ Base: [ts^{h}yee]	MAX -BD	ANCHOR -BD(L/R)	SON -SEQ[6]	MAX [ʔ]	LINEAR -BD	CONTIG -BD	DEP -BD
a. ts^{h}yee				*!			
b. ts^{h}eeʔ	*!	*					*
c. ts^{h}eyeʔ		*!			*		*
d. ʔts^{h}yee		*!	*				*
e. ts^{h}ʔyee			*!			*	*
f. ts^{h}yʔee			*!			*	*
☞ g. ts^{h}yeʔe						*	*
h. ts^{h}yeeʔ		*!					*

(7) An illustrative example of constraint evaluation in final-GSI

Input: /kwa+ʔ/ Base: [kwa]	MAX -BD	ANCH -BD(L)	CONTIG -BD	SON -SEQ	MAX [ʔ]	LINEAR -BD	ANCH -BD(R)	DEP -BD
a. kwa					*!			
b. kaʔ	*!						*	*
c. kawʔ						*!	*	*
d. ʔkwa		*!		*				*
e. kʔwa			*!	*				*
f. kwʔa			*!	*				*
g. kw̩ʔa			*!					*
☞ h. kwaʔ							*	*

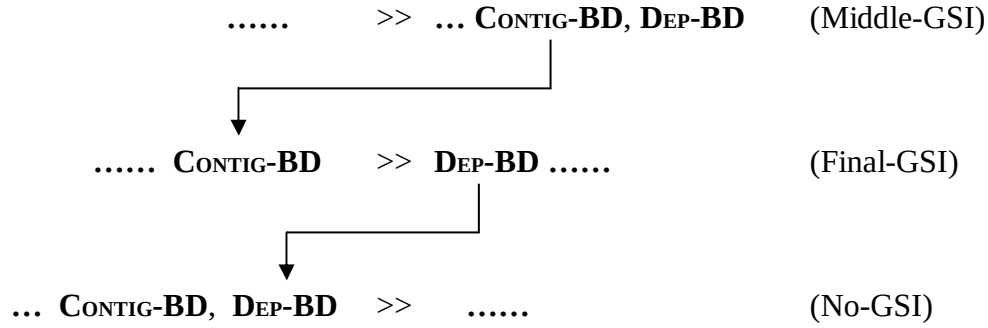
[6] The sonority hierarchy in this study follows the version of Kiparsky (1982): Vowels (5) > Glides (4) > Liquids (3) > Nasals (2) > Obstruents (1). Sonority Sequencing Principle (SSP) requires that, within a syllable, onsets should rise in sonority toward the nucleus and codas should fall in sonority from the nucleus, and, for this reason, the candidates (6f), (7f), (8e) and (8f) incur violation marks on SON-SEQ. Moreover, as far as complex onsets or codas are concerned, *onset augmentation* or *coda augmentation* is obligatory, following Steriade (1982). Given a syllable $C_wC_xVC_yC_z$, C_w and C_z will be definitely less sonorous than C_x and C_y respectively. That is, SSP prohibits segments with equal sonority from forming consonant clusters, either onsets or codas. Consequently, the candidates (6d), (6e), (7d) and (7e) also incur violation marks on SON-SEQ. The segments [ts^{h}], [k] and [ʔ] are all obstruents with equal sonority; therefore, [ts^{h}ʔ], [ʔts^{h}], [kʔ] and [ʔk] are illegitimate clusters under SSP.

(8) An illustrative example of constraint evaluation in no-GSI

	Input: /ŋyo+ʔ/ Base: [ŋyo]	ANCHOR -BD	CONTIG -BD	SON -SEQ	MAX -BD	DEP -BD	LINEAR -BD	MAX [ʔ]
☞	a. ŋyo							*
	b. ŋoʔ	*!			*	*		
	c. ŋoʔy		*!			*	*	
	d. ʔŋyo	*!				*		
	e. ŋʔyo		*!	*		*		
	f. ŋyʔo		*!	*		*		
	g. ŋyʔo		*!			*		
	h. ŋyoʔ	*!				*		

Moreover, the motivation of the diachronic change in YBTH diminutives is also observed in (5), which is schematically simplified in (9) below. The change from one type of YBTH diminutives to another (i.e. middle-GSI → final-GSI → no-GSI) derives from the gradual raise of the two low-ranked OOC constraints, CONTIG-BD and DEP-BD, into the high ranking, reflecting a gradual process of structural simplification. More details about the diachronic change in YBTH diminutives will be discussed in section 5.

(9)



Constraint interaction in (4) perfectly explains the synchronic variation in YBTH diminutives, and the diachronic change in YBTH diminutives is also motivated in (9). Unfortunately, this analysis misses the gradualness of language change, and thus fails to capture the transitional stages between different types of YBTH diminutives. For example, when YBTH diminutives develop from middle-GSI to final-GSI, there must be a transitional stage in which both middle-GSI and final-GSI are acceptable. During this time, the grammar is undoubtedly variable. Nonetheless, such an intermediate stage cannot be captured by simply reranking the constraints in (4), because of the rigid assumption in classical OT that the grammar of a language is defined as a total

ranking of a set of constraints (Prince and Smolensky 1993). Every constraint is ranked with respect to every other constraint. A total ranking of constraints ensures that every input has only one optimal output, and thus forces every grammar to be invariant (i.e. categorial). Consequently, language variation seems to be a great challenge to classical OT. Then, how can language variation be captured in OT? This is our following focus.

4. Variation and optionality: The framework of partially ordered constraints

Variation is not always among the leading issues in generative linguistics. In rule-based phonology, variation is covered by the term "optionality". That is, a rule is marked [+optional] and its application depends on the "external" contexts (Guy 1991). As a result, language variation is attributed to linguistic performance resulting from sociolinguistic factors or language contact (Anttila and Cho 1998). In Lexical Phonology (Kiparsky 1982), variation is restricted to post-lexical phonology, a stage in which phonetic implementation takes over the phonology, and in which gradient or noncategorial phonological alternations are allowed.[7] It seems that language variation is a linguistic phenomenon that is free from structural constraints, and falls outside grammar. Fortunately, the importance of language variation has been recognized in last two decades, and the study of variation has become increasingly significant in phonology (Coetzee and Pater 2008). No longer being grammatically random, language variation actually reflects a central idea in linguistics, an orderly heterogeneity (Weinreich et al. 1968). Namely, languages do not change in their own way, but subject to grammatical restrictions.

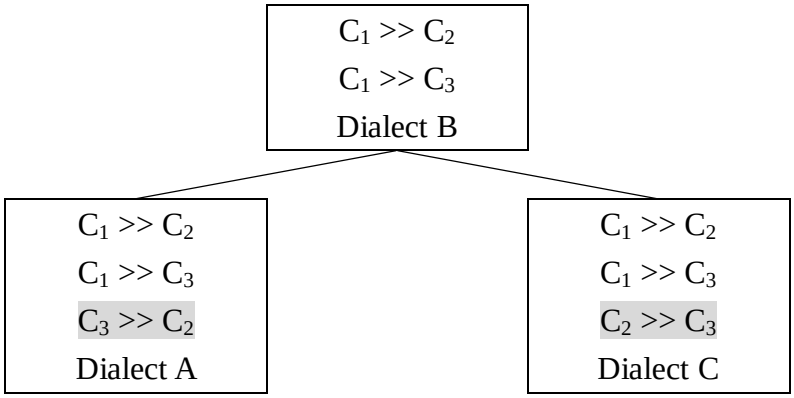
Language variation is a challenge to classical OT, owing to its inability to connect invariant (i.e. categorical) and variable (i.e. noncategorial) systems. Following Kiparsky (1993), who prompted the first systematic treatment of language variation in the OT literature, Anttila (1997, 2002a, 2002b, 2007) developed the framework of POC to account for language variation. Unlike totally ordered constraints in classical OT (Prince and Smolensky 1993, 2004), POC assumes that some constraints are free in a ranking in order for languages to vary.[8] Take the hypothetical grammar lattice in (10) as a simple example. Note that, in natural languages, the lattices will be much

[7] Actually, the concept of variation can also be extended to lexical phonology. See Coetzee and Pater (2008) for more details about this issue.

[8] As stated in Anttila and Cho (1998), the relation for a pair of constraints in classical OT shows the following four properties: irreflexivity (X can be ranked above or below X), asymmetry (If X is ranked above Y, it cannot be ranked below Y), transitivity (If X is ranked above Y, and Y is ranked above Z, then X is ranked above Z) and connectedness (every constraint is ranked with respect to every other constraint). The four properties define a total order. Except for the last property, partial order is defined by the first three properties. For more discussion about these properties, please refer to Partee et al. (1993:39-53).

more complex.[9]

(10) A hypothetical grammar lattice



In (10), dialects A and C contain totally ranked constraints, for C_1, C_2 and C_3 are ranked with respect to each other (C_1 >> C_3 >> C_2 for Dialect A and C_1 >> C_2 >> C_3 for Dialect C). Therefore, dialects A and C are invariant grammars which lead to "exclusively" single outputs. Dialect B is a variable system because of the partially ranked constraints. In dialect B, though the rankings between C_1 and C_2, and between C_1 and C_3 have been settled down, the ranking between C_2 and C_3 is still unknown. This gives dialect B flexibility to freely rank C_2 and C_3 (C_2 >> C_3 or C_3 >> C_2), and therefore makes language variation possible. Furthermore, comments concerning (10) are called for. First, C_2 and C_3 exist in a relation of crucial nonranking, one first mentioned in Prince and Smolensky (1993) and further interpreted in Anttila (1997, 2002a, 2002b, 2007):

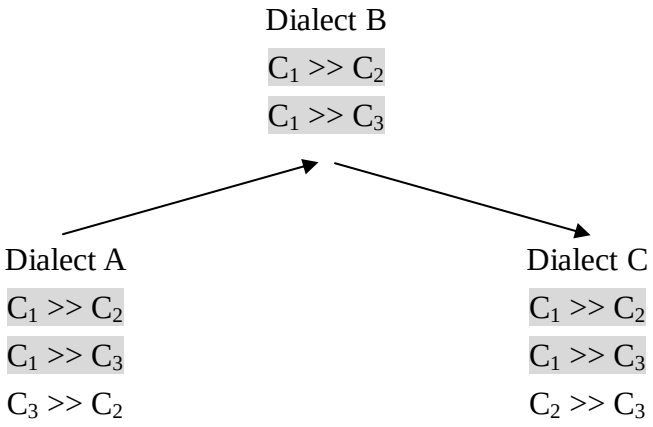
> With a grammar defined as a total ranking of the constraint set, the underlying hypothesis is that there is some total ranking which works; there could be (and typically will be) several, because a total ranking will often impose noncrucial dominance relations (noncrucial in that either order will work). It is entirely conceivable that the grammar should recognize nonranking of pairs of constraints, but this opens up the possibility of *crucial* nonranking (neither can dominate the other; both ranking are allowed), for which we have not yet found evidence. Given present understanding, we accept the hypothesis that there is a total order of domination on the constraint set; that is, that all nonrankings are noncrucial (Prince and Smolensky 1993:55)

Crucial nonranking opens up the possibility in OT for language variation. Second,

[9] The grammar lattices need not always show all partial rankings of constraints, given that some constraints in this analysis are in an undominated relation. Moreover, limited space also prevents us from listing all the constraints in a lattice.

if we assume that dialect A is diachronically prior to dialect C, then dialect B will function as a transitional stage in which both forms are acceptable. In (11), the diachronic change can be visualized by traversing the grammar lattice from left to right, up and down, as shown by the arrows (A → B → C).

(11) A hypothetical grammar lattice



Third, the mother node (i.e. dialect B) contains two sets of ranked constraints that are shared with dialects A and C, as in (11). It seems that, in this case, C_1 >> C_2 and C_1 >> C_3 in dialect B impose substantive grammatical limits on possible phonological systems. To be specific, sound changes are not unrestrictive, and grammar is always ready to get involved.

In brief, POC has the following advantages. First, it can connect invariant systems with variable systems within the same structural constraints, and give flexibility to grammar to account for language variation. Next, the path of diachronic sound changes can clearly be traced. This helps to reveal how and why synchronic variation and diachronic change are motivated. Third, POC also helps to show substantive grammatical limits shared by all grammars, either invariant or variable.[10]

5. The use of partially ordered constraints for the diminutives in Yuebei Tuhua

Our OT analysis in section 3 can successfully explain the synchronic alternations

[10] Though POC makes strong predictions about the range of possible variable phonological systems, there are also some weaknesses. The first one is that the pattern of language variation will not always be as systematic as that proposed in Anttila (1997), if too many constraints get involved. Language variation is usually a complex linguistic phenomenon, and, therefore, not easy to be handled merely by a simple set of constraints. The second weakness, as indicated in Coetzee and Pater (2008), lies in the probability distribution of the variants. POC derives its probability by interpreting the number of constraint rankings that yields a particular pattern. However, it faces a great problem when the probability distribution between two variants is strongly skewed in favor of one of them (Boersma and Hayes 2001). It is this weakness that gives rise to the stochastic models of OT (Boersma 1997, 1998).

in YBTH diminutives; however, it fails to capture the transitional stages in YBTH diminutives. For this reason, POC will be used in this section to account for the diachronic change in YBTH diminutives, with special attention given to two issues: noncrucial ranking and debacculization. Now, consider again the constraints in (5), reproduced here as (12).

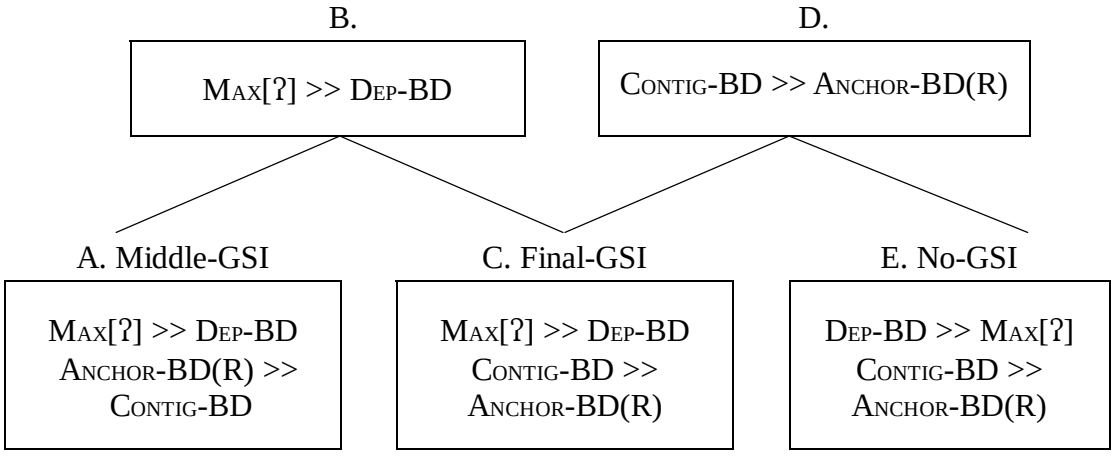
(12) a. YBTH middle-GSI diminutives
MAX-BD, LINEAR-BD, SON-SEQ, ANCHOR-BD(L /R), MAX[ʔ] >> CONTIGU-BD, DEP-BD

b. YBTH final-GSI diminutives
MAX-BD, LINEAR-BD, SON-SEQ, ANCHOR-BD(L), MAX[ʔ], CONTIG-BD >> ANCHOR-BD(R), DEP-BD

c. YBTH no-GSI diminutives
MAX-BD, LINEAR-BD, SON-SEQ, ANCHOR-BD(L/R), CONTIG-BD, DEP-BD >> MAX[ʔ]

The constraints in (12) will fall into two groups, based on whether their rankings are shifted or not. MAX-BD, LINEAR-BD, SON-SEQ and ANCHOR-BD(L) remain invariant in the high ranking. Such ranking stability enables them to form the substantive grammatical limits shared by all YBTH diminutives, and restricts their possible changing direction. Except for these four high-ranked constraints, the remaining constraints can be rearranged into the grammar lattice in (13).

(13) The grammar lattice of the diminutives in Yuebei Tuhua (No. 1)



In middle-GSI and final-GSI, the ranking MAX[ʔ] >> DEP-BD is stable, ensuring the appearance of the glottal stop in both types of YBTH diminutives. The presence of the glottal stop will undoubtedly incur a violation of DEP-BD. The ranking between ANCHOR-BD(R) and CONTIG-BD is variable, however. Ranking one high lowers the

other. As previously stated, during the development from middle-GSI to final-GSI, an unmarked feature emerges because of the shifted position of the inserted glottal stop. In middle-GSI, the inserted glottal stop breaks the contiguity of the bases. In final-GSI, however, the contiguity of the bases is maintained by inserting the glottal stop on the right edge of the bases. This phonological behavior echoes the voice of a cross-linguistic tendency that morphological constituents are maximally respected, as stated in Kager (1999:110):

> Epenthesis also tends to highlight the edges of morphemes, for example by making the beginning of a morpheme coincide with the beginning of a syllable…the processing of lexical elements is improved when their realization are constant and signaled prosodic edges.

Next, in Stage B, the presence of the glottal stop is guaranteed by the crucial ranking, MAX[ʔ] >> DEP-BD. Yet, the ranking between ANCHOR-BD(R) and CONTIG-BD is variable; they are in a relation of crucial nonranking. Either middle-GSI or final-GSI is acceptable in stage B. That is, Stage B is an intermediate stage located in-between middle-GSI and final-GSI. Besides, the existence of stage B is also empirically supported by comparing the use of diminutives between two YBTH speakers, as shown in (14) (Zhuang 2004:255).

(14)

	Speaker A	Speaker B	Gloss
a.	gey$ʔ^{M}$ tya^{M}ʔa^{H}	gey$ʔ^{M}$ tya^{M}ʔa^{H}	‘sun’
b.	pay^{ML} sye^{M}ʔe^{H}	pay^{ML} sye^{M}ʔe^{H}	‘tomb’
c.	key^{ML} kɛ^{L}ʔŋ^{M}	key^{ML} kɛ^{L}ʔŋ^{M}	‘a cock’
d.	vowʔ^{M} kwo^{L}ʔo^{M}	vowʔ^{M} kwo^{L}ʔo^{M}	‘a pan cover’
e.	ts^{h}aw^{MH} pye^{M}ʔe^{H}	ts^{h}aw^{MH} **pye^{M}ʔe^{H}** / ts^{h}aw^{MH} **pyeʔ^{H}**	‘a lawn’
f.	sɪ^{HM} hya^{M}ʔa^{H}	sɪ^{HM} **hya^{M}ʔa^{H}** / sɪ^{HM} **hyaʔ^{H}**	‘when’
g.	t^{h}u^{HH} ts^{h}a^{M}ʔy^{H}	t^{h}u^{HH} **ts^{h}a^{M}ʔy^{H}** / t^{h}u^{HH} **ts^{h}ayʔ^{H}**	‘belly button’
h.	gey$ʔ^{M}$ ta^{L}ʔŋ^{M}	gey$ʔ^{M}$ **ta^{L}ʔŋ^{M}** / gey$ʔ^{M}$ **taŋʔ^{M}**	‘daytime’

Both speakers are from Lisi, a dialect of YBTH. Speaker A, who is older and less educated than Speaker B, uses only middle-GSI diminutives. Speaker B uses both forms of diminutives interchangeably, showing that speaker B is now in the intermediate stage where ANCHOR-BD(R) and CONTIG-BD are optionally ranked (i.e. variable). The interchangeability between middle-GSI and final-GSI is also observed in other YBTH dialects, like Shangyao and Houpin (Zhao 2002).

How is the relation between final-GSI and no-GSI? The development from final-GSI to no-GSI is also a process for an unmarked feature to surface. The difference between final-GSI and no-GSI lies in whether the glottal stop shows up or not. In final-GSI, MAX[ʔ] dominates DEP-BD in order for the glottal stop to exist. No-GSI takes the reverse ranking, suppressing the glottal stop, and at this time, diminutive tones function as the sole marker for the diminutives. Owing to the lost glottal stop, the identity between morphologically related words (i.e. the diminutive and its base) is thoroughly pursued, as the central concept of Output-to-Output Correspondence goes (Benua 1995, 1997, McCarthy 1995).

In stage E, CONTIG-BD is "deliberately" set to dominate ANCHOR-BD(R), even though the relation of both constraints are originally undominated in (12c). This is what is called a noncrucial ranking. Given two constraints C_1 and C_2, noncrucial ranking means that C_1 can dominate C_2, and vice versa, and both rankings will lead to an identical optimal output. The question is: if the result is the same, why should C_1 and C_2 be ranked with respect to each other? These two constraints can still maintain themselves in an undominated relation. We will justify this relation in terms of the following arguments.

First, in classical OT, Prince and Smolensky (1993, 2004) regarded a grammar as a totally ranked hierarchy of constraints. Given two undominated constraints in a grammar, the learning algorithm (e.g. error-driven constraint demotion) will find at least one totally ranked hierarchy by free permutation (Tesar and Smolensky 2000, Boersma 2008). In other words, the grammar will finally rank one above the other, as clearly stated in Tesar and Smolensky (1998:249, 250):

> When learning is successful, the learned stratified hierarchy, even if not totally ranked, is completely consistent with at least one total ranking.
>
> How does the learner go to a totally ranked hierarchy? At the endpoint of learning, the hierarchy may not be fully ranked. The result is a stratified hierarchy with the property that it ***could*** be further refined into typically several fully ranked hierarchies, each consistent with all the learning data …. In human terms, one could suppose that by adulthood, a learner has taken the learned stratified hierarchy and refined it to a fully ranked hierarchy.

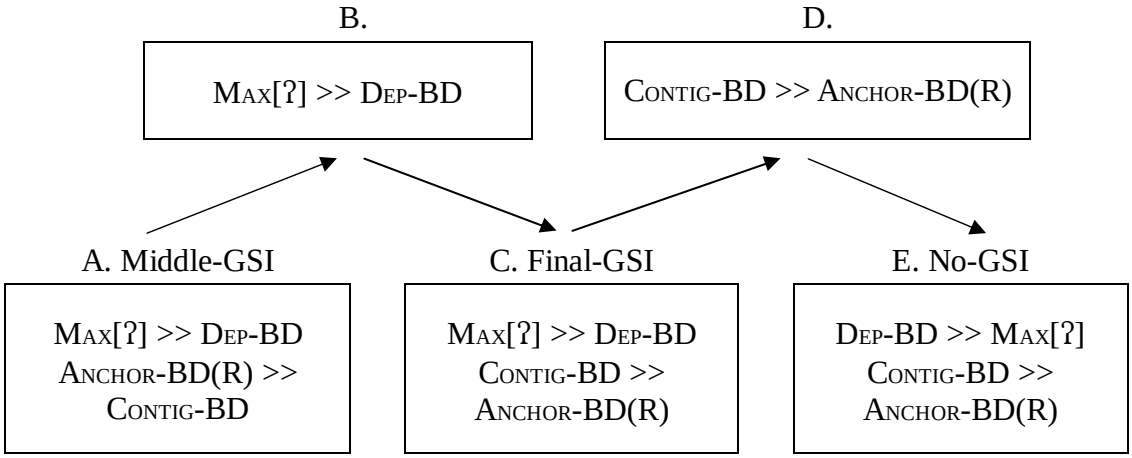
This is the case with YBTH diminutives. Though there is no ranking order between CONTIG-BD and ANCHOR-BD(R) for the time being, the ranking between them, undeniably, can be refined by any new information, like language learning or language contact. As a result, we cannot exclude the possibility that one dominates the

other, so either CONTIG-BD >> ANCHOR-BD(R) or ANCHOR-BD(R) >> CONTIG-BD is possible. If so, another question emerges: Why choose the former, but not the latter? Choosing the former is a direct response to our second argument, the emergence of the unmarked feature. In final-GSI, CONTIG-BD is ranked high and dominates ANCHOR-BD(R), resulting in an unmarked tendency that morphological constituents are maximally respected. For this reason, we may well believe that this ranking for the unmarked feature will be followed "implicitly" in no-GSI. The third argument is that CONTIG-BD must always be ranked higher than ANCHOR-BD(R), given that Chinese affixal phonology plays a decisive role. Lin (2004) explored some analytical and theoretical issues in Chinese affixal phonology, stating that Chinese diminutive affixes predominantly attached themselves to the right of the bases (i.e. suffixes).[11] Obvious cases come from nasalized diminutives in Wu and Hui, and retroflexed diminutives in Mandarin. The contiguity of the bases in these diminutives are maintained (i.e. no medial epenthesis or deletion), whereas ANCHOR-BD(R) is hereby violated because of the epenthetic diminutive suffixes on the right edge. Given this predominance, the ranking CONTIG-BD >> ANCHOR-BD(R) stands out among Chinese dialects. Fourth, as far as language contact and influence is concerned, given that Mandarin (i.e. Putonghua) is the standard language in China and that retroflexion in Mandarin is an important phonological phenomenon, there is no doubt that the ranking CONTIG-BD >> ANCHOR-BD(R) will be activated on account of the strong linguistic influence from Mandarin. After an extensive account of noncrucial ranking, our assumption for the implicit ranking CONTIG-BD >> ANCHOR-BD(R) in no-GSI is reasonable.

In Stage D, the ranking between DEP-BD and MAX[ʔ] is undefined, suggesting that both final-GSI and no-GSI diminutives should be acceptable in this stage. It is an intermediate stage that locates itself in-between final-GSI and no-GSI, and its existence is also supported by such YBTH dialects as Beixiang and Guitou (Zhao 2002). In brief, the diachronic change of YBTH diminutives can be visualized by traversing the grammar lattice in (15). The alternations in YBTH diminutives, either synchronic or diachronic, can be captured in terms of the POC framework.

[11] Diminutives formed by infixation are possible, like those in Yanggu (Dong 1985) and Pingding (Xu 1981). However, for Lin (2004), only the latter is the case.

(15) The grammar lattice of the diminutives in Yuebei Tuhua (No. 2)



The second issue that is worth exploring is debuccalization. As previously stated, under the POC framework, grammar will impose some substantive limits to restrict the ways of language variation. What are the grammatical limits for YBTH diminutives in the course of the diachronic change? The four high-ranked constraints in (12), namely, MAX-BD, LINEAR-BD, SON-SEQ and ANCHOR-BD(L), can function as the substantive limits for YBTH diminutives. In addition to these four constraints, the most important of all is debuccalization, a phonological process that is widely observed in natural languages and in southeastern Chinese dialects. Debuccalization means the deletion of the oral place features from consonants, hereby removing the constriction in the oral cavity (de Lacy 2002, 2006, Lombardi 2001, McCarthy 2007, Rice 2007, Yip 2001). Debuccalization of obstruents typically leaves [h] and [ʔ] behind, and the debuccalized segments will go on to be deleted or assimilated, depending on the rankings of constraints in each language (McCarthy 2007).

Prior to the discussion of debuccalization in YBTH diminutives, let us first explore where the glottal stop in diminutives comes from. In his study of diminutives in the dialects of Wu and Min, Chen (1992b, 1999) stated that the glottal stop originates from /k/, a degenerate form from the syllabic diminutive suffix /kiaŋ/ in the Min dialects, as shown in (16). The close relation between /ʔ/ and /k/ is assumed in the transitional stage (*CVk) because of an extensively-observed pattern of the sound change (-p, -t, -k → -k → -ʔ → ϕ). For this reason, Chen (1999:39) stated that "although the form *CVk does not occur in either Wu or Min dialect, it is not hard to imagine that this transitional form existed … at some early time".

(16)

1st stage	2nd stage	3rd stage	4th stage	5th stage
CV + **kiaŋ/kĩ**	*CV**k**	CV**ʔ**	Cv́ʔ	Cv́
Fuzhou Datian		Nanxiong Wuyi	Ningpo Qingtian	Wenzhou

ʔ = glottal stop ʔ = glottalization v́ = diminutive tone change

Note that the glottal stop is deleted in the last stage in (16), like that in no-GSI. As addressed in McCarthy (2007), debuccalization is a necessary condition for segmental deletion because the loss of oral place features makes the segments unstable. This is the very case in (16) and YBTH diminutives. Moreover, /k/ and /ʔ/ in (16) are epenthetic in nature, and there is a tendency for inserted segments to be neutral in place of articulation, as stated in Rice (2007:83) below. Maybe, this accounts for the reason why *CVk does not exist synchronically.

> Epenthetic segments are not present in a lexical entry, but are added to satisfy surface constraints on well-formed prosodic structures. Their absence from lexical representations makes epenthetic segments strong candidates for unmarked features as insertion might be expected to provide the least marked features…the most common epenthetic consonant is probably a laryngeal, either glottal stop or [h].

Based on this reasoning, it becomes evident that debuccalization is highly related to the glottal stop in the diminutives in southeastern Chinese dialects. Subsequently, all diminutives in YBTH are involved with glottal stop insertion. Whether the glottal stop can surface or not depends on the constraint ranking. In no-GSI, it is the ranking DEP-BD >> MAX[ʔ] that restricts the presence of the glottal stop. If so, debuccalization must stand out in the formation of YBTH diminutives. The constraint ranking in (17) must play an active role, and provide a substantive limit in the grammar to restrict the ways for YBTH diminutives to vary.[12] The complete grammar lattice is displayed in (18).

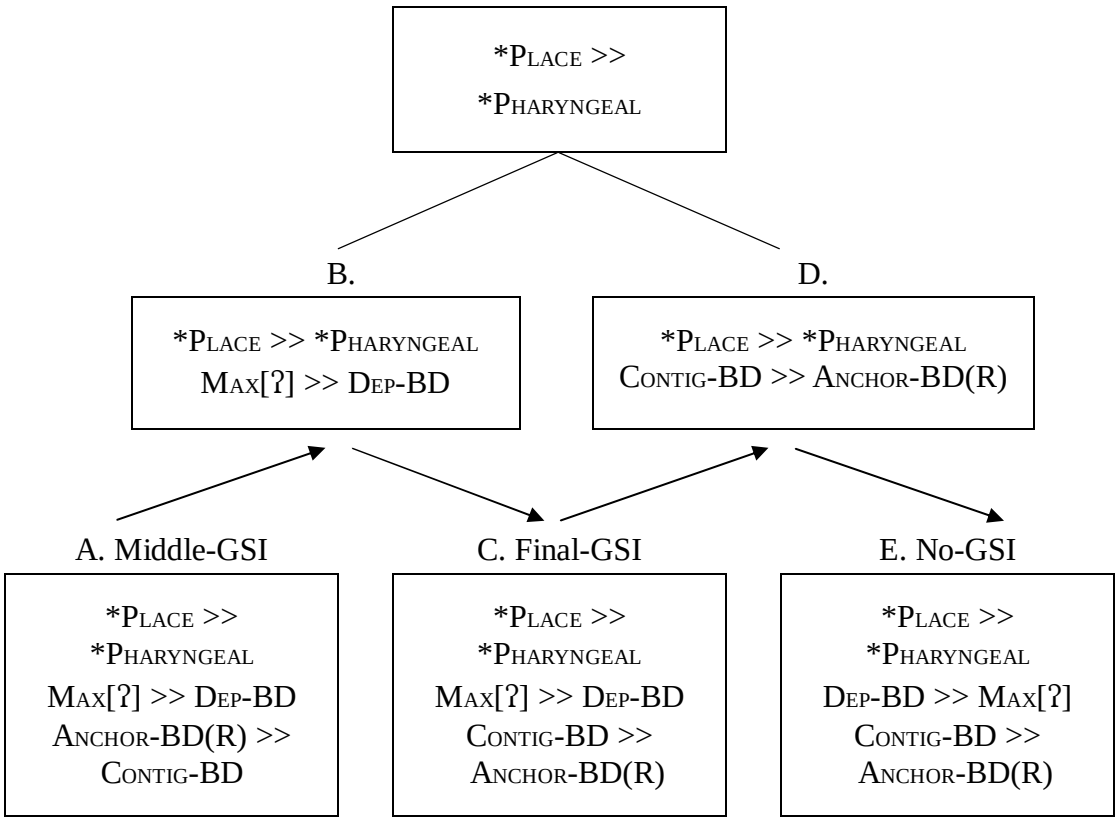
(17) Debuccalization

*PLACE >> *PHARYNGEAL

(Epenthetic segments in diminutives should be placeless.)

[12] The four high-ranked constraints, MAX-BD, LINEAR-BD, SON-SEQ and ANCHOR-BD(L), also form substantive limits for YBTH diminutives, which is omitted here because they are in an undominated order.

(18) The grammar lattice of the diminutives in Yuebei Tuhua (final version)



6. Conclusion

This study brings OOC and POC into the analyses of YBTH diminutives, and connects descriptive data to theoretical analyses. Moreover, not only does it bridge the gap between synchronic variation and diachronic change, but also captures the gradual change among different types of YBTH diminutives by crucial nonrankings between CONTIG-BD and ANCHOR-BD(R), and between MAX[ʔ] and DEP-BD. The key notion of POC gains thorough support from the theoretical study of YBTH diminutives.

This study also manifests some theoretical insights for future study of Chinese diminutives. First, diminutives change over time and their change must be well-motivated; however, such motivations for the diachronic change are often missed in the literature. Second, the variation of diminutives is neither random nor abrupt, but systematic and gradual. Previous studies of Chinese diminutives failed to seize the insight. Both weaknesses result from the lack of an appropriate analytical framework. It is in the hope that, with fruitful analytical results in YBTH diminutives, the POC framework can also be extended to other types of Chinese diminutives.

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粵北土話小稱詞的歷時演變：基於部分排序制約的優選理論分析

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漢語小稱詞長久以來已爲學術界熱烈討論。然而，大部分研究的弱點在於語料與理論脫離、共時與歷時二分。有鑑於此，本研究以優選理論中的部分排序制約爲架構，分析粵北土話小稱詞的歷時演變。我們首先回顧粵北土話小稱詞的形成方式，及其在優選理論架構下的分析。緊接著，我們利用部分排序制約來分析粵北土話小稱詞，並特別注意二個要點的詮釋：「非決定性的排序」及「去口腔阻塞化」。研究顯示，部分排序制約架構的應用，不僅可以解釋語言演變的動機，更可以解釋語言變化的選擇性。

關鍵詞：小稱、優選理論、部份排序制約、語言演變、粵北