Diachronic Change of the Wu Nasalized Diminutives: An Optimality-Theoretical Analysis with Partially Ordered Constraints

Ming-chung CHENG

Abstract

Earlier studies related to Chinese diminutives usually fail to connect language descriptions to linguistic theories, fall into a synchrony/diachrony dichotomy, and is unable to capture the gradual transitions in diachronic change. In view of these weaknesses, this study desires to explore the Wu nasalized diminutives in terms of Output-Output Correspondence (OOC) and Partially Ordered Constraints (POC) in Optimality Theory (OT). This study first classifies the synchronic alternations and the diachronic stages of the Wu nasalized diminutives, and then puts them into the OOC and POC frameworks. It is indicated that the Wu nasalized diminutives in different diachronic stages result from reranking a common set of constraints (MAX[nas], ANCHOR-SD(L), MAX-SD, IDENT-SD[nas], DEP-SD, *Vnas, *VoralN), and that the transitional stages can be captured by two sets of crucial nonrankings (IDENT-BD[nas] ~ DEP-BD, IDENT-BD[nas] ~ MAX[nas]). Also, whether [-n] or [-ŋ] surfaces as the diminutive suffix results from a conflict between PoA markedness and language contact, and

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can also be coped with by a crucial nonranking (*dorsal ~ *coronal). Overall, this study shows that OOC and POC function well not only to capture the motivations in diachronic change and the optionality in language variation, but to bridge the gap between descriptive data and theoretical analyses.

**Keywords:** diminutive, nasalization, Optimality Theory, language variation, Wu
1. Introduction

In recent decades, the integration between synchronic variation and diachronic change has become a prevailing issue in phonology. Along with the new advances of the theoretical machinery (e.g. constraint-based approach), this prevalence also results from the deeply-rooted concept in historical linguistics that diachronic change can be inferred from synchronic alternations. A case for this view comes from the widespread diminutives among Chinese dialects. Synchronically, they usually appear in various phonetic shapes, and these cross-dialectal alternations highlight how they develop diachronically. This characteristic explains the reason why Chinese diminutives have long been an intriguing topic in Chinese studies. Though extensively investigated, Chinese diminutives are still calling for further endeavors in three aspects. First of all, most studies center on descriptive data collection (Li 2007, Tsao 2006, Wang 2007). Comparatively, little theoretical attention has been directed to the diachronic change. Second, previous studies usually fall into a dichotomy between synchrony and diachrony, and the gap between them is rarely bridged. Third, the gradual transitions among the stages usually fail to be captured. In view of these weaknesses, this study aims to explore the Wu nasalized diminutives in terms of Optimality Theory (OT), with special concentration on how OT can capture the evolvemental transitions, an issue that has been always missed in the literature.

The remainder of this study is organized as follows. Section 2 classifies the Wu nasalized diminutives, synchronically and diachronically. After briefly illustrating the OT framework, section 3 shows how the nasalized diminutives are an-

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1 For more discussion of this issue, see Coetzee and Pater (2008) and Holt (2003).
analyzed in terms of Output-Output Correspondence (OOC). Section 4 exhibits the concept of Partially Ordered Constraints (POC), and section 5 goes further to display how POC captures the transitions between the Wu nasalized diminutives in different diachronic stages, and proposes related issues of the variability between [n] and [ŋ]. Section 6 concludes this study.

2. Nasalized Diminutives in the Wu Dialects

The Wu dialects are well-known for their diverse nasalized diminutives and have appealed to a multitude of related literature (Cao 2001, 2002, Chen 1992a, 1992b, Fang 1986, 1993, Fu 1961, Kao 2004, Li 1978, Lin 2001, Pan 1988, Shi 2002, Tsao 2006, Zhengzhang 1979, 1980, 1981). Synchronically, there are four types of phonetic realizations of the nasalized diminutives, as in (1). Note that ‘nasalized diminutives’ is used here as a cover term. It can refer to diminutives formed with syllabic diminutive words (1a), with nasal suffixes (1b), with vowel nasalization (1c), or even with no observable diminutive nasality on the surface (1d). Besides, each Wu dialect may take one or more ways to create its diminutives.2

(1) a. Syllabic Diminutive Word: Yunhe (Cao 2001:33)
   \[ \text{a?} \rightarrow \text{a? ni} \quad \text{‘small duck’} \]
   \[ \text{ti} \rightarrow \text{ti ni} \quad \text{‘small pig’} \]
   \[ \text{mao} \rightarrow \text{mao ni} \quad \text{‘small cat’} \]

b. Nasal Suffixation without Vowel Lengthening: Tangxi (Cao 2001:34)3

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2 Nasalized diminutives may be assigned diminutive tones. Throughout this study, diminutive tones are ignored unless they are relevant to the discussion.

3 Because of the suffixation of [-ŋ], the main vowels in the stems are raised (Kao 2004:29).
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c. Vowel Nasalization: Jinhua (Cao 2001:35)
li → lǐ ‘pear’
y → yǐ ‘box’
tʰu → tʰu ‘rabbit’

d. No Diminutive Nasality: Wenling (Lin 2001:196)
tio⁴² → tio⁵³ ‘bird’
to³³ → to³⁵ ‘knife’
dvŋ⁵⁵ → dvŋ⁵³ ‘wooden stool’

Moreover, after conducting a large-scale survey of the nasalized diminutives in Wu, Cao (2002) concludes that they undergo several developmental stages, as in (2).

(2) Diachronic Stages of the Nasalized Diminutives in the Wu Dialects⁴

<table>
<thead>
<tr>
<th>Initial Stage</th>
<th>Stage A</th>
<th>Stage B</th>
<th>Stage C</th>
</tr>
</thead>
<tbody>
<tr>
<td>(C)V + ȵie/ŋi/ɲi/ŋ/ŋ</td>
<td>(C)ronym/ŋy</td>
<td>(C)y</td>
<td>(C)ŋy</td>
</tr>
</tbody>
</table>

⁴ Some literature states that a transitional stage, CV:N, between the Initial Stage and Stage A, emerges in such Wu dialects as Yiwu (Fang 1986, Shi 2002), Wenzhou (Zhengzhang 1980, 1981) and Pujiang (Chen 1992a). However, vowel lengthening in the CV:N stage is still under controversy. For example, Shi (2009) explores the issue of vowel lengthening of the Yiwu diminutives by means of PRAAT, and discovers that vowels in these diminutives are not lengthened but shortened. In his opinion, the false impression of vowel lengthening may result from the tone sandhi which is caused by the nasal suffixation. As a result, CV:N should be still regarded as a member of CVN. Because of this uncertainty, this stage is temporarily excluded from discussion in this study.
In the Initial Stage, diminutives are formed by adding syllabic diminutive words (e.g. niε/nic/ni/ni/η) to the stems. Diminutive words are monosyllabic and prosodic, have their individual lexical tones, and form separate syllables from the stems. After the Initial Stage, diminutive words lose their lexical tones, become degenerate suffixes, and merge into the preceding stems.

In Stage A, the [-n, -ŋ] suffixes are attached to the stems, and the suffixation will sometimes give rise to rime changes. In Stage B, the vowels in the stems are nasalized as compensation for the disappearance of the nasal suffixes. Vowel nasalization results from the spreading of the [nasal] feature left by the omitted nasal suffixes. In fact, coarticulatory vowel nasalization occurs in virtually all languages (Beddor 1993), and is an important acoustic and perceptual cue for the coming nasal consonants (Beddor 2009). Function extension through grammaticalization and the high-frequency use of the diminutives also render the weakening of the nasal suffixes (Cao 2002). Both factors trigger the shift from Stage A to Stage B. In Stage C, diminutive nasality no longer exists, so stems and diminutives are identical in segmental shapes. According to Cao (2001, 2002), there is a correlation between diminutive nasality and diminutive tones (DTs). The existence of diminutive nasality makes DTs subsidiary. At this stage, owing to the disappearance of the diminutive nasality, DTs turn out to be the exclusive marker for the diminutives to be recognized.

After the classification of the synchronic alternations and the diachronic

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5 At this stage, the diminutive words have no segmental impact upon the stems, but the tones on diminutive words will sometimes give rise to tone sandhi. Take Suichang, one of the Wu dialects, for instance. The tone of the diminutive word [niε] and the Yangping tone have the same tonal value [221]. However, [221] will be changed to [212] when it follows another Yangping tone (Cao 2002:152).

6 The process from vowel nasalization to vowel denasalization is also widely observable in Romance languages. See Sampson (1999) for more discussion.
stages of the Wu nasalized diminutives, the study will proceed to illustrate how both themes can be captured within the framework of OT.

3. The OOC Analysis of the Nasalized Diminutives in the Wu Dialects

Dispensing with serial derivation and ordered rules, OT is traditionally a parallel output-oriented framework in which Input, Generator, Evaluator and Output are all crucial components (McCarthy 2002, Prince and Smolensky 1993, 2004). For a given input, Generator will produce all logically possible output candidates. The set of candidates are then evaluated for optimality (i.e. harmony) by Evaluator, which contains a universal set of violable constraints that have a language-specific ranking hierarchy. The candidate which incurs the least violation marks of the high-ranked constraints is selected as the optimal output. Differences in constraint rankings result in different languages (or dialects), and can also account for language change.

After the brief introduction of OT, this study will then show its application to the nasalized diminutives in the Wu dialects, based on Cheng (2012). Before the analysis, the OT model utilized in this study is schematically shown in (3).

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7 Though Prince and Smolensky (1993, 2004) briefly discuss serialism in OT, standard OT is parallel in nature. Recently, serialism has been utilized in such OT frameworks as harmonic serialism and OT-CC. For more discussion and application of the serial models, please refer to Kimper (2008), McCarthy (2000, 2002, 2007a, 2007b, 2008, 2009a, 2009b), Pruitt (2008), Wolf (2008), among others.

8 There are typically two types of constraints in OT, Faithfulness and Markedness. As indicated in Kager (1999: 10), Faithfulness functions as a protector for lexical properties, “making it possible for languages to have sets of formally distinct lexical items to express different meanings.” Markedness is a structural well-formedness requirement for outputs. For instance, sonorants must be voiced (*SONORANT[-vd]) and syllables must not have codas (*CODA). Both types of constraints typically, but not always, come into conflict, and their interaction forms the heart of OT.
There are two types of correspondence in (3), IO-Faithfulness and SD-Identity. The former requires that diminutive outputs should be faithful to inputs (i.e. /STEM + AFFIX/), while the latter requires the identity between stems (S) and diminutives (D), a model traditionally called Output-Output Correspondence (OOC) (Benua 1995, 1997, Kenstowicz 1996, Steriade 2000). With this model, the constraints crucial for this study are introduced in (4).

(4) *V<sub>nas</sub>: Vowels must not be nasal.

*V<sub>oral</sub>N: Vowels must not be oral before a tautosyllabic nasal.

MAX-SD: Every element in the stem has a correspondent in the diminutive (‘no deletion’).

DEP-SD: Every element in the diminutive has a correspondent in the stem (‘no insertion’).

IDENT-SD<sub>[nas]</sub>: Correspondent segments between the stem and the diminutive have the same value on the [nasal] feature (‘no change of the value of the [nasal] feature’).

ANCHOR-SD(L): Any element at the left edge of the stem has a correspondent at left edge of the diminutive (‘no insertion/deletion at the left edge’).  

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9 Based on reduplication and truncation, Nelson (2003) proposes Positional Anchoring and argues for an inherent asymmetry between both edges. She states that only left-edge anchoring constraints are default and necessary, while right-edge association is attributed to other independent factors (like stress, foot, etc.). This view can also be extended to the affixation of fixed segments.
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**Max[nas]**: Inserted diminutive nasality must be maintained (i.e. parsed) in the diminutive (‘no deletion of the diminutive nasality’).

The first two constraints, *V\text{nas} and *V\text{oralN}, are markedness ones, both of which are typological-based or phonetic-grounded, for (a) nasal vowels are universally more marked than oral ones (Maddieson 1984) and (b) vowels always perceptually and articulatorily anticipate the nasality of following tautosyllabic nasals (Cohn 1993). The remaining constraints in (4), except Max[nas], pursue the identity between stems and diminutives, and do not target the nasal suffixes. 

Max[nas] is an IO-Faithfulness constraint and is proposed specifically to control the occurrence of the diminutive nasality, segments or features. According to Cao (2002), nasality is a significant marker of these diminutives, so the role of Max[nas] is important. When Max[nas] is high-ranked, diminutive nasality is sure to occur (i.e. Stages A and B). While it is low-ranked, nasalized diminutives are allowed to appear without any diminutive nasality on the surface (i.e. Stage C). With these constraints, the constraint rankings for different diachronic stages are shown in (5), and tableaux (6-8) illustrate the evaluation of these constraint rankings.

Though the formation of the nasalized diminutives does not refer to stress placement or foot structures, this study also exhibits that, following Nelson (2003), the placement of the diminutive nasal suffixes is compelled to surface at the right edge of the stems under the pressure of the high-ranked constraints, such as ANCHOR-SD(L) and CONTIGUITY-SD. Hence, ANCHOR-SD(R) is not assumed in this study.

Max[F] is adopted in Lombardi (1999, 2001) and Zhang (2000, 2001). Unlike Max-IO which only targets segment deletion, Max[F] also extends its function to feature deletion. Moreover, in the case at hand, high-ranked Max[nas] is functionally similar to REALIZEMORPH (i.e. a morpheme must have some phonological exponent in the output) (Lin 2004:1033), originating from AFFIX MANIFESTATION PRINCIPLE (Lin 1993:656) which states that “within the limits of universal and language-specific constraints, the effect of affixation of a phonologically expressed morpheme is always manifested.”
(5) Stage A: CVN
\[
\text{MAX}_{\text{nas}}, \text{ANCHOR-SD(L)}, \text{MAX-SD}, \text{IDENT-SD[nas]} \gg \text{DEP-SD}, \ast V^{\text{nas}}, \ast V^\text{oral}_N
\]
Stage B: CV
\[
\text{MAX}_{\text{nas}}, \text{ANCHOR-SD(L)}, \text{MAX-SD}, \text{DEP-SD} \gg \text{IDENT-SD[nas]}, \ast V^{\text{nas}}, \ast V^\text{oral}_N
\]
Stage C: CV
\[
\text{ANCHOR-SD(L)}, \text{MAX-SD}, \text{DEP-SD}, \text{IDENT-SD[nas]} \gg \text{MAX}_{\text{nas}}, \ast V^{\text{nas}}, \ast V^\text{oral}_N
\]

(6) An illustrative example of constraint evaluation for CVN nasalized diminutives

<table>
<thead>
<tr>
<th>INPUT: /zi+ŋ</th>
<th>MAX [nas]</th>
<th>ANCH [L]</th>
<th>MAX-SD</th>
<th>IDENT-SD[nas]</th>
<th>DEP-SD</th>
<th>*V^{nas}</th>
<th>*V^oral_N</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ziu[ŋ]</td>
<td>!</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. ŋziu</td>
<td>!</td>
<td></td>
<td>!</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. zuiŋ</td>
<td>!</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td>!</td>
<td></td>
</tr>
<tr>
<td>d. ziuŋ</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td>!</td>
<td>!</td>
<td></td>
</tr>
<tr>
<td>e. ziù</td>
<td></td>
<td></td>
<td>*</td>
<td>!</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In (6), the number of violation marks of the high-ranked constraints is crucial in selecting the optimal output. MAX[nas] enforces the diminutive nasality to emerge, segments or features. Consequently, without any diminutive nasality on

\[11\] The vowel [o] in the stem [zi] is changed into [u] in the diminutive [ziuŋ]. In OT, the vowel quality change can be dealt with by some unstated IDENT-SD[F] constraints (e.g. IDENT-SD[high]). Detailed discussion on this issue is irrelevant in the current study.
the surface (i.e. not parsed), candidate (6a) fatally violates MAX[nas]. MAX-SD rules out candidate (6c) because one input segment in the stem gets deleted. For the sake of the left-edge insertion of [ŋ] and vowel nasalization, candidates (6b) and (6e) are ruled out by ANCHOR-SD(L) and IDENT-SD[nas] respectively. As for candidate (6d), though the insertion of [ŋ] and no vowel nasalization before [ŋ] make it deviant from the regulation of DEP-SD and *VoralN, (6d) satisfies all high-ranked constraints and is selected as the optimal output.

(7) An illustrative example of constraint evaluation for Cy nasalized diminutives

| INPUT: /li + n / | MAX [nas] | ANCH-
|STEM: [li] | MAX [L] | DEP-
| | | -SD |
| a. li[n] | *! | - |
| b. nli | | * |
| c. in | *! | * |
| d. lǐ | | | * |
| e. lin | *! | - |
| f. lîn | *! | | * |

In (7), candidates other than (7d) incur more or less violation marks on the high-ranked constraints; thus, they are suboptimal candidates. Candidate (7d) violates IDENT-SD[nas] and *VoralN owing to the nasal coloring on [i], but both constraints are low-ranked and less decisive, so (7d) is chosen as the optimal output.
(8) An illustrative example of constraint evaluation for CV nasalized diminutives

<table>
<thead>
<tr>
<th>INPUT: /tiɔ + n/</th>
<th>STEM: [tiɔ]</th>
<th>MAX -SD</th>
<th>ANCH -SD (L)</th>
<th>DEP -SD</th>
<th>IDENT -SD [nas]</th>
<th>MAX [nas]</th>
<th>*V_{nas}</th>
<th>*V_{oralN}</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. tiɔ[n]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. ntiɔ</td>
<td>*!</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. tɔn</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>d. tiɔn</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>e. tiɔn</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. tiɔ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>

Candidate (8a) does not incur any violation marks on the high-ranked constraints, despite it loses the diminutive nasality and violates the low-ranked MAX[nas], so it is the optimal form. The remaining candidates are ruled out because they fatally incur violation marks on one or more high-ranked constraints.

It is clearly illustrated in these tableaux that the optimal form in each diachronic stage can be correctly predicted by the same set of constraints with different rankings. In addition, the historical development of the nasalized diminutives from Stage A to Stage C can be represented as incremental promotion of DEP-SD and IDENT-SD[nas] into the high ranking, as displayed in (9). On the one hand, the gradual promotion of the two constraints indicates their relative priority during historical sound change. On the other hand, constraint rerankings also show that the Wu nasalized diminutives go in the direction of syllable simplification.12

12 Careful readers may notice that syllable simplification seems to be a concept under markedness.
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(9) \text{IDENT-SD[long], IDENT-SD[nas]} \ldots \gg \text{DEP-SD} \ldots \text{Stage A}

\text{IDENT-SD[long], DEP-SD} \ldots \gg \ldots \text{IDENT-SD[nas]} \text{Stage B}

\text{IDENT-SD[long], DEP-SD, IDENT-SD[nas]} \gg \ldots \text{Stage C}

One advantage in OT lies in its capability to characterize synchronic dialectal alternations by constraint rerankings, and, as claimed in McMahon (2000), constraint rerankings can also explain diachronic sound change. At present, this study captures both issues thoroughly. Unfortunately, the OT analysis above fails to grasp the gradual transitions between these diachronic stages, and this issue turns out to be the research focus in what follows.

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.” A rule is marked [+optional] and its application depends on the “external” contexts (Guy 1991). Thus, language variation is ascribed 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

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Yet, it should be noted that the SD-Identity constraints in this study aim to pursue the identity between stems and diminutives. Raising these constraints into the high ranking will naturally lead to syllable simplification, for nasalized diminutives in most cases are more complex in syllable structure than their corresponding stems.
stage in which phonetic implementation takes over the phonology, and in which
gradient or noncategorial phonological alternations are allowed. Language vari-
ation seems to be a linguistic phenomenon free from structural constraints, and
falls outside grammar. Fortunately, the importance of variation has been recog-
nized in the last two decades, and the study of variation has become increas-
ingly significant in phonology (Coetzee and Pater 2008). No longer being grammat-
ically random, language variation reflects a central notion in linguistics, an orderly
heterogeneity (Weinreich et al. 1968). Languages do not change in their own way,
but are subject to grammatical restrictions.

Language variation is a challenge to classical OT, because it is unable to
connect invariant (i.e. categorical) and variable (i.e. noncategorial) systems. Following Kiparsky (1993), who prompts the first systematic treatment of lan-
the framework of Partially Ordered Constraints (POC) to account for language
variation. Dissimilar to totally ordered constraints in classical OT (Prince and
Smolensky 1993, 2004), POC assumes that some constraints can be freely ranked
in order for languages to vary. Take the hypothetical grammar lattice in (10) as
a simple example.

13 In classical OT, language variation can still be handled by ranking constraints in an undominated
order. Yet, this kind of ranking relations represents a static state, and it is unable to display the
dynamic transitions between different diachronic stages.

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

15 The grammar lattices need not always show all partial rankings of constraints, given that some
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 (\( C_1 \gg C_3 \gg C_2 \) for Dialect A and \( C_1 \gg C_2 \gg C_3 \) 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 the flexibility to freely rank \( C_2 \) and \( C_3 \) ( \( C_2 \gg C_3 \) or \( C_3 \gg C_2 \)), and therefore makes language variation possible. Moreover, further comments as for (10) are called for. First, \( C_2 \) and \( C_3 \) exist in a relation of crucial nonranking, first mentioned in Prince and Smolensky (1993) and further interpreted in Anttila (1997, 2002a, 2002b, 2007):

We assume that the basic ranking 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 dom-

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constraints in the analysis are always ranked high or low in an undominated relation.
inance 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 1993:51)

Crucial nonranking opens up the possibility in OT for language variation. Second, if dialect A is assumed to be diachronically prior to dialect C, then dialect B functions as a transitional stage, in which forms in dialects A and C 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

```
Dialect B
C₁ >> C₂
C₁ >> C₃

Dialect A
C₁ >> C₂
C₁ >> C₃
C₃ >> C₂

Dialect C
C₁ >> C₂
C₁ >> C₃
C₂ >> C₃
```
Third, the mother node (i.e. dialect B) contains two set of ranked constraints that are shared with dialects A and C, as in (11). In other words, $C_1 >> C_2$ and $C_1 >> C_3$ in dialect B impose substantive grammatical limits on possible phonological systems. Definitely speaking, sound change is not unrestrictive, and grammar is always ready to get involved.

POC has the following advantages. First, it not only connects invariant systems with variable ones within the same structural constraints, but also gives the flexibility to grammar to account for language variation. Next, the path of diachronic sound change can be clearly traced, which helps reveal how and why synchronic variation and diachronic change are motivated. Third, POC also helps to illustrate substantive grammatical limits shared by all grammars, either invariant or variable.16

5. The POC Analysis of the Nasalized Diminutives in the Wu Dialects

This section is dedicated to the POC analysis of the Wu nasalized diminutives. The constraint rankings in (5) have been slightly marked in (12).

16 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 phenomenon, and, thus, 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).
(12) Stage A: CVN

\[ \text{MAX-SD, ANCHOR-SD(L), MAX-SD[nas], IDENT-SD[nas]} \gg \text{DEP-SD, } *\text{V}^{\text{nas}}, *\text{V}^{\text{oral}} \]

TS\(_1\)

Stage B: Cv

\[ \text{MAX-SD, ANCHOR-SD(L), MAX-SD[nas], DEP-SD} \gg \text{IDENT-SD[nas], } *\text{V}^{\text{nas}}, *\text{V}^{\text{oral}} \]

TS\(_2\)

Stage C: CV

\[ \text{MAX-SD, ANCHOR-SD(L), DEP-SD, IDENT-SD[nas]} \gg \text{MAX[nas], } *\text{V}^{\text{nas}}, *\text{V}^{\text{oral}} \]

The constraints in (12) can be divided into two groups, depending on whether their rankings are shifted. MAX-SD and ANCHOR-SD(L) are high-ranked and \( *\text{V}^{\text{nas}} \) and \( *\text{V}^{\text{oral}} \) are low-ranked for all diachronic stages. These constraints, along with many others that are not mentioned (e.g. \( *\text{COMPLEXCODA} \)), form the substantive grammatical limits for all nasalized diminutives and restrict their possible changing directions.

In (12), there exist two transitional stages (abbreviated as TS\(_1\) and TS\(_2\)), both of which are the targets of POC. In TS\(_1\), the ranking between DEP-SD and IDENT-SD[nas] is decisive. When IDENT-SD[nas] is ranked higher than DEP-SD, CVN results; Cv\(_{\text{v}}\) appears while the ranking is reversed. This variation can be empirically witnessed in (13).

(13) Jinhua: Cao (2001:39)

\[
\begin{align*}
\text{kuv} & \quad \text{kuo}^{334} \sim \text{kue}^{334} & \text{‘song’} \\
\text{tcya?} & \quad \text{tcya}^{4-55} \sim \text{tcye}^{4-55} & \text{‘orange’} \\
\text{tcio?} & \quad \text{tcio}^{4-55} \sim \text{tcio}^{4-55} & \text{‘bamboo’}
\end{align*}
\]
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In TS$_2$, the undefined ranking between IDENT-SD[nas] and MAX[nas] suggests that diminutives with or without nasalization are both acceptable, as shown in (14). When formed without nasalization, they can be identified exclusively by diminutives tones.

(14) Jinhua: Cao (2001:39)

<table>
<thead>
<tr>
<th>tsǐ$^{535-55}$</th>
<th>‘sister’</th>
</tr>
</thead>
<tbody>
<tr>
<td>ku$^{313-33}$</td>
<td>‘a kind of bird’</td>
</tr>
<tr>
<td>mya$^{24-55}$</td>
<td>‘sparrow’</td>
</tr>
</tbody>
</table>

According to the discussion, the diachronic change of the nasalized diminutives can be manifested as the grammar lattice in (15). The transitional stages between the nasalized diminutives can be captured under the POC framework in terms of two sets of crucial nonrankings.

<table>
<thead>
<tr>
<th>(15)</th>
<th>TS</th>
<th>Crucial Nonrankings</th>
<th>Constraint Rankings</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td></td>
<td>A.</td>
<td>IDENT-SD[nas] &gt;&gt; DEP-SD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B.</td>
<td>DEP-SD &gt;&gt; IDENT-SD[nas]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C.</td>
<td>IDENT-SD[nas] &gt;&gt; MAX[nas]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TS$_1$</td>
<td>DEP-SD ~ IDENT-SD[nas]…</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TS$_2$</td>
<td>IDENT-SD[nas] ~ MAX[nas]…</td>
</tr>
</tbody>
</table>
In (15), ‘～’ means the undefined relations between the constraints, and ‘…’ shows the ranking relations that are not on current focus, but these ranking relations are not by no means considerable. Even if not explicitly expressed, such constraint rankings as MAX-SD >> DEP-SD still positively control the changing directions, and represent the substantial grammatical restrictions for the nasalized diminutives. Of the relations that are not obviously mentioned, one deserves special attention, that is, place of articulation (PoA) of the nasal diminutive suffixes.

To deeply explore the PoA issue, the following discussion will cover the Wu and Hui dialects, in which a number of nasalized diminutives can be gathered. Moreover, investigating the PoA issue of the nasal diminutive suffixes in the Wu and Hui dialects also requires a knowledge about the historical development of Yangshengyun (i.e. rimes closed by [-m, -n, -ŋ]). Generally speaking, rimes closed by [-m, -n, -ŋ] were lexically contrasted in Middle Chinese, based on Qieyun and Guangyun. As time goes by, nasal codas are merged in the Wu and Hui dialects. For instance, [-m] disappears synchronically, and it appears only in appropriate contexts (i.e. place assimilation).17 For [-n] and [-ŋ], Cao (2002) and Zhao (2004a), after having conducted large-scale surveys of the synchronic Wu and Hui dialects, find out that nasal codas are largely merged into [-ŋ] in Wu and [-n] in Hui.18

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17 Take Jinyun, one of the Wu dialects, for example. According to Cao (2002:87), [-m] only occurs in such rimes as [aum], [iaum], and [ium], but all the rimes are in free variation with [auŋ], [iauŋ] and [iuŋ]. This suggests that [m] is contextually derived because of the [u] sound in the rimes. Similar cases are also observed in the Hui dialects, like Wuyuan [œm, œm, œm, œm], Chunan [œm, œm, œm], Suian [œm], Jiande [œom, œom] and Shouchang [œm, œm] (Zhao 2004a:251).

18 Cao (2002) examines eleven Wu dialects, and the [-ŋ] coda appears in nine of them in his survey. Zhao (2004a) discovers that the [-n] codas occurs in eight out of twelve Hui dialects in his investigation. Yet, it should be noticed that the overall tendency for the development of the nasal codas in the Wu and Hui dialects is vowel nasalization. Namely, all nasal codas are now degenerating and are predicted to disappear in the future.
Move back to the nasal diminutive suffixes in the Wu and Hui dialects. In accord with the developing tendency of the nasal codas, nasal diminutive suffixes surface as [-n] or [-ŋ] as well, but a remarkable distributional difference emerges. According to Cao (2001), Zhao (2004b), Wu and Wang (2006) and other related literature, nasal diminutive suffixes surface predominantly as [-n]. The distribution of [-ŋ] is pretty restrictive; it occurs merely in some Wu dialects, like Wenzhou, Qinyuan, Yunhe and Tangxi (Cao 2001). Why does [-n] take a higher percentage than [-ŋ]? The skewed distribution of [-n] over [-ŋ] must reveal a couple of important issues about the PoA markedness.

A broad consensus about the PoA markedness exists in the literature (Battistella 1990, de Lacy 2002, 2006, Lombardi 1999, 2001, 2002, Prince and Smolensky 1993, Smolensky 1993). Specifically, there is a cross-linguistic PoA markedness hierarchy, [dorsal > labial > coronal], where ‘>’ stands for ‘more marked’. Yet, this hierarchy seems partially impractical for the nasalized diminutives in Wu and Hui, because [-ŋ], instead of [-m], surfaces as the nasal diminutive suffix. Consequently, the historical development of the nasal rimes and the survey results of the synchronic nasalized diminutives in Wu and Hui suggest that the hierarchy should be modified to [labial > dorsal > coronal], from which three intriguing topics deserve special attention.

The first issue is that, according to the cross-linguistic tendency, coronals are

19 There is a least-marked PoA, [glottal], which is irrelevant for the present discussion. Moreover, attention should be directed to the so-called “placeless nasal stop,” usually transcribed as [N]. This interesting issue will be discussed at the end of section 5.

20 According to de Lacy (2006), the markedness hierarchy [dorsal > labial > coronal > glottal] is universal irrespective of their environment. The change of the PoA hierarchy, like [labial > dorsal > coronal] in the present case, must be due to the conflcitions between different hierarchies (e.g. sonority hierarchy, syllable hierarchy, voicing hierarchy, etc.) or to language-particular factors (e.g. language contact, historical development, etc.).
the least marked with respect to labials and dorsals. This may be the reason why [-n] takes a higher percentage than [-ŋ] to be the nasal diminutive suffix. Besides the PoA markedness hierarchy, the “epenthetic” nature of the diminutive suffix must also make a great contribution to the predominant status of [-n], as stated in Rice (2007:83).

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.

De Lacy (2006:79) also states that “markedness reduction (i.e. to be less marked) is often the driving force in determining the feature content of epenthetic consonants.” Coronal PoA is often viewed as the most unmarked, so it is reasonable for the inserted nasal suffix to be [-n]. At the present, why the unmarked PoA emerges in the nasalized diminutives has been definite; how can this markedness hierarchy be put into the POC analysis? The hierarchy can be expressed by the three PoA constraints in (16a) and the pair-wise interactions among them in (16b). The interactions establish the substantial grammatical restrictions for [n]-suffixed diminutives in the Wu and Hui dialects. They can be placed into “…” in (15), and reproduced here as (17).

(16) (a) Constraints for PoA: *labial, *dorsal, *coronal
    (b) Pair-wise Constraint Interaction for [labial > dorsal > coronal]
        *labial >> *dorsal
        *labial >> *coronal
        *dorsal >> *coronal
As for the second issue, if [n] is the least marked, why does [ŋ] emerge? Note that the suffix [ŋ], to my knowledge, exists only in the Wu dialects. The arguments for [ŋ] can be expressed as follows. First, the suffix [ŋ] may bear a close
relation with the historical development of nasal rimes. As previously stated, nasal codas are merged predominantly into [ŋ] in Wu, which may motivate the diminutive suffix to surface as [ŋ]. Second, Cao (2002) states that nasals are key elements for recognizing nasalized diminutives, and more nasality will surely lead to much easier recognition. As far as nasality is concerned, [ŋ] is stronger than [n] on account of more airflow in the nasal cavity during production. On the basis of Ohala and Lorentz (1977), [m], [n] and [ŋ] can be distinguished by their different size of the oral cavity, as shown in (18).

(18) Vocal Tract Shapes for [m], [n], [ŋ] (Ohala and Lorentz 1977:586)

According to (18), when nasals are produced, the airflow goes primarily into the nasal cavity (as marked by ●) because of the lowered velum. However, when the oral cavity is larger, more airflow deviates into the oral cavity, and thus more consonantal constriction results. To put it differently, more airflow into the nasal cavity will result in stronger resonance and more salient nasality. If diminutives are to be identified by nasality, it is reasonable that a high degree of nasality in [ŋ] will increase successful recognition. Third, Wang (1999) claims that the emergence of [-ŋ], at least in some dialects, is a later linguistic phenomenon, and is highly related to language contact. He expounds that the strong policy to enforce Standard Chinese brings to other Chinese dialects many linguistic characteristics of Mandarin, one of which is the difference between [n] and [ŋ]. Both [n] and [ŋ]
remain as syllable codas in Mandarin, but they have different phonological behaviors. Take retroflex diminutives in Beijing Mandarin for instance. When retroflex diminutives are formed, vowels in the stems are nasalized when [ŋ] is deleted (e.g. kaŋ + r → kẽ ‘a tub’), but vowel nasalization is not observed in the case of [n] (e.g. pʰan + r → pʰa’ ‘a dish’) (Lu 2001, Wang 1991, Xu 1993). The survival of the [nasal] feature after [ŋ] deletion also implies that [ŋ] is stronger than [n] in terms of nasality. In addition, the gradual shift from [n] to [ŋ] in nasalized diminutives is also a change in progress, as shown in (19).

(19)  

Zhengzhang (1980, 1981) investigates the nasalized diminutives of the Wu dialects in Zhejiang Province, and discovers a generational difference in the use of diminutive suffixes in the Wenzhou dialect. The old generation prefers [-n], while the young generation favors [-ŋ]. Such findings undoubtedly side with the viewpoint of the linguistic influence from Standard Chinese.

The third issue is how to represent the competition between [-n] and [-ŋ]? If [-n] has the least marked PoA, why does [-ŋ] emerge? On the contrary, if [-ŋ] has the strongest nasality, why does [-n] surface? In fact, the variability between [-n] and [-ŋ] can also be expressed by a relation of crucial nonranking, as shown in (20).
On the basis of (20), constraint rankings are totally ranked for [-n] in Stage X (i.e. *labial > *dorsal > *coronal) and for [-ŋ] in Stage Z (i.e. *labial > *coronal > *dorsal). Nevertheless, the ranking of *coronal and *dorsal is undecided in Stage Y, so both [-n] and [-ŋ] are possible, like the case in the Wenzhou dialect. Additionally, the variability between [-n] and [-ŋ] can also be regarded as a conflict between the PoA markedness and the influence form language contact. When the former beats the latter, [-n] dominates [-ŋ]. If the latter is stronger than the former, [-ŋ] surfaces. Besides, the [-n] suffix is widely observed synchronically, but the gradual change from [-n] to [-ŋ] can be predicted as a result of the leading linguistic impact from Standard Chinese. This view can also be captured by traversing from Stage X, via Stage Y, to Stage Z, as schematically shown in (21).

(21) Transitional Stage

Y.  
*dorsal ~ *coronal 
[-n] or [-ŋ]

X.  
*dorsal >> *coronal 
*dorsal >> *coronal  
[-n]

Z.  
*coronal >> *dorsal  
*coronal >> *dorsal  
[-ŋ]
Amusingly, the shift from [-n] to [-ŋ] also arises two additional theoretical issues about the PoA markedness hierarchy of nasals. First of all, although coronals are considered less marked than dorsals cross-linguistically, the reverse view (i.e. velar unmarkedness), even if less popular, is also proposed (Harris 1990, Kaye et al. 1985, van Oostendorp 1999, Rice 1996, 1999a, 1999b, Williamson 1977). For example, Trigo (1988) proposes that velars are the least marked consonant in coda position. Nonetheless, velar unmarkedness is rejected by de Lacy (2006) who states that “the least-marked PoA feature – [glottal] – is usually produced with glottal constriction, but will also be produced with velar-uvular occlusion as a side effect of nasal production (de Lacy 2006:369),” resulting in a glottal nasal [N], so-called ‘placeless nasal stop’. [ŋ] and [N] are similar in both manner and place of articulation, and their difference lies in consonantal constriction in the oral cavity. [N] is articulated without any consonantal constriction in the oral cavity (de Lacy 2006:37-41). The similarities between [ŋ] and [N] usually cause descriptive confusion in the literature. That is, a placeless [N] is usually transcribed as a velar [ŋ], which mistakenly gives rise to velar unmarkedness. 21 If this is the case, the nature of [ŋ] in nasalized diminutives should be further scrutinized articulatorily and acoustically. Probably, it may be a placeless [N]. If it is an [N], it can developmentally pattern with [ʔ] in glottalized diminutives, another kind of diminutives that is extensively observed in such southeastern Chinese dialects as Min, Wu and Yue. 22 There is also another possibility that [ŋ] is developing towards a placeless [N], like the development of [k] into [ʔ] in glottalized di-

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21 For detailed discussion on this issue, please refer to Chapter Eight of de Lacy (2006).
22 According to Chen (1992b, 1999), the glottal stop in glottalized diminutives derived historically from [k] which was, in turn, a degenerate form of the syllabic diminutive suffix [kiaŋ] in Min. [k] and [ʔ] are phonetically similar except that [ʔ] lacks an overt supralaryngeal specification (i.e. placeless). For more discussion about this issue in glottalized diminutives, please see Cheng (2009).
minutives (i.e. [k] → [ʔ]). Obviously, whether this issue can be attested waits for more research endeavors in the future.

Second, markedness hierarchies are relative, depending on different languages and linguistic contexts. Unmarked features can vary or be identified, depending on the system in which they occur (Rice 2007, Trubetzkoy 1969). As a result, according to de Lacy (2006), if there is a universal PoA markedness hierarchy (i.e. [dorsal > labial > coronal]), which PoA eventually surfaces as the least marked depends, to some degree, on other factors, such as language-specific and cross-linguistic occurrence frequency, perceptual salience, ease of articulation, and historical and socio-cultural conditions. Evidently, the case in this study (i.e. [n] → [ŋ]) belongs to the last factor.

6. Conclusion

Chinese languages are often characterized as analytic languages and hence exhibit few alternations induced by affixation processes. This explains why most literature is descriptive, and little theoretical attention is paid to Chinese affixational phonology. This study brings OOC and POC into the analyses of the nasalized diminutives in the Wu dialects, and establishes a connection between descriptive data and theoretical analyses. Not only does it bridge the gap between synchronic variation and diachronic change, but also captures the gradual transitions by two sets of crucial nonrankings (DEP-SD ~ IDENT-SD[nas] and IDENT-SD[nas]~MAX[nas]), both of which are empirically supported from the synchronic Wu dialects. Besides, whether [-n] or [-ŋ] surfaces as the nasal diminutive suffix results from the competition between the PoA markedness (i.e. dorsal > labial > coronal) and language contact with Standard Chinese, and the variability between [-n] or [-ŋ] can also be caught by a set of crucial nonranking (i.e.
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*dorsal ~ *coronal). On the whole, the transitional stages of the nasalized diminutives and the gradual change from [-n] to [-ŋ] are under the regulation of POC. Besides, this study also shows that the variation of diminutives is neither random nor abrupt, but systematic and gradual.
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責任編輯：李正芬
吳語鼻化小稱詞的歷時演變：
「部分排序制約」的優選理論分析

鄭明中 

提 要

漢語方言小稱詞長久以來已為學術界廣泛討論。然而，大部分研究的缺點在於語料與理論脫離、共時與歷時二分。有鑑於此，本研究以優選理論為架構，分析吳語鼻化小稱詞的歷時演變。首先，本文歸納吳語鼻化小稱詞的共時變異及歷時演變階段。隨後，本文利用「輸出－輸出對應」與「部分排序制約」來分析吳語鼻化小稱詞。研究結果顯示，小稱詞的各個階段決定於一組相同制約 (MAX[nas], ANCHOR-SD(L), MAX-SD, IDENT-SD[nas], DEP-SD, *Vnas, *VoralN) 的不同排序。再者，小稱詞演變過程中的過渡階段可以透過兩組「決定性的不排序」 (IDENT-BD[nas]～DEP-BD, IDENT-BD[nas]～MAX[nas]) 來呈現。另外，小稱鼻音尾[-n]或[-ŋ]的選取亦可藉由一組決定性的不排序 (*dorsal～*coronal) 來進行說明。總之，本文不僅解釋語言演變的動機及語言變化的選擇性，更建立語料與理論之間的聯結。

關鍵詞：小稱、鼻化、優選理論、語言演變、吳語

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