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以優選理論分析上海話之入聲變調

An OT Approach to the Tone Sandhi of Checked Syllables in Shanghai

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An OT Approach to the Tone Sandhi of Checked Syllables in Shanghai

BY

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要感謝的人太多了，不如就謝天吧。陳之藩如是說。

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謹以此標誌你我曾經有過的時光，我愛你。

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TABLE OF CONTENTS

CHAPTER 4 YANGRU TONE SANDHI..63

CHAPTER 5 CONCLUDING REMARKS 107

BIBLIOGRAPHY 113

國立政治大學研究所碩士論文提要

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本論文以優選理論探討上海話之入聲變調，試圖將文獻中所認為表現不規律之入聲變調納入與舒聲變調相容之分析中。本研究認為入聲變調與舒聲變調皆受制於 ANCHOR-L($t_{\sigma 1}$, $\acute{\sigma}$)，因此其首音節之基底聲調在輸出值中皆出現於重讀音節。以此觀之，則入聲變調與舒聲變調的差異主要在於節律重音的位置：在舒聲變調中首音節重讀；在入聲變調中重音則後移——在陰入變調中係移至第二音節，在陽入變調中則移至末音節。

本論文提出兩點假設：上海話中舒聲音節為重量音節，入聲音節為輕量音節；節律結構基本上為一位於左端之雙音節音步。據此，本研究提出 COINCIDE ($\acute{\sigma}_{\mu}$, FT-final)，認為陰入變調中重音所以後移至第二音節是因為重讀之輕量音節傾向於由音步末音節核可(licensing)。另一方面，由於陽入的單字調為曲拱調，與陰入的水平調有別，是以本研究另外提出 COINCIDE(Contour, PrWd-final)，此制約顯示陽入變調中重音的遠距移位是為了遵行「曲拱調須由末音節核可」之普遍現象。

綜述之，本論文提供了一個重量音節、節律重音、曲拱調以及邊際位置等韻律顯著位置間彼此對映的實例。此外，本研究亦顯示上海話的連讀變調涉及聲調與重音的互動，是以所提出之分析或許對相關類型之研究亦有所貢獻。

ABSTRACT

This thesis offers an Optimality-theory approach to the tone sandhi of checked tones (TSC) in Shanghai, in an attempt to regulate its surface patterns which have long been considered anomaly as opposed to the tone sandhi of smooth tones (TSS). With a reanalysis in the present study, TSC and TSS arguably have in common that their process of tone mapping is both subject to ANCHOR-L($t_{\sigma 1}$, $\acute{\sigma}$), by which the underlying tone of the initial syllable ends up at the stressed syllable in the output. It follows that TSC is different from TSS in the way that metrical head is assigned: all domains undergoing TSS are stressed on their initial syllable; only in domains of TSC does the stress move rightwards, either to the second place in the tone sandhi of *Yinru* (TSYI), or to the final syllable in the tone sandhi of *Yangru* (TSYA).

Given the assumption that checked syllables and smooth syllables in Shanghai are light and heavy, respectively, in terms of moraicity, and that foot-parsing is binary and left-aligned in general, the one-syllable shift of stress in TSYI can be accounted for by positing COINCIDE($\acute{\sigma}_{\mu}$, FT-final), which sets up the preference for light stress-bearing syllables to be licensed foot-finally. On the other hand, given that *Yangru* in the citation forms represents a rising contour, different from the level tone of *Yinru*, a licensing constraint, namely COINCIDE(Contour, PrWd-final), is further posited so that the long-distance movement of metrical head observed in TSYA emerges to satisfy the requirement for the retained rising contour to be licensed word-finally.

Taken together, this thesis instantiates a remarkable case of the mapping among multiple prominent positions, including heavy syllables, metrical head, contour tones, and edge positions. Also, the present analysis demonstrates that Shanghai tone sandhi involves an interaction between tone and stress, thus a contribution to the general OT

tone-prominence typology literature (cf. Zhang 2001, Barnes 2002, De Lacy 2002).

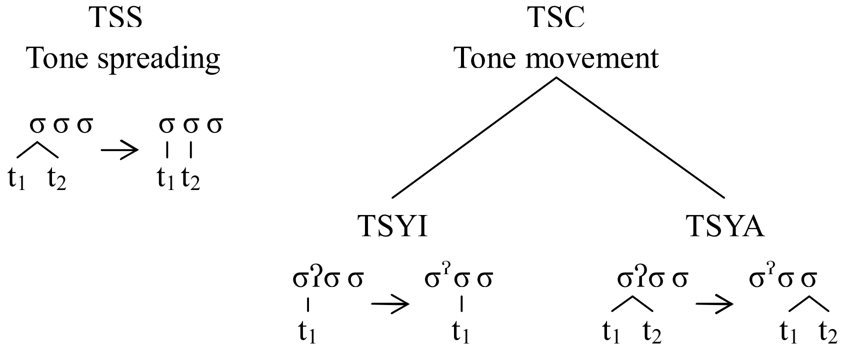
CHAPTER 1

INTRODUCTION

1.1 Preliminaries

Traditional Chinese phonology distinguishes checked tones from smooth tones. A check tone refers to a tone realized on a syllable ending in an occlusive coda (e.g., a glottal stop -ʔ in Shanghai), while a smooth tone, by contrast, refers to a tone realized either on an open syllable, or on a syllable closed by a nasal stop. It is usually noted that checked tones are distinct from smooth tones in their short duration in isolation. For that matter, Shanghai appears to be somewhat marked, as it provides an instance of a case in which checked tones differ from smooth tones not only in the phonetic realizations of the citation forms, but also in the way in which they manifest themselves in the sandhi forms. This thesis addresses the distinctive sandhi process of two checked tones in Shanghai. As an overview, the diagram in (1) illustrates how the two checked tones, *Yinru* and *Yangru*, undergo processes different from those undergone by smooth tones at the initial position of a sandhi domain. The tone sandhi of smooth tones and checked tones are abbreviated as TSS and TSC, and the tone sandhi of *Yinru* and *Yangru* as TSYI and TSYA, respectively.

(1) Overview: Shanghai tone sandhi



Most of the previous analyses of Shanghai have only paid attention to TSS, where the initial contour tone is considered to undergo the process of tone spreading, with all of the non-initial tones being sweepingly obliterated (Selkirk & Shen 1990, Yip 1980, 1995, Duanmu 1993, among others). This approach provides no account of the initial tone which manifests in TSC, however. Specifically, instead of spreading to the next syllable as in TSS, the initial tone in TSC undergoes the process of tone movement – the target tone either shifts one syllable away to the second syllable, as in TSYI, or moves a long way from its lexical source to the final syllable, as in TSYA. Little literature is available on the process of this anomalous movement, and therefore prompts the present analysis.

1.2 Research Questions

The anomaly of TSC shown in (1) raises two research questions to be answered. The first question is what motivates the discrepancy between TSS and TSC as they are supposed to undergo parallel sandhi processes, under the received view that a checked tone and its smooth counterpart can be grouped into a single toneme for their complementary distribution with respect to syllable types (Haas 1958, Roberts & Li 1963, Li, 1966, Chiang 1967, Jones 1967, Xia 1981, Luo 1988, Barrie 2007, among others). The other question concerns TSC itself: with the initial tones staying checked in both cases of TSC, it is then unclear why the landing-site of the tone movement changes from the second position in TSYI to the final position in TSYA. Putting together both of these questions, Shanghai tone sandhi reveals two unmotivated discrepancies in the surface tone patterns, with one between TSS and TSC, and the other between TSYI and TSYA. In consequence, analyses of Shanghai tonology has to be provided to account for this double discrepancy, although such an account is absent in virtually all of the previous works (Chen 2000, Li 2003, Hsieh 2007, among others).

1.3 The Proposal

The aim of this thesis is to provide a unified account of the different positions of the initial tone among TSS, TSYI and TSYA. Given the dual-prominence hypothesis that a lexical tone retained in the sandhi process is realized on the foot-head (Li 2003), I put forward a proposal for the conditions of stress placement in Shanghai, as shown below.

(2) Stress placement conditions

- a. Stress falls outside the first syllable, if
  the first syllable is a checked syllable, which repels foot-heads.

- b. Stress falls on the final syllable, if
  the tone to be realized is a contour tone, which is licensed word-finally.

Since the final syllable is in the scope of non-initial syllables, condition (2a) subsumes condition (2b). In other words, stress placement that meets condition (2b) also meets condition (2a), but not *vice versa*. Condition (2a) reconciles the discrepancy between TSS and TSC with an assumption that checked syllables are as non-prominent as light syllables. It follows that the rhythmic organization is left-prominence in TSS but not in TSC, thus the occurrence of the different positions of the realization of the retained tone. Condition (2b), founded on the positional restriction of contour-tone licensing (Zhang 2001), explains the discrepancy between TSYI and TSYA. Specifically, the foot-head is displaced to word-final in TSYA because the retained tone in this case, *Yangru*, is a contour tone which must be licensed word-finally, in contrast to the case of TSYI where the tone to be realized is level.

Needless to say, the conditions in (2) assume an interaction of stress and tone in both directions: only the foot-head realizes tonal contrasts, and its placement may be influenced by the requirement of a specific tone. Under the derivational tradition, this interaction entails serial operations of metrical system and tonal system. The question is then how the bi-directional interaction between tone and stress can be categorized on a non-derivational basis. For this purpose, this thesis employs a perspective from the Optimality Theory (abbreviated as OT, Prince & Smolensky 1993/2004), which requires that all output candidates be evaluated in parallel. In the present analysis, I will posit a set of metrical constraints and a set of tonal constraints to capture the bi-directional interaction, by which the effect of the conditions in (2) is also attained.

1.4 Thesis organization

This thesis consists of five chapters. The first chapter presents the motivation and research issues behind the current study, also laying out the research questions with a sketch of the major proposal. Chapter 2 reviews some relevant theoretical frameworks, and looks at the previous analyses of Shanghai tone sandhi. Chapters 3 and 4 present the analyses of TSC. Chapter 3 discusses the word-medial stress in TSYI by means of comparison with the word-initial stress in TSS. Chapter 4 addresses the long-distance tone movement and the concomitant word-final stress in TSYA, where a minor process of contour extension is also under discussion. Chapter 5 provides the concluding remarks.

CHAPTER 2

THEORETICAL AND TONAL BACKGROUND

In this chapter we are first to review relevant theoretical background, including Optimality Theory (section 2.1), metrical phonology (section 2.3), and positional prominence within the field of tone mapping (section 2.4). The reviewal will then move on to the previous analyses on Shanghai tonal phonology (sections 2.5), where both Autosegmental approaches and Optimality-theoretic approaches will be scrutinized.

2.1 Optimality Theory

The parts of this section are organized around several components of Optimality Theory (henceforth OT, Prince & Smolensky 1993/2004, McCarthy & Prince 1993a, 1993b, 1995, 1999, inter alia). The first part sets up the basic architecture of OT, and the parts that follow focus on some constraint schemata. In addition, variation in OT is also discussed in this section.

2.1.1 Basics

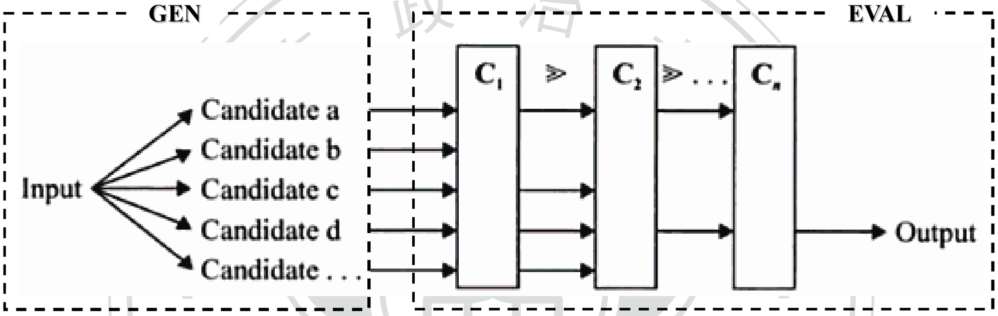
The fundamental notion of OT forsakes the derivational convention in generative grammar in which the context-driven rewrite rules predominate. OT instead advocates parallelism, which means that all possible ultimate outputs are contemplated at once. As a result, the effects of diverse phonological processes are present simultaneously.

OT considers that Universal Grammar (abbreviated as UG) includes a constraint component CON that contains the entire repertoire of violable, rankable and well-motivated constraints. Every constraint in CON is in the grammar of every language, with the ranking of constraints with respect to one another determined on a language-specific basis. These hypotheses follow from the more general assumption that constraint ranking is the only way that languages systematically differ.

Constraints in CON are categorized into two competing forces: markedness and faithfulness. Markedness constraints impinge on the structural well-formedness of the output. The other family, faithfulness constraints, governs the input-output correspondence. For a full discussion of correspondence theory, see McCarthy & Prince (1995b, 1999).

The schema in (1) elucidates the architecture of OT.

(1) Schema of OT



As seen, OT, conspicuously, inherits the input-output or underlying-surface relations from generative phonology. Additionally, this input-output mapping does not proceed in step-by-step fashion. No serious of the rule application is involved. Rather, an input pertains to an infinite number of possible output candidates via GEN. The candidates are submitted in parallel to constraints in CON for EVAL. A higher-ranking constraint can compel the violation of a lower-ranking one; nonetheless, the violation is always minimal, so no constraint is violated more than is absolutely necessary to satisfy the constraints that dominate it in the hierarchy. The candidate that violates the lowest-ranked constraint or does not incur any violation is selected by EVAL as the optimal output. Should there be any output candidate that violates a constraint, the one that incurs the fewest violation-marks of the constraint wins out or is passed down to the next lower-ranked constraint for evaluation.

2.1.2 Alignment, Anchoring and Coincidence

The original idea of Generalized Alignment was defined within the PARSE/FILL/ Containment-based model of Prince & Smolensky (1991, 1993), which posits a single output representation containing information about underlying morphological structure and surface prosodic structure. Generalized Alignment requires a coincidence of the edges of prosodic and/or morphological constituents within the output structure. The schema of Generalized Alignment from McCarthy and Prince (1993a) is given below in (2).

(2) Generalized Alignment (McCarthy and Prince 1993a:2)

Align(Cat1, Edge1, Cat2, Edge2) $=_{\text{def}}$

$\forall$Cat1 $\exists$Cat2 such that Edge1 of Cat1 and Edge2 of Cat2 coincide.

Where

Cat1, Cat2 $\in$ PCat $\cup$ GCat

Edge1, Edge2 $\in$ {Right, Left}

Conceptually developed from the edge coincidence of Alignment, Anchoring was originally introduced by McCarthy and Prince (1993a) as a family of reduplication-specific constraints that require base-initial (or final) segments to have initial (or final) correspondents in the reduplicant – the two strings must be anchored at an edge. With the development of correspondence theory, which allows direct reference to the input (or other related representation), McCarthy & Prince (1995b) point out that some of phenomena originally attributed to Alignment constraints, particularly the faithfulness to the edge-most position of a correspondent segment, should be in fact understood as Anchoring effects. From then on Anchoring has been generally used to capture the special degree of faithfulness accorded to designated edges, both in the IO-domain as well as in BR-relations. The general schema for Anchoring is given in (3).

(3) Anchoring (McCarthy & Prince 1995a):

{RIGHT, LEFT}-ANCHOR(S_1, S_2)

Any element at the designated periphery of S_1 has a correspondent at the designated periphery of S_2.

Let *Edge*(X, {L, R}) = the element standing at the *Edge* = L, R of X.

RIGHT-ANCHOR. If $x = \text{Edge}(S_1, R)$ and $y = \text{Edge}(S_2, R)$ then $x\mathcal{R}y$.

LEFT-ANCHOR. Likewise, *mutatis mutandis*.

Based on (3), Anchoring constraints have the general form ANCHOR(Cat1, Cat2, E) where Cat1, Cat2 range over morphological categories (root, affix word, etc.) and prosodic categories (syllable, foot, PrWd, etc.), and Edge E may be left edge or right edge.

Another constraint family founded on Alignment is Coincidence introduced by Zoll (1996). With conjoining the edge coincidence of Generalized Alignment and a markedness constraint, Zoll defines Coincidence as a family of licensing constraints that dictates the coincidence of the marked structure in question with a prosodically strong constituent. The general formulation of Coincidence is given in (4).

(4) **COINCIDE** (marked structure, strong constituent) (Zoll 1996:147)

(i) $\forall$x (x is marked $\rightarrow \exists$y(y=strong constituent $\wedge$ Coincide (x,y))

(ii) Assess one mark for each value of x for which (i) is false

COINCIDE (x,y) will be true if (i) y=x; (ii) y dominates x; or (iii) x dominates y, where x stands for marked structures that need licensing at some specific position and y stands for prosodically strong constituents that serve as the qualified licensor. Some constituents, such as accented/stressed syllables and long vowels, may be considered strong independently of their location, but others gain prominence only by dint of their peripheral position. To pick out these peripheral constituents the function *{L,R}-most*(P, Q) is used to designates any prosodic constituent (from the prosodic hierarchy) at a designated edge, as in (5).

(5) Prosodic constituents at designated edges (Zoll 1996:149)

Let *{L,R}-most*(P,Q) = the {L,R}-most P in Q, where P,Q are prosodic constituents

Then: *Rightmost*(P,Q) = the rightmost P in Q

Leftmost(P,Q) = the leftmost P in Q

According to (5), a prosodically strong constituent y in COINCIDE(x,y) may refer to a designated edge, which means that the effect of Coincidence constraints involve the notion of edge coincidence as does Generalized Alignment. Nevertheless, Zoll points out that Coincidence constraints crucially differ from Alignment ones in two regards: (a) intrinsically, Coincidence refers to a coincidence of constituents, not of edges; (b) unlike Alignment constraints, Coincidence does not distinguish different degrees of misalignmnent. These differences, as Zoll has demonstrated, make Coincidence fare better than Alignment in accounting for licensing phenomena.

2.1.3 Local (Self-)conjunction

According to Smolensky (cf. 1995, 1997, 2006), every constraint in CON can be conjoined with another constraint, or with itself, to produce a new constraint. This operation provides a rationale for constraints that exclude “the worst of the worst.” A formulation is given here for defining the conjunction of different/identical constraints, as shown in (6), which is adapted from Itô & Mester (1998:10).

(6) Local conjunction of constraints (LCC)

a. Definition

Given a domain δ and two constraints A and B that can be evaluated over the domain δ, the local conjunction of A and B relative to δ is denoted as $[A\&B]_{\delta}$.

Let A and B be members of the constraint set CON; then $[A\&B]_{\delta}$ is also a member of CON.

b. Interpretation

$[A\&B]_{\delta}$ is violated if (and only if) there are *distinct* violations of A and B in a single domain δ.

c. Ranking (universal)

$[A\&B]_{\delta}$ » A

$[A\&B]_{\delta}$ » B

Based on this formulation, if the two constraints conjoined are different, namely A = Cons1 and B = Cons2, then a locally-conjoined constraint $[\text{Cons1}\&\text{Cons2}]_{\delta}$ is derived, which is violated once by any instance of δ that contains a distinct violation of Cons1 and a distinct violation of Cons2. By contrast, if we are conjoining a constraint with itself, so that A = B = Cons1, then the self-conjunction $[\text{Cons1}\&\text{Cons1}]_{\delta}$ – normally written more simply as $[\text{Cons1}]^2$ – is violated once by every pair of distinct violations of Cons1 in a single domain δ.

In sum, local (self-)conjunction $[A\&B]_{\delta}$ permits violations of A and B, as long as the violation of A does not co-occur with the violation of B in a single domain δ. It follows that a locally-conjoined constraint is less stringent in assessing violations than the individual constraints that make up the local conjunction. Given two constraints in a stringency relationship, the less stringent constraint is demonstrably ranked higher than the more stringent one (for an illustrative discussion see McCarthy 2008), hence A and B under the domination of $[A\&B]_\delta$, as the universal ranking in (6c), which says that the violation of a locally-conjoined $[A\&B]_\delta$ is more fatal than the violation of A or B.

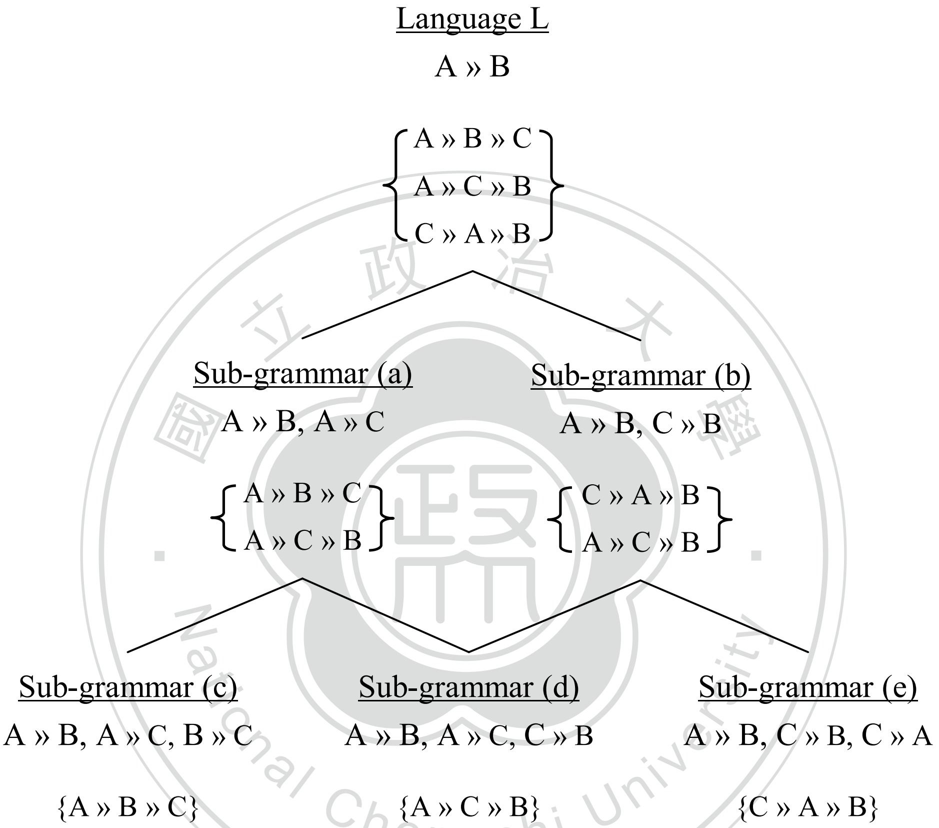
2.1.4 Variation in OT

In classical OT, there is no room for multiple outputs, due to the OT architecture, which selects only one candidate as optimal from a given input. Hence, phonological variation/optionality, which always involves multiple outputs, runs into problems with classical OT, and is one of the central issues for the OT criticism (Vaux 2002, 2006, Bermúdez-Otero & Börjars 2006).

To take account of variation/optionality, recent OT analyses have focused on the function of EVAL/ranking ordering of constraints to obtain the multiple outputs from a single underlying form. There have been various attempts to adapt the OT model in some way to explain free variation, including floating constraints (Nagy and Reynolds, 1997), partially ordered grammars (Anttila & Cho 1998, Anttila, 1997, 2002a), and strictness bands (Hayes, 2000), etc. One of the more successful models to date is the partially ordered model. Under this model, a grammar is defined as a partial order in a set of constraints. "A partial order is a binary relation (i.e. a set of ordered pairs) that is irreflexive, asymmetric, and transitive." (Anttila 2007:527). By this new definition, given three constraints {A, B, C}, then {A » B} qualifies as a grammar, so does {A » B, B » C}. The generalized optimality-theoretical grammars are termed "Partially Ordered Grammars" (abbreviated as POGs). A classical optimality-theoretical grammar is a POG where all the pairs are ordered, e.g., {A » B, B » C, A » C}. Under this view, a language L with internal variations is a POG where only *some* pairs are ordered (i.e.

specified for ranking), and each of the variations in L shares these ordered pairs, with the other unordered ones specified variably. Intra-linguistic variations, hence, serve as the sub-grammars of L. The subset relation is formalized in the grammar lattice in (7).

(7) The formulation of a grammar lattice (Anttila 2002a)



Given three constraints, {A, B, C}, there are a total of six grammars that arise from ordering these constraints in different degrees. Each super-ordinate grammar has less ordered pairs than its subordinate grammar, which is manifested by the intersection of nodes. The partially ordered pairs on each grammar-node can be translated into a set of totally ranked constraints, which is placed in the braces. The more ordered pairs there are, the less variation there is. In consequence, sub-grammars (c), (d), and (e) are the totally ranked grammars that describe invariant dialects, while sub-grammars (a), (b), and the language L, contain intra-linguistic variations. This model provides a theoretical foundation for the re-ranking of constraints, by which OT can be accommodated to the variation/optionality within a single language.

2.2 Metrical Phonology

The parts of this section shortly review several notions of metrical phonology, including bracketed grid, bounded/unbounded foot-parsing, quantity-sensitivity, and stress clash/lapse, all of which are available for the present analysis.

2.2.1 Bracketed Grid

The main assumption of metrical phonology is that stress is a relational property, represented by prominence relations between constituents in hierarchical structures (Liberman 1975, Liberman & Prince 1977, Hayes 1980). This assumption is presented by metrical grid (Liberman & Prince 1977, Prince 1983, Selkirk 1984), a succession of columns of grid elements of different height. Height of columns hints a syllable's relative prominence. As an example, consider (8), the metrical grid of "Apalachicola" [ˌæpəˌlætʃɪˈkoːlə]. Its grid analysis contains six columns, each standing over a syllable. The first, third and fifth columns are taller than the second, fourth and sixth. The fifth column, indicating the culminating peak of the grid, is taller than the first and third.

(8) "Apalachicola" in metrical grid

PrWd-level					x	
Foot-level	x		x		x	
Syllable-level	x	x	x	x	x	x
	ˌæ.	pə.	ˌlæ.	tʃɪ.	ˈkoː.	lə.

The metrical grid can be combined with metrical constituency, which refers to groupings of grid elements at low levels into higher-order elements. Metrical constituency is formally presented by bracketing grid elements by pairs of parentheses. (Hammond

1984, Halle & Vergnaud 1987, Hayes 1995). Each constituent has an obligatory head, represented by a grid-mark at the next-higher level, plus an optional non-head, which has no corresponding mark at the next-higher level. By adding the constituency to the grid in (8), we obtain a bracketed representation in (9).

(9) “Apalachicola” in bracketed grid

PrWd-level					x	
Foot-level	(x		x		x	)
Syllable-level	(x	x)	(x	x)	(x	x)
	ˌæ.	pə.	ˌlæ.	ʧɪ.	ˈkoː.	lə.

At the syllable level, pairs of grid elements are bracketed together by parentheses into three “metrical feet:” (æ.pə), (læ.ʧɪ) and (koː.lə). Rhythmically strong syllables, called “heads,” are initial in those feet, forming “trochaic rhythm.” Each foot projects its head by a mark at the foot level. Elements at the foot level are similarly bracketed together in a single foot with final head, forming “iambic rhythm.” This then projects a grid element at the prosodic-word level, the primary stress of the word.

Hayes (1995) uses a flattened representation of bracketed grid, which collapses three layers into two. Within each constituent, the head is represented by a grid-mark, the non-head by a dot, as shown below.

(10) “Apalachicola” in a flattened bracketed grid

				x	
(x	.)	(x	.)	(x	.)
ˌæ.	pə.	ˌlæ.	ʧɪ.	ˈkoː.	lə.

The flattened grid in (10) can be translated into single-layer representations, as exemplified in (11), where dots indicate syllable boundaries, parentheses, foot boundaries, and square brackets, prosodic-word boundaries. Relative prominence is signified by

IPA-style stress-marks before syllables.

(11) “Apalachicola” in a single-layer bracketed grid

[(ˌæ.pə).(ˌlæ.ʧɪ).(ˈkoː.lə)]

We will primarily use this single-layer representation throughout this thesis, with the duple-layer one in (10) interchanged if necessary. Nonetheless, bear in mind that these simplified representations are based on the hierarchically bracketed grid in (9).

2.2.2 Foot-parsing

As seen in the bracketed grid, stressed syllables serve as the obligatory head of a metrical foot, which implies that the foot-parsing centers upon stress – where there is a stressed syllable, there is a foot that can be construed. The number and position of stress in a word (i.e. rhythmic patterns) varies among stress languages. On one end of the spectrum, there are systems which have multiple stresses in an alternating pattern, with the most prominent, or primary stress, being at or near an edge, and the others being less prominent, or secondary. Since there are multiple stresses, more than one foot is parsed, as shown in the bracketed analysis in (12). The feet contain a stressed syllable and no more than one unstressed syllable, termed “bounded feet.”

(12) Alternating stresses under the bounded foot-parsing

a. [(ˈσσ)(ˌσσ)(ˌσσ)…]

b. […(ˌσσ)(ˌσσ)(ˈσσ)]

On the opposite end of the rhythmic spectrum, we find systems with only one stress at or near an edge in each word. It follows that only a single foot is parsed, which can be represented in two ways. One is to build a non-iteratively parsed bounded foot, as in

(13) (Prince 1985); the other is to employ an exhaustive parsing of all the syllables, as in (14), in which case foot has more than two syllables, consisting of a head and any number of foot non-heads. This type of foot is termed an “unbounded foot,” whence the single-stress systems are known as “unbounded stress systems.”

(13) Single stress under the bounded foot-parsing

a. [(ˈσσ)σσσσ…]

b. […σσσσ(σˈσ)]

(14) Single stress under the unbounded foot-parsing

a. [(ˈσσσσσσ…)]

b. [(…σσσσσˈσ)]

This thesis is not to decide whether the bounded foot-parsing in (13) or the unbounded one in (14) is the correct way of parsing patterns with single stress. Rather, the foot-parsing in different cases will be analyzed individually on the empirical basis.

2.2.3 Quantity-sensitive Stress

Stress prefers to lodge on syllables which have a certain degree of intrinsic prominence. The relevant property is usually syllable weight (i.e. moraic quantity). Long vowels and vocalic diphthongs are always bimoraic, while coda consonants are mora-bearing on a language-specific basis, so (C)VC syllables may count as heavy in one language and light in another. Systems containing stress attraction by heavy syllables are called “quantity-sensitive” stress systems.

In unbounded stress systems that are characterized by quantity-sensitivity, stress falls on the leftmost/rightmost heavy syllable, and in the absence of heavy syllables, on the leftmost/rightmost syllable. Each of the four logical combinations of leftmost/

rightmost in the statement corresponds to attested languages (see Hayes 1995:296ff); the two cases in which the edges are the same are called “default to same edge” (DTS), and the two other cases in which the edges are different are called “default to opposite edge” (DTO), the terminology taken from Prince (1985).

A list of languages fitting each of these gross typological classifications is given in (15). The list is based on those of Hayes (1995:296-297), with additional languages from Walker (1996).

(15) Gross typological instantiations

a. Default to same edge (DTS)

Leftmost heavy/leftmost: Amele, Au, Indo-European accent, Khalkha Mongolian, Lhasa Tibetan, Lushootseed, Mordwin, Murik, Yana

Rightmost heavy/rightmost: Aguacatec, Golin, Kelkar’s Hindi, Klamath, Sindhi, Western Cheremis

b. Default to opposite edge (DTO)

Leftmost heavy/rightmost: Komi Yaz’va, Kwakw’ala

Rightmost heavy/leftmost: Chuvash, Classical Arabic, Eastern Cheremis, Huasteco, Kuuku-Yaʔu, Selkup

To take the first cases in (15a) and (15b) each as an example, the table in (16) elucidates the difference between DTS and DTO systems. What these two systems have in common in this table is that stress falls on the leftmost heavy syllable, if any. They differ in forms containing purely light syllables: stress falls on the leftmost syllable in DTS, but on the rightmost syllable in DTO. Note that Σ denotes a heavy syllable, σ a light syllable. Since the foot-parsing for unbounded stress systems is undecided, the forms in (16) are exempted from foot-bracketing.

(16) Illustrations of DTS vs. DTO

	DTS	DTO
Forms with heavy syllables	σσˈΣσΣσ	σσˈΣσΣσ
Forms without heavy syllables	ˈσσσσσσ	σσσσσˈσ

An excurses: although usually a strict division into quantity-sensitive and quantity-insensitive systems is assumed, stress systems actually fall into finer-grained classes, showing various degrees of quantity-sensitivity, with a range of intermediate positions (Kager 1992a, 1992b, Alber 1997).

2.2.4 Stress Clash and Lapse

Stress languages present a preference for well-formed rhythmic patterns, where stressed syllables and unstressed syllables are spaced apart at regular intervals. This is manifested by avoidance of "stress clash," or by avoidance of "stress lapse." Stress clash results from adjacent stressed syllables, which can be formally defined in terms of metrical grid as a situation of adjacent strong beats without an intervening weak beat at the next-lower level (Liberman 1975, Liberman & Prince 1977, Prince 1983; Selkirk 1984), as shown below.

(17) Stress clash

n+1	x	x
n	x	x

By contrast, a lapse is a sequence of unstressed syllables, which can be defined as the adjacency of two grid elements at level n, without either having a level n+1 counter-part, as in (18).

(18) Stress lapse

n+1
n x x

Stress clash and lapse are rhythmic outcomes, independent of foot structure. They are generally marked configurations so that stress languages often avoid them employing an alternating rhythm. Nonetheless, they may be less marked in some contexts. Chen (2000) provides the insight that clash is more tolerable at word-end. Kager (2001), on the other hand, hypothesizes that lapses become less marked in two positions: word-finally and adjacent to the main-stressed syllable. This notion of licensing restriction will motivate the present analysis in Chapter 4.

2.3 Positional Prominence in Tone Mapping

It is acknowledged that certain positions such as syllable onset, stressed syllables and root-initial syllables, etc. are singled out by phonology as privileged. One of the diagnostics of positional privilege is the licensing of phonological contrasts in those positions, which are neutralized elsewhere (Beckman 1998). The privileged positions enjoy some perceptual advantage in the processing system, via either psycholinguistic or phonetic prominence, over the complement set of non-privileged positions (see also Barnes 2001).

In the present study we are primarily concerned with positional prominence in the domain of tone mapping. Studies on Chinese tone sandhi phenomena have shown that such positional asymmetries also obtain in tone mapping, by which tonal contrasts are preserved in certain prominent positions, but neutralized elsewhere.

There have been two approaches in the literature to positional prominence in tone mapping. The first one is traditional, assuming that only a single prominent position, either peripheral or metrical, plays a part in tone mapping. For example, in almost all analyses of Shanghai tones it is assumed, explicitly or implicitly, that the domain- initial stressed syllable preserves its lexically associated tone and that the non-initial unstressed syllables lose their tones (Zee & Maddieson 1979, Yip 1980, Selkirk & Shen 1990, Duanmu 1993, Zhu 1995, Chen, 2000).

In contrast to the single-prominence theory above, Li (2003, 2005) proposes an idea of dual prominence. From observing the tone movement in the tone sandhi of the Chinese Zhenhai dialect, he draws evidence on his proposal in which two points are made: (a) both metrical prominence (associated with head position) and edge prominence (associated with peripheral positions) in a domain of tone mapping have to be referred to by the phonology; and (b) phonological patterns of tone retention and realization emerge from the interaction of such different kinds of positional prominence; namely, tone preservation at the edge-prominent position, and tone realization at the metrical prominent position. In other words, tone movement under this view can be considered a tonal process where the underlying tone of a syllable at one edge of a sandhi domain is preserved, but surfaces on the stressed syllable at the other edge in the same domain. By contrast, the single-prominence theory cannot deal with tone movement in any obvious way.

Under the dual-prominence assumption, Li argues that a simplistic typology of tone-prominence interaction can be generated, as shown below in (19)

(19) Simplistic tone-prominence typology (Li 2003: 104)

Tone retention and tone realization:

a. in different positions → tone movement

  – *initial* retention, realization on *final* stress (Zhenhai)

  – *final* retention, realization on *initial* stress (Wenzhou)

b. in same position → no tone movement

– *initial* retention, realization on *initial* stress (Shanghai, Suzhou)

– *final* retention, realization on *final* stress (Xiamen, Yantai)

It is noteworthy that in (19), Shanghai tone sandhi is grouped under the category in which tone retention and realization is in the same position, and therefore no tone movement occurs.

2.4 Previous Analyses of Shanghai Tone Sandhi

The major task of this section is to review the previous works on Shanghai tonal phonology. Beginning with an introduction to the tonal inventory of Shanghai, I will in turn discuss two approaches that used in the literature – an autosegmental approach (section 2.4.2), and an OT approach (section 2.4.3).

2.4.1 Tonal Basics

According to the literature (Xu et al. 1981, Xu et al. 1988, Qian 1992), Shanghai contains five lexical tones in citation forms, with three of smooth (*Yinping*, *Yinqu* and *Yangqu*) and two of checked (*Yinru* and *Yangru*). Smooth tones are solely carried by smooth syllables (i.e. open syllables and syllables closed by a nasal), whereas checked tones are, in complementation, carried exclusively by checked syllables (i.e. syllables ending in a glottal stop.) Checked tones are for this reason significantly shorter than smooth tones. The following table shows the distribution of the five tones with respect to syllable types[1].

---

[1] The transcriptions of the tones in Chao's tone letters differ slightly in different sources. For example, *Yinping* is transcribed as 51 or 52 by different authors. Nonetheless, the same contour shape can be inferred; the tones are for this reason transcribed here in an impressionistic way. For a discussion of some limitations regarding the use of Chao's tone letters, please refer to Duanmu (1990, 103ff).

(20) Citation tones in Shanghai

Tonal types	**Smooth tones**			**Checked tones**	
Syllable types	CV, CVN			CVʔ	
Tonal categories	*Yinping*	*Yinqu*	*Yangqu*	*Yinru*	*Yangru*
Tonal values	HL	MH	LH	Hʔ	LMʔ

As a typical Wu Chinese Language, the five tones are divided into the high register and the low register. It has been instrumentally confirmed that such a register contrast is tightly related to phonation differences in Shanghai (Cao & Maddieson 1992, Ren 1992, Zhu 1999). More specifically, low-register tones occurs only on syllables with breathy voice (or murmur, I shall use them interchangeably), while high-register tones are compatible with syllables with modal (clear) phonation. The tone-phonation correlation is rooted in a well-known fact: breathy voice lowers F_0 (see Hombert 1978, Homber et al. 1979, Gordon & Ladefoged 2001, Silverman 2002).

In addition, Ren (1992), through a series of acoustic measurements, perception tests, and physiological investigations, arrived at the conclusion in (21). In brief, he argues that such contrasts are manifested neither on the vowel nor on the tone because murmur is most salient in the vocalic onset and fades away before the middle point of a vowel. In particular, if murmur were represented with a feature under the tonal node (Yip 1993), it would be expected that breathy voice lasts throughout the entire tone-bearing portion. Therefore, phonation is the inherent property of the onset consonant. (marked with ‘ ̤’ underneath a consonant). Zhu (1999) further notes that the modal vs. murmur distinction is attested in sonorants and onsetless vowels as well.

(21) Phonation contrasts among the obstruent categories (Ren 1992:150)

	Initial position		*Non-initial positions*	
	Phonation type	Tonal register	Phonation type	Tonal register
taa	More adducted	H-register	More adducted	Neutralized

	Voiceless		Voiceless	
t̤aa	More abducted	L-register	More abducted	Neutralized
	Voiceless		Voiced	
t^haa	Most abducted	H-register	Most abducted	Neutralized
	Voiceless		Voiceless	

As (21) indicates, the phonation distinction and the register contrast are restricted to the initial position. In non-initial positions, murmur is lost, resulting in obstruent voicing and, more importantly, the neutralization of the tonal register.

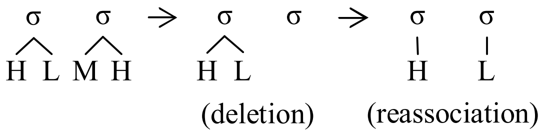
2.4.2 An Autosegmental Approach

2.4.2.1 Tone Sandhi of Smooth Tones as Deletion and Reassociation

Despite the fact that Shanghai is probably the best-documented Wu Chinese Language in the phonological literature, most of the previous analyses have only focused on the tone sandhi of smooth tones (TSS, see Zee & Maddieson 1979, Yip 1980, 1989, Wright 1983, Selkirk & Shen 1990, Duanmu 1993, 1994b, among others). Virtually all of the works agree that TSS is derived from a two-step process from the perspective of autosegmental phonology (Goldsmith 1976, Pulleyblank 1986): (a) deletion of non- initial tones, and (b) re-association of the remaining initial contour tone to the syllable string from left to right in a one-to-one fashion, as illustrated in (22).

(22) Derivation: *Yinping* + T

k^he.sɨ *'boiled water'*



This analysis appears to entail the assumption that syllables are the tone-bearing unit (TBU), as posited implicitly by most analysts (for example, Selkirk & Shen 1990). However, Duanmu (1993, 1994b) argued for a different view of the TBU of Shanghai, in an attempt to explain why the re-distribution of contour tones occurs in Shanghai, and not in Mandarin. Two assumptions were made in his work for this purpose: (a) the TBU is mora instead of syllables in Chinese dialects, and (b) syllables in Shanghai are monomoraic, different from the case of Mandarin where most syllables (specifically, non-neutral-toned syllables) are bimoraic. Given these assumptions, Duanmu claimed that the contour re-distribution in (22) can be treated simply as a result of a one-to-one mapping between tone segments and TBUs.

The evidence drawn by Duanmu in support of those assumptions is the fact that Shanghai contains fewer bi-segmental rhymes than Mandarin. However, in Chapter 3 I will argue that such evidence is insufficient to assert that all syllables in Shanghai are light syllables, and as the present analysis will show, contour re-distribution may be unnecessary to be explained by stipulating mora as the TBU.

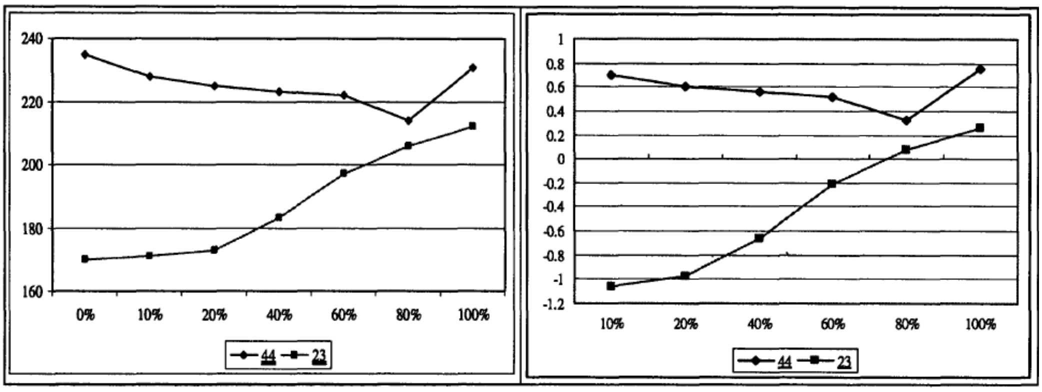
2.4.2.2 Yinru and Yinqu

Whether the TBU is posited to be syllable or mora, the traditional deletion-*cum*-reassociation approach to TSS fails to derive the tone sandhi of checked tones (TSC), especially in the case of *Yinru*, where the surface contour, M-H, has little to do with the initial level tone, H. Consequently, to account for the sandhi-patterns of *Yinru*, the traditional analysis has posited that both the presence of the M on the first syllable and the H on the second syllable ought to have their source underlyingly, therefore the need to posit a putative underlying representation that never occurs as a citation tone, i.e. /MH/. This assumption leads to a merger of different tonal categories: *Yinru* and *Yinqu* are underlyingly identical. This merger is consistent with the received view that a checked tone is an allotone of some smooth counterpart. Needless to say, having posited the tonal value of *Yinqu*, /MH/, as the underlying tone for *Yinru*, an extra rule is required to derive from it to the actual citation tone: /MH/ → [H], which is specific to the context of checked syllables. This is basically the analysis – with minor variations – of all current proposals (see Zee & Maddieson 1979, Yip 1980, Wright 1983, Selkirk & Shen 1990, Duanmu 1993, Jin 1997, Li 2003, among others).

Although this modus operandi is quite standard in linguistic practice, I submit that this putative base form is not only "nothing but an artifact of the conventional analysis" in the words of Chen (2000:224), but also brings in an asymmetry between the checked tones in two regards. First, given that *Yinru* and *Yangru* are carried by checked syllables in citation forms, it is quite puzzling that the contour-reduction rule is applied to the underlying contour tone of *Yinru*, but is blocked for that of *Yangru*. Second, if both the checked tones are rising contours, a question arises as to why they behave differently in the sandhi process. Such problems reveal that to posit an abstract underlying form identical to what is manifested in *Yinqu* is of no help in accounting for TSC with the deletion-*cum*-reassociation analysis.

On the other hand, there are two arguments against the hypothesis that *Yinru* is only an allotone of *Yinqu* in Shanghai. First, according to Ping's (2001b) experimental results, *Yinru* is phonetically implemented as a level tone, different from *Yinqu* and the other checked tone, *Yangru*, which are undoubtedly rising tones. The F_0 tracings for the checked tones in isolation are shown below, where the normalized F_0 curves are plotted against normalized time and so are logarithmic Z-scored (LZ) normalized F_0 trajectories. Note that in the case of Shanghai, a contour tone requires at least a pitch excursion of 1 in LZ, according to the criterion set by Hsieh (2007: 81).

(23) Normalized F0 (in Hz) and LZ Normalized F0 for citation checked tones



The (LZ-)normalized F0 tracks show that *Yinru* is a high-level tone (44). Note that "the final pitch jump is presumably due to the glottalization" (Hsieh 2007: 79).

The other argument is drawn from the sandhi process in Old Shanghai, which can be heared only from people over 70 years old nowadays. The table in (24) shows that in Old Shanghai, the tone sandhi of *Yinru* is not parallel to that of *Yinqu*. As far as disyllabic domain is concerned, when the second syllable carries *Yinshang*, *Yinqu*, or *Yangqu*, the tone sandhi of *Yinru* exclusively surfaces as H-H, but the tone sandhi of *Yinqu* surfaces as another two sandhi patterns more commonly – M-HM and H-HL. The asymmetry is more apparent when the second syllable carries checked tones: the surface tone pattern for *Yinru* tone sandhi is M-H, whereas the pattern for *Yinqu* tone sandhi is M-HL. These asymmetries appear to be in disfavor of the view that *Yinru* is grouped as the same toneme with *Yinqu* in Shanghai.

(24) *Yinqu* tone sandhi vs. *Yinru* tone sandhi in Old Shanghai

σ2 σ1	*Yinping*	*Yinshang*	*Yinqu*	*Yangqu*	*Yinru*	*Yangru*
Yinqu	M-HL	M-HL H-H	H-HL H-H		M-HL	
Yinru	M-HL	H-H	H-H		M-H	

2.4.3 An OT Approach

In the literature, the OT approach to Shanghai tonology is twofold. One is to recast the deletion-*cum*-reassociation analysis in a non-derivational framework, works of which attribute the initial-tone preservation and the contour-tone re-distribution to positional faithfulness and positional markedness. For instance, Yip (2002) assumes that the initial syllable in Shanghai receives the metrical head, so that the preservation of the initial tone in the sandhi process can be explained with a higher-ranked faithfulness constraint sensitive to the head position, MAX-HEAD-TONE. To account for the split of the initial contour, Yip further proposes LICENSE-CONTOUR, which is on the empirical basis that contour tones prefer to be licensed at the final position (cf. Zhang 2001; for other contour-licensing constraints, see Li 2003, Zoll 2003, inter alia).

This analysis itself runs into problems, however. On one hand, faithfulness constraints like MAX-HEAD- TONE entails that the metrical structure has been built in the input, which contradicts the basic premise in OT that phonological processes such as syllabification, metrification, etc. arise from the interaction of output-oriented constraints. On the other hand, what the contour-licensing constraints can do is nothing but to split the initial contour tone into level tones, the deployment of which is irrelevant to this constraint. Then, in face of a domain containing more than two syllables, it is impossible to guarantee that the general sandhi pattern in Shanghai, where the initial contour tone is re-distributed over the first two syllables, can be derived as expected. Nonetheless, in the present analysis, positional faithfulness and positional markedness will be deemed the crucial factors in Shanghai tonology, and the problems they may cause will be one of those that we shall settle.

In addition to recasting the traditional deletion-*cum*-reassociation analysis, a few of the previous studies also employ the perspective of OT to cope with the tone sandhi of checked tones (TSC), which fails to be interpreted in a deletion-*cum*-reassociation way. The relevant analyses can be grouped into two, with one treating TSC tones as a sub-grammar or minor system, and the other as a result of a single constraint ranking. Both of them are discussed in what follows.

2.4.3.1 A Different Ranking for TSC

Chen (2000) regards TSC as the tonal manifestation of the weak~strong accentual pattern. Under this view, the high-pitch tone on the second syllable derived from TSC is the phonetic realization of the pitch accent. This analysis implies that TSC is a different system from TSS, since the pitch accent requires a set of constraint ranking regarding the stress-driven tone, say, *Hd/L » *Hd/M » *Hd/H (de Lacy 2002), which must be ranked higher than other tone-placement constraints in TSC, and must be ranked lower in TSS. That is, an account of different systems calls for constraint reranking, which is not favorable in the OT literature, though.

The pitch-accent analysis incurs another problem. Given that Shanghai is widely acknowledged to present a left-prominent system, then something must be said about the pitch accent on the second syllable. Accordingly, by assuming checked syllables and smooth syllables are heavy and light, respectively, Chen argues that the accent, or stress, does not fall on the leftmost syllable in TSC because that syllable is a checked syllable. To capture this phenomenon of quantity-sensitivity, he posits that the weight-to-stress constraint WSP (Prince 1990, defined in (25b)) crucially dominates the left-prominence constraint LEFTMOST, (defined in (25a)), as shown below.

(25) a. LEFTMOST: Assign stress on the leftmost syllable.

b. WSP: Stress cannot fall on a light syllable.

(26) Right-prominence in TSC (cf. Chen 2000:222)

$\sigma_{\mu}\sigma_{\mu\mu}$	SWP	Leftmost
☞a. $\sigma_{\mu}\acute{\sigma}_{\mu\mu}$		*
b. $\acute{\sigma}_{\mu}\sigma_{\mu\mu}$	*!	

This constraint ranking, however, leads to a couple of unwanted predictions, as listed in (27), all of which are unattested in Shanghai. Therefore, the pitch-accent analysis appears to be insufficient empirically.

(27) Wrong predictions made by the constraint ranking in (23)

a. The position of the stress holds consistent, whether the initial syllable carries *Yinru* or *Yangru*.

b. In forms lacking smooth syllables, the tress falls on the initial syllable.

c. In *Yinru* tone sandhi, the stress falls on the third syllable if that syllable is a smooth syllable.

d. In trisyllabic *Yangru* tone sandhi, the stress falls on the second syllable if that syllables is a smooth syllable.

In addition to Chen, Li (2003) also treats TSC as a distinct sub-system, so his analysis suffers from the same defect: the discrepancy between TSC and TSS cannot be attained without re-ranking some constraints. To make matters worse, Li's analysis can only interpret *Yangru* tone sandhi, leaving *Yinru* tone sandhi unsolved.

2.4.3.2 A Single Ranking for TSC and TSS

To account for the contour-tone displacement in *Yangru* tone sandhi, Hsieh (2007) proposes a smooth-syllable-specific Ident(T), written as Ident(T)$_{\text{InitialLongSyll}}$. The line of reasoning is that smooth syllables are longer than checked syllables, so it is reasonable that the preservation of tonal identity is more important as far as smooth syllables are concerned. With this constraint higher than other tonal faithfulness constraints (e.g., the relational correspondence, RELCORR(x<y)), the displacement of the initial contour tone in *Yangru* tone sandhi is attained, without the resort to constraint re-ranking. In sum, although Yinru tone sandhi remains unsolved under the proposed constraint ranking, this account founded on a single ranking appears to be preferable than the previous ones.

CHAPTER 3

YINRU TONE SANDHI

3.1 Descriptive Basics of Shanghai Tone Sandhi

Overall, tone sandhi in Shanghai is typical of the left-dominant tone systems in Yue-Hashimoto's taxonomy (1987): only the initial tone matters in determining the surface tone pattern of the entire domain, regardless of the syllable counts therein; the underlying tones of the non-initial syllables are irrelevant and are lost in the process of tone sandhi. It is then possible for two otherwise contrastive tones to be completely neutralized if they occur after the same initial tone. As illustrated in (1), for example, an underlying contrastive pair, sɨ^{HL} 'book' in (1a) and sɨ^{MH} 'water' in (1b), associated with *Yinping* and *Yinqu* respectively, become non-contrastive with respect to their tone values when preceded by another syllable which is domain-initial and happens to be lexically associated with a tone in the same tonal category, say, *Yangqu* in this case.

(1) Neutralization of non-initial tones

a.	du 'picture'	+	sɨ 'book'	=	du.sɨ 'storybook'
	LH		HL		L-H
b.	du 'big'	+	sɨ 'water'	=	du.sɨ 'flood'
	LH		MH		L-H

Hence, Shanghai tone sandhi is remarkably different from other Chinese dialects in that the number of possible distinct tonal strings does not increase with the number of syllables. Rather, the tonal string remains invariant under the condition that the initial tone is identical. It follows that given the five lexical tones in Shanghai, the possible distinct tonal strings of a polysyllabic domain (of no matter how many syllables), can be reduced to only five tone-sandhi patterns, with three of smooth tones and two of checked tones, depending on which lexical tone the initial syllable carries. The tone-sandhi patterns of smooth tones (TSS) are, under the traditional account, quite regular and transparent relative to the tone-sandhi patterns of checked tones (TSC), which are further comprised of two diverse sandhi patterns different in the derivation – the tone sandhi of *Yinru* (TSYI) and the tone sandhi of *Yangru* (TSYA). For ease of discussion, the description of these patterns will be broken down into three parts: the regular TSS is briefly sketched in section 3.1.1, and section 3.1.2 is devoted to one of the irregular TSC, namely, TSYI. The details of the other irregular pattern, TSYA, will be deferred until Chapter 4.

3.1.1 TSS as Tone Spreading

When the initial syllable in a given domain carries one of the three smooth tones, namely *Yinping*, *Yinqu* and *Yangqu*, the syllabic string of such domain surfaces as one of three TSS patterns. As shown in (2), the initial contour tone splits into two halves over the first two syllables in all of the TSS patterns, with the first half *in situ*, and the second half right on the following syllable. In other words, TSS appears to be an extension of the initial contour, of which the array of data given in (3) is illustrative.

(2) TSS patterns: Qian (1992: 619)

Initial σ		σσ	σσσ	σσσσ
Yinping	**HL**	**H-L**	**H-L**-L	**H-L**-L-L
Yinqu	**MH**	**M-H**	**M-H**-L	**M-H**-L-L
Yangqu	**LH**	**L-H**	**L-H**-L	**L-H**-L-L

(3) Examples of TSS

a. *Yinping*

	kʰe.sɨ	kʰe.mu.səʔ	kʰe.ŋe.wu.tɕy
	‘boiled water’	‘opening ceremony’	‘avaricious person’
base	**HL**-MH	**HL**-MH-Hʔ	**HL**-LH-HL-HL
sandhi	**H**-**L**	**H**-**L**-Lˀ	**H**-**L**-L-L

b. *Yinqu*

	ɕjɔ.niɲ	ɕjɔ.tsʰaʔ.lɔ	ɕjɔ.ka.ba.tɕʰi
	‘child’	‘buster’	‘shabby’
base	**MH**-LH	**MH**-Hʔ-LH	**MH**-HL-LH-MH
sandhi	**M**-**H**	**M**-**H**ˀ-L	**M**-**H**-L-L

c. *Yangqu*

	ɲ̍.zəʔ	ɲ̍.ti.tsoŋ	ɲ̍.he.loʔ.tsoŋ
	‘fifty’	‘five o’clock’	‘heavily swollen’
base	**LH**-LMʔ	**LH**-MH-HL	**LH**-HL-LMʔ-MH
sandhi	**L**-**H**ʔ	**L**-**H**-L	**L**-**H**-Lˀ-L

In derivational terms, the patterns of TSS are derivable via tone deletion and tone spreading in a straightforward way. Tone deletion eliminates all but the initial tone; tone spreading then re-aligns the remaining tone segments with the syllables in a left-to-right, one- to-one fashion. Syllables left toneless after the tone spread, if any, are linked to L by default (Selkirk & Shen 1990, Yip 1980, 1995, Duanmu 1993, among others). This derivation is illustrated by examples like the following.

(4) Derivation of TSS

	ɕjɔ.niɲ	ɕjɔ.ka.ba.tɕʰi
	‘child’	‘shabby’
base tones	MH.LH	MH.HL.LH.MH
tone deletion	MH. o	MH. o. o. o
tone spread	M. H	M. H. o. o
default L	--	M. H. L. L

o = unspecified for tone

Although this derivation is applicable throughout the TSS patterns as we have seen, it runs into problems when a tonal string begins with a checked tone, which will be demonstrated first through one of the checked tones, *Yinru*, in the next section.

3.1.2 TSYI as Tone Movement

When the domain-initial syllable is associated with *Yinru* (i.e. the high-register one of the two checked tones), the polysyllabic string of the entire domain invariably has a tonal envelope of TSYI. Consider the pattern in (5), where TSYI always has a M on the first syllable and a H on the second syllable, no matter how many syllables are included in the domain, of which the data is laid out below.

(5) TSYI pattern: Qian (ditto)

Initial σ		σσ	σσσ	σσσσ
Yinru	Hʔ	**M**^{ʔ}**-H**	**M**^{ʔ}**-H**-L	**M**^{ʔ}**-H**-L-L

(6) Examples of TSYI

a. disyllabic

	ɪʔ.dɔ	haʔ.kaŋ
	‘together’	‘to utter nonsense’
base	Hʔ-LH	Hʔ-MH
sandhi	**M**^{ʔ}**-H**	**M**^{ʔ}**-H**

b. trisyllabic

	ɪʔ.pe.ɕiɲ	haʔ.le.le
	‘in general’	‘to act recklessly’
base	Hʔ-HL-MH	Hʔ-LH-LH
sandhi	**M**^{ʔ}**-H**-L	**M**^{ʔ}**-H**-L

c. quadrisyllabic

	ɪʔ.t^{h}i.sɨ.ka	haʔ.se.o.sɨ
	‘all over the place’	‘to talk through one’s hat’
base	Hʔ-HL-MH-MH	Hʔ-HL-LH-MH
sandhi	**M**^{ʔ}**-H**-L-L	**M**^{ʔ}**-H**-L-L

Clearly, the derivation behind TSYI is not so transparent as that of TSS. Recall that TSS patterns are derived by spreading the initial tone, giving rise to a strong link between the tone segments lexically associated with the initial syllable, and the tonal shape of the first two syllables in the sandhi domain. Such a link, however, appears not to be found in TSYI, where the melodic shape over the first two syllables surfaces as a rise composed of M and H, which seems to have little to do with the underlying level of the initial syllable. It follows that the deletion-cum-spreading approach fails to derive TSYI, as exemplified in (7), where the spreading of the initial H is applied, as in (7a), or is blocked, as in (7b), after tone deletion. In either way, the wrong results are obtained, however. This failure, therefore, makes the derivation of TSYI relatively opaque and anomalous.

(7) Deletion-cum-spread derivation: wrong prediction

a. with spreading

	ɪʔ.dɔ	haʔ.le.le
	‘together’	‘to act recklessly’
base	Hʔ.LH	Hʔ.LH.LH
tone deletion	Hʔ. o	Hʔ. o. o
tone spreading	*H^{ʔ}. H	Hʔ. H. o
default L	--	*H^{ʔ}. H. L

b. without spreading

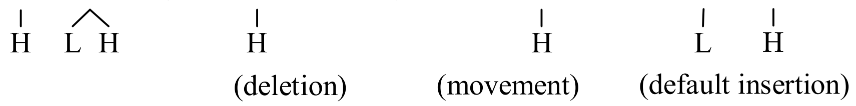
	ɪʔ.dɔ	haʔ.le.le
	‘together’	‘to act recklessly’
base	Hʔ.LH	Hʔ.LH.LH
tone deletion	Hʔ. o	Hʔ. o. o
tone spreading	--	--
default L	*H^{ʔ}. L	*H^{ʔ}. L. L

To accommodate TSYI to the deletion-*cum*-spread derivation, the traditional analysis has posited that both the presence of the M on the first syllable and the H on the second have their source underlyingly; in other words, there is the need to assume that *Yinru* is phonemically an allotone of *Yinqu*. Their underlying forms are equally /MH/. However, as we have argued in Chapter 2, such an assumption is denied by the experimental results provided by Ping (2001b), and by the asymmetrical sandhi process of *Yinru* vs. *Yinqu* in Old Shanghai. What is worse, to posit that *Yinru* is underlyingly a rising tone may lead to unreasonable discrepancies between the checked tones. Thus, we cannot resort to an abstract underlying form to account for TSYI.

Although the pattern of TSYI is not derivable in the traditional fashion, I suggest that a generalization of TSYI is possible in reference to the notion of tone movement. More precisely, I assume that the H on the second syllable originates from the underlying tone of the initial *Yinru*, while the "extra" M on the first syllable is derived from a default L whose register is raised to [+upper] due to the co-occurrence restriction with the non-murmur onset, as is portrayed in (8). The landing-site of the movement is always the second syllable, with the following syllables left for default L; that is, the initial tone undergoes a process of *local* movement in TSYI. Note particular that default Ls are only raised to M when it is inserted in the first position, due to the fact that the distinction between murmur and clear phonation is restricted to word initial in Shanghai.

(8) Derivation of TSYI

ɪʔ.dɔ 'together'



The account of tone movement, while attainable in this case, may be somewhat *ad hoc* since it raises a question in comparison with the tone-spread patterns of TSS: why is the initial tone segment(s) positioned *in situ* – at least partially – through TSS, but backwards in the second syllable through TSYI? More precisely, what motivates the movement applicable to the initial *Yinru*, and not to the initial tone that belongs to one of the smooth tones? We will turn to this issue next.

3.2 (Non-)coincidence of Dual Prominence

Similar to other phonological processes, in Chinese tone sandhi the mapping of tones is also subject to a distinction between prominent positions and non-prominent positions. Prominent positions are privileged to license tonal contrasts through either phonetic or psycholinguistic advantages, making the tonal contrasts in the underlying form survive tone-sandhi processes; non-prominent positions, on the other hand, are the complement set, and are relatively impotent in preserving underlying tonal contrasts from neutralization.

As reviewed in Chapter 2, section 2.3, Li (2003, 2005) proposes, with evidence drawn from the tone movement in the Chinese Zhenhai dialect, that there are two sorts of positions singled out by the phonology as prominent in Chinese tone sandhi, referred to by Li as "dual prominence." One is "metrical prominence," associated with stressed syllables, or foot-head positions, in the metrical structure; the other is "edge prominence," associated with peripheral positions of a syllabic string, thus including the parameters of the left/right edge. The two kinds of prominent positions militate against the neutralization of underlying tonal contrasts in different but complementary ways. The edge prominent position, left or right, serves as the privileged position in which the underlying tone can be invariantly retained; the metrical prominent position is more favorable for the retained tone to realize in the surface. Hence, when the two kinds of prominence happen to coincide in the same position, the underlying tone is preserved and realized therein; if the edge prominence is located at one position with metrical prominence at another, then the underlying tone retained at either edge would be realized somewhere else, resulting in tone movement. To put it another way, under the view of dual-prominence hypothesis, the tone movement is derived entirely from the non-coincidence of the edge prominence and the metrical prominence.

In Li's proposal, Shanghai has been treated as a case of coincidence in which the edge prominence coincides with the metrical prominence at the leftmost syllable. The simplistic typology generated by Li is repeated in (9), where Shanghai tone sandhi is categorized in (9b) – where tone retention and realization is at the same position, and no tone movement occurs accordingly.

(9) Simplistic tone-prominence typology (Li 2003: 104)

Tone retention and tone realization:

a. in different positions → tone movement

– *initial* retention, realization on *final* stress (Zhenhai)

– *final* retention, realization on *initial* stress (Wenzhou)

b. in same position → no tone movement

– *initial* retention, realization on *initial* stress (Shanghai, Suzhou)

– *final* retention, realization on *final* stress (Xiamen, Yantai)

Presumably, Shanghai is grouped into the coincidence type of dual prominence simply because this language is commonly viewed as a left-prominent system. Indeed, as we have noted, all of the TSS patterns encode left prominence by means of the relative stability of the initial tone. However, recall that TSYI has been analyzed as a process of tone movement in section 3.1.2. If this analysis is on the right track, then Shanghai is also characterized by the mobility of the initial tone. This implies that the metrical prominent position, which governs the realization of the initial tone, lies outside the left edge in Shanghai. Accordingly, I will take another stance in the present study: in Shanghai tone sandhi, the positional relation between edge prominence (associated with initial position in this case) and metrical prominence can be different depending on the tonal category to which the domain-initial tone belongs. As depicted in (10), the two prominent positions coincide at the left edge when the initial syllable bears a smooth tone, as in (10a); yet when the initial tone is *Yinru* instead, they separate from each other, with one at the first syllable and the other at the second, giving rise to a process of tone movement, as in (10b).

(10) Dual prominence in Shanghai

a. Coincidence in TSS: *no tone movement*

$$\begin{array}{ccccc} \sigma_1 & \sigma_2 & \rightarrow & \boldsymbol{\acute{\sigma}_1} & \sigma_2 \\ | & | & & | & \\ \mathbf{T_i} & T_j & & \mathbf{T_i} & \end{array}$$

(initial stress)

b. Non-coincidence in TSYI: *tone movement*

$$\begin{array}{ccccc} \sigma_1 & \sigma_2 & \rightarrow & \sigma_1 & \boldsymbol{\acute{\sigma}_2} \\ | & | & & & | \\ \mathbf{T_i} & T_j & & & \mathbf{T_i} \end{array}$$

(stress on the second)

By doing so, the question raised in 3.1.2 is accounted for in that the underlying tone of the initial syllable is realized *in situ* because the head (i.e. the tone-realization position) coincides with the left word-edge (i.e. the tone-retention position), and that the movement of the initial base tone arises from the displacement of the metrical head.

3.3 The Formation of Metrical Structure

Given that tone movement in TSYI results from displacement of metrical stress from the initial syllable to the second syllable, the question to be asked subsequently in this section is how to decide the placement of the stress – the token of the metrical prominence. For this purpose, in what follows I will argue for two assumptions: (a) that Shanghai features the quantity-sensitive unbounded stress systems; and (b) that smooth syllables and checked syllables are heavy and light, respectively, in terms of the moraic content. A set of metrical constraints is proposed in this section to capture these assumptions about the metrical structure in Shanghai.

3.3.1 Parsing of Metrical Feet

As argued in section 3.2, it is always the case in the tone mapping of Shanghai that only one position in a sandhi domain is available for the preserved tone to realize: either at the first syllable in TSS, or at the second in the domain of TSYI, regardless of the syllable count therein. This deployment of tone realization implies that there is merely a single stress at or near the left edge of the entire domain. To put it another way, the placement of the stress in Shanghai is characterized by the well-known unbounded stress system.

Based on the literature of stress assignment, unbounded stress can be structurally analyzed in two ways. One is by the demarcation of unbounded feet in which all the syllables in a domain are included, as shown in (11). This foot-parsing contrasts with the bounded stress system which is represented as the circumscription of the iteratively constructed bounded feet by which multiple stresses are assigned, as shown in (12). Parentheses in both schemata below indicate foot boundaries.

(11) Single stress in unbounded foot

(σ́σσσσσ)

(12) Multiple stresses in iterative bounded feet

(σ́σ)(σ̀σ)(σ̀σ)

Instead of admitting both bounded and unbounded feet into the typology of foot types, Prince (1985) argues that iteratively constructed bounded feet in forms like that in (11) could simply be non-iteratively constructed to interpret the unbounded stress system. The structural analysis of single stress assignment under this view is hence as given in (13) instead of that in (11).

(13) Single stress in non-iterative bounded feet

(σ́σ)σσσσ

In adopting Prince's proposal I posit that the domain for tone mapping in Shanghai is a prosodic word (annotated as PrWd), and that the assignment of stress involved in the tone mapping can be formalized as a single left-aligned foot in every PrWd. The foot-size is two-syllable-long, namely, in accordance with the notion of foot binarity; again, this foot-parsing is on the basis of the fact that the stress can only fall on either of the first two syllables in both the TSS and TSYI patterns. The constraints responsible for the foot parsing – defined in (14) below – capture the aforementioned insight. The question of how to decide the location of the stress is set aside at this stage.

(14) Foot-parsing constraints

a. ALLFTL:

Assign one violation mark for every foot whose left edge is not aligned with the left edge of a PrWd (McCarthy & Prince 1993a)[2].

---

[2] The constraint ALLFTL is equivalent to ALIGN-L(Ft, PrWd) (on Generalized Alignment, please see Prince & Smolensky 1993, McCarthy and Prince 1993b). The concept of Generalized Alignment is originally based on the edge theory in work by Selkirk (1986) and Chen (1987), referring to the coinciding of prosodic and morphological edges.

b. PARSE-σ:

Assign one violation mark for every syllable that is not footed (Prince & Smolensky 1993).

c. FTBINMAX:

Assign one violation mark for every foot that consists of more than two syllables (cf. Prince & Smolensky 1993)[3].

d. FTBINMIN:

Assign one violation mark for every foot that consists of fewer than two syllables (cf. Prince & Smolensky 1993).

ALLFTL requires that all feet be as close as possible to the left edge of a PrWd, and PARSE-σ forces all syllables in a PrWd to be parsed into feet. By an interaction with each other, these constraints can exert their influence in a subtler way on the position and number of foot-parse. McCarthy & Prince (1993a) show that the ranking ALLFTL » PARSE-σ limits the number of feet per PrWd to one, the position of which is also restricted to the left edge. This ranking is employed here to rule out secondary stress and obtain the foot-parse on the left word-edge. In addition, FTBINMAX, which sets a maximum of binarity, also dominates PARSE-σ to prevent ternary or unbounded foot-parsing in the forms like (11) from occurring. The ranking arguments are given v the following tableau.

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[3] The idea of Foot Binarity originated from the widely attested observation that feet ideally consist of exactly two elements, morae or syllables (cf. Prince 1980, McCarthy & Prince 1986, Kager 1989, Hayes 1994). The split of FTBIN is elaborated in work by Chen (2000), Hsiao (2008) inter alia.

(15) {FtBinMax, AllFtL} » Parse-σ

σσσ	FtBinMax	AllFtL	Parse-σ
☞a. (σσ)σ			*
b. (σσσ)	*W		L
c. (σσ)(σ)		**W	L

Candidate (15b) is removed by FtBinMax as it has a ternary foot, and candidate (15c) fatally violates AllFtL twice since two syllables intervene between the left edge of the PrWd and the second foot. Thus, candidate (15a) wins the evaluation, in which the single stress is structurally represented as in the forms like (13).

In addition to the ranking above, to compel the parsing of monosyllabic feet, or "degenerate feet," in a PrWd containing only one syllable, Parse-σ has to be ranked above FtBinMin, which dictates a minimum of two syllables per foot. Tableau (16) provides the argument in support of this ranking.

(16) Parse-σ » FtBinMin

σ	FtBinMax	AllFtL	Parse-σ	FtBinMin
☞a. (σ)				*
b. σ			*W	L

In (16), the higher-ranked Parse-σ prefers the monosyllabic foot in candidate (16a) to the unparsed syllable in candidate (16b), at the expense of violating FtBinMin, the lower-ranked constraint. This tableau shows that the posited ranking indeed ensures that the only syllable within a PrWd is correctly parsed into a degenerate foot.

Now that foot-parsing is achievable, we may set out to deal with the part of stress assignment. Constraints given in (17) pertain to the assignment of stress, or to the foot type; the feet preferred by these constraints are shown below, where Trochee prefers left-headedness to right-headedness, while it is the other way around for Iamb.

(17) Stress-placement constraints

c. TROCHEE[4]:

Assign one violation mark for every foot whose head is not initial (Prince & Smolensky 1993).

d. IAMB[5]:

Assign one violation mark for every foot whose head is not final (Prince & Smolensky 1993).

(18) Preference in foot types

	a. (σ́σ)...	b. (σσ́)...
TROCHEE	☺	
IAMB		☺

Recall that the stress falls on the initial syllable in all of the TSS patterns, and on the second syllable in TSYI pattern, which means that given the binary foot on the left edge, TSS has a trochaic foot as in (18a), while TSYI has an iambic foot as in (18b). This suggests that all else being equal, TROCHEE must dominate IAMB in TSS, but in TSYI, where the initial syllable is the checked *Yinru*, the ranking has to be reversed, with IAMB above TROCHEE, as shown in the following table.

(19) Ranking paradox

	Foot types	Relevant ranking
TSS	(σ́σ)... (=29a)	TROCHEE » IAMB
TSYI	(σʔσ́)... (=29b)	IAMB » TROCHEE

Here a ranking paradox comes into play, which reveals that the constraints laid out in (14) are still insufficient to account for the difference between TSS and TSYI in the

---

[4] The constraint TROCHEE is the same as ALIGN-L(σ́, Ft).

[5] The constraint IAMB is equivalent to ALIGN-R(σ́, Ft).

assignment of stress.

3.3.2 Quantity Difference

To account for why stress assignment in TSS behaves in a way exactly opposite to that in TSYI, I assume that it stems from the distinction of inherent quantity (i.e. syllable weight) between smooth and checked syllables, since quantity has long been admitted in the literature to have great influence on foot-parse among stress languages (see Hayes 1995). In what follows I will argue for the assumption that in Shanghai, smooth syllables are heavy (i.e. bimoraic) and checked syllables are light (i.e. mono-moraic). The arguments are twofold. On one hand, I disagree with Duanmu's (1993, 1999) S-language hypothesis that smooth syllables in Shanghai may be analyzed as underlyingly light, and on the other I draw on evidences from language-internal and -external data in support of our proposal that checked syllables in Shanghai only bear one mora.

3.3.2.1 Against S-language Hypothesis

To give a solution to the contour split in TSS, which we have discussed in 3.2.3, Duanmu (1993:8) draws close attention to the syllable structure of Shanghai through a comparison with that of Standard Mandarin. Consider the following inventories of rhymes found in each of the two languages, excluding pre-nuclear glides.

(20) Rhyme inventories

	Shanghai	Mandarin
Mono-segmental	ɨ i u y a ɤ ø e o ɔ ã m̩ n̩ l̩	ɨ i u y a ɤ ɹ̩
Bi-segmental	əɲ iɲ yɲ oŋ aʔ əʔ oʔ ɪʔ	ai ei au ou in an iŋ aŋ ən əŋ oŋ

Clearly, Shanghai, unlike Mandarin, has relatively few bi-segmental rhymes, largely because there are no diphthongs found in Shanghai inventory. In addition, in what are traditionally transcribed as CVC syllables, there are no minimal pairs in which codas are contrastive. For transcriptions that distinguish [ɲ] and [ŋ], the choice of [ɲ] vs. [ŋ] depends on the quality of the nuclear vowel. Duanmu claims accordingly that even the few bi-segmental rhymes may be more properly transcribed as being simple vocalic nuclei with nasalized or glottalized vowels, so that [iɲ] and [ɪʔ] is actually [ĩ] and [ɪˀ], for example. He concludes that in Shanghai and languages whose tone-sandhi pattern behaves alike (whence referred to as “S-languages” in his terms), all syllables are underlyingly light syllables, so they can carry just one tone each in the connected speech, thereby resulting in the phenomenon of contour split.

Under this view, all smooth syllables in Shanghai (with mono-segmental rhymes, V, or bi-segmental rhymes, VN), turn out to be non-distinguishable from checked syllables in terms of the moraic content. This is dubious, however, due to the fact that smooth syllables are phonetically longer than checked ones, and that this difference in duration, as will be shown in section 3.3.3., indeed plays an important role in motivating the distinction between TSS and TSYI. To deny S-language hypothesis, in what follows I will concentrate on the question of whether bi-segmental rhymes with VN sequence are necessarily a nasal vowel and, thus, are monomoraic in the underlying form. The mono-segmental rhymes with a single nuclear vowel are put aside, since they are free to be monomoraic, as in English and Japanese, or bimoraic, as in most of the Chinese dialects.

The arguments addressed by Duanmu in support of his assumption that VN is underlyingly a nasal vowel are dependent on two aspects. The first one, as noted above, is that there is no contrastive nasal coda in Shanghai. Nasal codas always assimilate in the place of articulation to the previous vowel. Theoretically speaking, however, this argument founded on contrastiveness proves nothing but the fact that coda nasals are unspecified for place node in the underlying from. It is not a sufficient condition for the claim that coda nasals are phonemically a feature attached to the nuclear vowel.

The other argument made by Duanmu is based on Xu *et al*. (1988:73), that [əɲ], [iɲ], [yɲ], and [oŋ] “are often pronounced as [ə̃], [ĩ], [ỹ], and [õ]”. Nonetheless, there are actually two analyses by which the nasal vowels can be derived in the surface, as formalized in (21).

(21) Two analyses for deriving nasal vowels

a. /Ṽ/ ⟶ [Ṽ]

b. /VN/ ⟶ [Ṽ]

The first analysis in (21a), assumed by Duanmu, is relatively straightforward because the putative underlying form, /Ṽ/, is what is heard in the surface. By contrast, the second analysis in (21b) posits an abstract underlying form, /VN/, with a deviation from the surface form, [Ṽ]. This analysis, thus, appears to cost more than the first one in terms of theory-simplicity. It follows that the concrete analysis in (21a) is more succinct and hence more favorable for the moment. Note, however, that an underlying nasal vowel, though mono-segmental, may still be considered bimoraic in a number of languages, such as Southern Min (Yip 1997) and French (Caroline Féry 2003).

Nevertheless, the analysis to be adopted in the present proposal is the abstract one in (21b), with the sequence /VN/ in the underlying form. The reasoning relies mainly on the fact that these so-called nasal vowels are not as typical as those in French or Southern Min. Specifically, most of the occurrences of non-low nasal vowels, (i.e. [ə̃], [ĩ], [ỹ], and [õ]) also alternate with a sequence of an oral vowel plus a nasal consonant; even the low vowel, [ã], which has consistently been transcribed as mono-segment in the literature, is reported to be followed by a slight, puny nasal-ending, and therefore should be properly transcribed as [ã^{ŋ}] (Gu 2006). This propensity for nasal vowels to be “unpacked” suggests that nasal vowels realized in Shanghai are bi-phonemic (i.e. /VN/), instead of mono-phonemic (i.e. /Ṽ/). This view makes it possible the excre- scent nasals, and on the other hand, it can also derives the nasal vowels employing a process of nasal absorption. The derivations in (22) show the present analysis.

(22) Nasal vowels as bi-phonemic

$$\begin{tikzcd} /VN/ \arrow[r] \arrow[dr] & {[VN]} \\ & {[\tilde{V}]} \end{tikzcd}$$

Given the analysis in (22), we conclude that the bi-phonemic /VN/, either surfacing as mono-segmental [Ṽ] or as bi-segmental [VN], bears two moras. This result further leads us to believe that oral vowels in an open syllable are also bimoraic, because these oral vowels are about equal to VN/Ṽ in duration. It follows that both of the syllable types (C)V and (C)VN are bimoraic, even though they are realized as mono-segmental. In other words, all smooth syllables in Shanghai are underlyingly heavy syllables, as opposed to the S-language hypothesis.

3.3.2.2 Checked Syllables as Light

Recall that the only obstruent coda occurring in Shanghai is glottal stops [ʔ], so checked syllables in this language merely consist of syllables ending in [ʔ]. Checked syllables with glottal stop as coda may be considered bimoraic on a par with smooth syllables in some Chinese dialects. For example, in her analysis of Chaoyang, a Southern Min dialect, Yip (1997) treats syllable-final [ʔ] as a feature [constricted glottis], which bears a “silent mora” that fails to license any tone but which contributes to the satisfaction of the bimoraic requirement. This is not the case for Shanghai, however. Here I wish to argue that syllable-final [ʔ] in Shanghai, unlike that in Southern Min, bears no mora at all, making all checked syllables turn out to be monomoraic, light syllables. Two arguments are given in support of this claim.

The assumption that checked syllables are monomoraic can first be proven from the absence of compensatory lengthening in Shanghai. Although the final glottal stops in Shanghai are reported to drop at non-final positions in connected speech, as those in Taiwanese do, the previous vowel behaves very differently in these languages. In Taiwanese, the nucleus vowel is lengthened after the loss of the following glottal stop; while this is not the case for Shanghai, where the compensatory lengthening is never observed, as shown in the following data.

(23) Loss of glottal stops

Taiwanese:	/peʔbak/	→	[pee.bak]	‘clueless’
	/ʦjoʔʦĩĩ/	→	[ʦjoo.ʦĩĩ]	‘borrow money’
Shanghai:	/ʦʰɐʔpee/	→	[ʦʰɐ.pee]	‘publish’
	/ʨɪʔkwən/	→	[ʨɪ.kwən]	‘fierce’

Such a difference between Taiwanese and Shanghai is accountable only if we assume that the glottal stop contributes to syllable weight in Taiwanese, but not in Shanghai[6]. It is borne out that in Taiwanese the loss of a weight-bearing glottal stop would cause the transfer of the mora from the deleted coda to the previous vowel, as in (24a); yet in Shanghai, on the contrary, the glottal stop seems to be weightless and hence fails to result in compensatory lengthening of the vowel, as illustrated in (24b).

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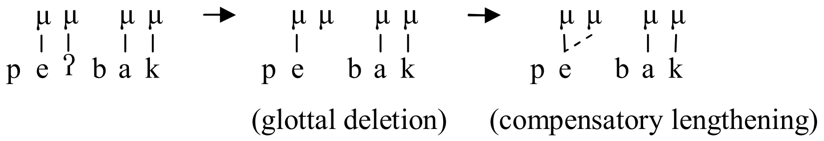
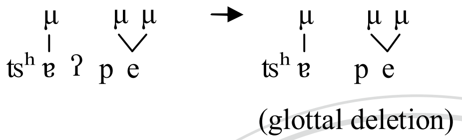
[6] Based on data from 78 languages, Kavitskaya (2001) argues that the deletion of true phonetic glottal stops never results in vowel lengthening, and that glottal stops whose deletion triggers compensatory lengthening are in fact vocalic or approximant-like, in that their shape of the vocal tract is acoustically realized as that of surrounding vowels, parallel to what is observed for [h]. This furnishes us with a phonetic approach to the weight difference on glottal stops between Shanghai and Taiwanese.

(24) Compensatory lengthening

a. Application in Taiwanese



b. Blocking in Shanghai



This testifies that checked syllables in Shanghai are inherently different from those in Taiwanese, in that they bear no mora on the coda and thus are light syllables.

On the other hand, based on Ping's measurements (2001b), as cited in (25) below, the rime duration of smooth syllables is almost more than twice the length of checked syllables, in both monosyllabic words and the initial position of polysyllabic words.

(25) Rime duration (ms)

a. Monosyllabic words

Smooth			Checked	
Yinping	*Yinqu*	*Yangqu*	*Yinru*	*Yangru*
HL	MH	LH	H	LM
185.9	243.5	242.0	92.4	134.0

b. Disyllabic words

	Yinping-σ_2	*Yinqu*-σ_2	*Yangqu*-σ_2	*Yinru*-σ_2	*Yangru*-σ_2
σ_2	H-L	M-H	L-H	M-H	L-LH
Smooth	**147.7**-136.4	**143.1**-171.2	**144.9**-177.1	**77**-199	**83.7**-199.3
Checked	174.4-103.2	143.8-130.6	160-130.3	76.3-134	70.4-120

Based on the experimental results provided, it is not unreasonable to take smooth syllables and checked syllables in Shanghai as heavy and light, respectively.

3.3.3 Default to Opposite Edge

By assuming the difference in quantity, the stress assignment in the metrical foot composed of various syllable types can be transcribed as (26), in which feet beginning with a smooth syllable (i.e. a heavy syllable) are always trochaic, and feet with an initial checked syllable (i.e. a light syllable) are iambic, as analyzed before.

(26) Stress assignment in composition of different syllable types

		Leftmost stress	Rightmost stress
a.	Only one heavy	$(\acute{\sigma}_{\mu\mu}\sigma_{\mu})$	$(\sigma_{\mu}\acute{\sigma}_{\mu\mu})$
b.	All heavy	$(\acute{\sigma}_{\mu\mu}\sigma_{\mu\mu})$	
c.	No heavy		$(\sigma_{\mu}\acute{\sigma}_{\mu})$

From table (26) we can find three principles for the assignment of stress in Shanghai: Heavy syllables take priority over light syllables, as in (26a); leftmost heavy syllables are privileged over rightmost heavy syllables, as in (26b); and stress favors rightmost light syllables over leftmost light syllables, as in (26c). In other words, the stress assignment in Shanghai appears to exhibit a pattern where the leftmost heavy syllable receives the metrical stress, but in forms lacking heavy syllables, it is the rightmost syllable that is stressed.

Such a pattern clearly fits the default-to-opposite-edge stress system (hereafter DTO, Prince 1985, Hayes 1995). In their cross-linguistic survey, Kenstowicz (1994), Hayes (1995) and Walker (1996) discuss DTO stress patterns and conclude that a total of eleven languages feature this stress pattern. In nine of these languages, the default side for stress in words consisting of only light syllables is the left side, while in the other two languages the default side is the right side[7]. Shanghai seems to fit the latter

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[7] For a detailed account of these languages, consult Gordon (2000).

case according to (26).

Zoll (1996, 1998) proposed that this “conflicting directionality” can be derived in a constraint-based framework by the interaction between two kinds of constraints: one governing the general pattern, which is not specific to marked structure, and the other being a licensing constraint that penalizes the marked structure which has full-fledged distribution. When the general constraint outranks the licensing constraint, the effects of the lower constraint will become invisible. If the licensing constraint is dominant and specifies the opposite edge from the general constraint, we can attain the pattern of conflicting directionality in a certain domain.

To apply this idea to the DTO stress pattern in question, I argue that the marked structure in this case is a light stress-bearing syllable. As demonstrated by Zoll (1996: 153), “the existence of languages which lengthen stressed short vowels, such as those presented in Hayes (1985) and Buckley (1996), provides strong support for the contention that light syllables with stress are indeed marked.” The constraint proposed below expresses the effect of licensing stressed light syllables only foot-finally.

(27) COINCIDE($\acute{\sigma}_{\mu}$, Rightmost(σ, FT) (abbr. COINCIDE($\acute{\sigma}_{\mu}$, FT-Fianl)):

Assign one violation mark for every stressed light syllable that does not coincide with the final syllable of a foot.

With this additional constraint, the ranking paradox of TROCHEE and IAMB raised in 3.3.1 can be resolved by further stipulating two relevant rankings, as given in (28).

(28) a. TROCHEE » IAMB

b. COINCIDE($\acute{\sigma}_{\mu}$, FT-Final) » TROCHEE

(28a) presumes that the general pattern of metrical feet is left-headed, in line with the tradition that Shanghai is treated as a left-dominant language in most of the previous studies (Yue-Hashimoto 1987, Yip 1995, among others). To derive the DTO pattern, we propose the ranking in (28b), which spells out that the general left-edge-oriented constraint (i.e. TROCHEE) must be ranked lower than the right-edge-oriented licensing constraint (i.e. COINCIDE($\acute{\sigma}_{\mu}$, FT-Final)). Tableaux below present the four DTO stress patterns in (26) that are produced by these rankings.

(29) Left-headed: COINCIDE is inactive

i. All heavy

$\sigma_{\mu\mu}\sigma_{\mu\mu}$	COINCIDE($\acute{\sigma}_{\mu}$, FT-final)	TROCHEE	IAMB
☞a. ($\acute{\sigma}_{\mu\mu}\sigma_{\mu\mu}$)			*
b. ($\sigma_{\mu\mu}\acute{\sigma}_{\mu\mu}$)		*W	L

ii. Only one heavy

$\sigma_{\mu\mu}\sigma_{\mu}$	COINCIDE($\acute{\sigma}_{\mu}$, FT-final)	TROCHEE	IAMB
☞a. ($\acute{\sigma}_{\mu\mu}\sigma_{\mu}$)			*
b. ($\sigma_{\mu\mu}\acute{\sigma}_{\mu}$)		*W	L

(30) Right-headed: COINCIDE is active

i. No heavy

$\sigma_{\mu}\sigma_{\mu}$	COINCIDE($\acute{\sigma}_{\mu}$, FT-final)	TROCHEE	IAMB
a. ($\acute{\sigma}_{\mu}\sigma_{\mu}$)	*W	L	*W
☞b. ($\sigma_{\mu}\acute{\sigma}_{\mu}$)		*	

ii. Only one heavy

$\sigma_{\mu}\sigma_{\mu\mu}$	COINCIDE($\acute{\sigma}_{\mu}$, FT-final)	TROCHEE	IAMB
c. ($\acute{\sigma}_{\mu}\sigma_{\mu\mu}$)	*W	L	*W
☞d. ($\sigma_{\mu}\acute{\sigma}_{\mu\mu}$)		*	

The licensing constraint, COINCIDE($\acute{\sigma}_{\mu}$, FT-Final), plays no active role at all in (29) as it is masked or vacuously satisfied, thus leaving the choice up to the next constraint, TROCHEE, which militates against stress on the rightmost syllable. Accordingly, the general left-headed candidates (29a) and (29c) both win out as the output. By contrast, in the tableau in (30) the top-ranked COINCIDE($\acute{\sigma}_{\mu}$, FT-Final) comes into play to select the right-headed feet, via eliminating the trochaic candidates (30a) and (30c), which contain the marked light stress-bearing syllable in a prosodically weak position. This shows that an account of licensing founded on COINCIDE seems fairly favorable for reconciling the conflicting directionality in the DTO stress pattern.

3.4 Tone Mapping in Dual Prominence

After setting the stress placement, we will now explain how the dual prominence leads to the tone preservation and tone realization. In section 3.4.1, I propose a set of tone-placement constraints to attain the tone mapping in Shanghai. Section 3.4.2 addresses the pattern of contour split in TSS.

3.4.1 Tone-placement Constraints

To capture the effect of dual prominence on the tone preservation and realization under the framework of OT, I posit a set of constraints governing the placement of the underlying lexical tone in tone mapping, as defined in (31). The idea in the present analysis is, in the terms of OT, that the manifestation of the initial prominence in the preservation of underlying contrast is driven by positional faithfulness on the initial syllable.

(31) Tone placement constraints

a. MAX(T)$_{\sigma1}$:

Let input tonal tier = $t_1t_2t_3$ … t_n and output tonal tier = $T_1T_2T_3$ …T_m.

Assign one violation mark for every t_x if t_x is associated with the word-initial syllable and there is no T_y where t_x $\mathcal{R}$ T_y (correspondence theory, see McCarthy & Prince 1995, 1999).

b. ANCHOR-L(t$_{\sigma1}$, σ́):

Let input tonal tier = $t_1t_2t_3$ … t_n and output tonal tier = $T_1T_2T_3$ …T_m.

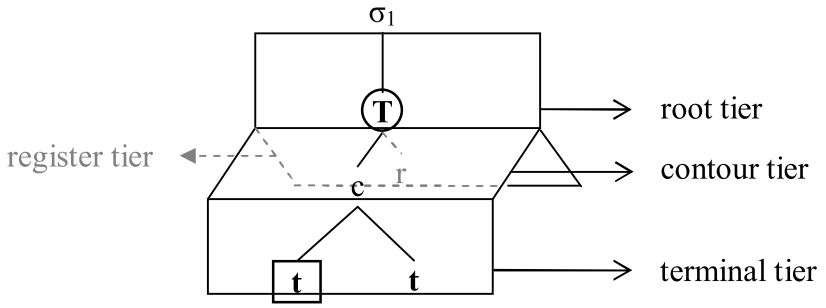
Assign one violation mark for every t_x if t_x is at the left edge of the tonal tier, which is associated with the word-initial syllable, and there is no T_y at the left edge of the metrical head where t_x $\mathcal{R}$ T_y (McCarthy & Prince 1993a, 1995).

c. *t:

Assign one violation mark for every tone specification.

MAX(T)$_{\sigma1}$ protects the tone associated with the initial syllable from deletion, while ANCHOR-L(t$_{\sigma1}$, σ́) further requires that the tone at the left edge of the initial syllable be faithfully realized on the head syllable in the output; *t is the markedness constraint in conflict with MAX(T)$_{\sigma1}$. Notice particularly that the notation of tone, T or t, in these constraints denotes different tonal tiers: the capital T in MAX(T)$_{\sigma1}$ stands for the tonal root node. For example, deleting an initial contour tone is counted as one violation of MAX(T)$_{\sigma1}$. By contrast, the lowercase t in ANCHOR-L (t$_{\sigma1}$, σ́) and *t refers to terminal tone segments dominated by contour node, hence there is one violation mark of *t for a level tone and two for a contour tone. The geometric model of these multiple tonal tiers is illustrated below, adapted from Bao (1990a), where the target of MAX(T)$_{\sigma1}$.is circled, and the target of ANCHOR-L ($t_{\sigma1}$, $\acute{\sigma}$), the leftmost tone segment, is in a square.

(32) Tonal geometry



The conspiracy of MAX(T)$_{\sigma1}$ and ANCHOR-L($t_{\sigma1}$, $\acute{\sigma}$) gives rise to tone retention on the initial syllable and realization on the stressed syllable; for this reason, they must be undominated in the tone sandhi of Shanghai. Besides, given that in the sandhi process all the underlying tones other than those associated with the initial syllable are deleted in the output, MAX(T)$_{\sigma1}$ must be ranked above *t, as given in (33). This is attested through the tableaux in (34) and (35), which instantiate the mapping process in TSS and TSYI, respectively. The metrical structure of the candidate set is under the control of the metrical constraints and the ranking thereof, which is proposed in the previous section. Thus, the foot-parsing is equally bounded in these tableaux, differing only in the position of the foot-head – feet being left-headed in TSS and right-headed in TSYI, due to COINCIDE($\acute{\sigma}_{\mu}$, FT-Final) » TROCHEE. Since all of the metrical constraints prefer neither the winner nor the losers in these tableaux, they are set aside so that we can concentrate on the evaluation of the tonal constraints. Note in passing that the ranking of ANCHOR-L($t_{\sigma1}$, $\acute{\sigma}$) is unknown with respect to the other constraints, so we have separated ANCHOR-L($t_{\sigma1}$, $\acute{\sigma}$) with a double line here.

(33) Constraint ranking: MAX(T)$_{\sigma1}$ » *t

(34) TSS: /k^{h}e.sɨ/ *'boiled water'*

$\sigma_{\mu\mu}\ \sigma_{\mu\mu}$ HLMH	ANCHOR-L ($t_{\sigma1}$, $\acute{\sigma}$)	MAX(T)$_{\sigma1}$	*t
☞a. ($\acute{\sigma}_{\mu\mu}\ \sigma_{\mu\mu}$) HL			**
b. ($\acute{\sigma}_{\mu\mu}\ \sigma_{\mu\mu}$) HLMH			****W
c. ($\acute{\sigma}_{\mu\mu}\ \sigma_{\mu\mu}$) MH	*W		**
b. ($\acute{\sigma}_{\mu\mu}\ \sigma_{\mu\mu}$) H		*W	*L

(35) TSYI: /ʦoʔ.ɲiʔ/ *'pitiful*

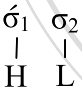
$\sigma_{\mu}\ \sigma_{\mu}$ H LM	ANCHOR-L ($t_{\sigma1}$, $\acute{\sigma}$)	MAX(T)$_{\sigma1}$	*t
☞a. ($\sigma_{\mu}\ \acute{\sigma}_{\mu}$) H			*
b. ($\sigma_{\mu}\ \acute{\sigma}_{\mu}$) H LM	*W		***W
c. ($\sigma_{\mu}\ \acute{\sigma}_{\mu}$) H	*W		*
b. ($\sigma_{\mu}\ \acute{\sigma}_{\mu}$) LM	*W	*W	**W

Candidate (34c) is excluded by ANCHOR-L($t_{\sigma1}$, $\acute{\sigma}$), since the leftmost tone segment of the initial syllable, H, fails to map to the initial head. Candidate (34d) is ruled out in violation of the higher-ranked MAX(T)$_{\sigma1}$ due to the partial deletion of the underlying tones associated with the initial syllable. Eventually, candidate (34a) prevails over the faithfully mapping candidate (34b) with less violation of *t. As for the TSYI pattern in which the stress is presumed to fall on the second syllable, as in (35), ANCHOR-L ($t_{\sigma1}$, $\acute{\sigma}$) is active in eliminating all the losers, and consequently, candidate (35a) wins out as the optimal output. This shows that the constraints proposed in (31) and the ranking thereof correctly derive the consequence that the initial base tone is always kept and that it surfaces in the head position, whether it is one of the smooth tones or *Yinru*. The next section is dedicated, by way of parenthesis, to the split of the initial contour found in TSS patterns, which is omitted from tableau (34) above.

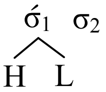
3.4.2 Contour Split in TSS

As we have seen in tableau (34), the constraint ranking proposed so far warrants that in TSS, the initial contour tone is preserved *in situ*, as indicated by the winning candidate (34a). This selected form is not attested, however. The intended output for TSS should be the pattern where the initial contour tone is divided into level tones, straddling over the first two syllables, as shown in (36a). For ease of comparison, the unattested winner (34a) is also copied here as in (36b). Clearly, both of the candidates pass the high-ranked MAX(T)$_{\sigma 1}$ and ANCHOR-L(t$_{\sigma 1}$, σ́), thus making the competition between them end up with a tie. This unwelcome result suggests that the constraints thus far in use here are insufficient to account for the contour-split pattern in TSS.

(36) a. Attested output for TSS



b. (=34a): optimal in (34) but unattested for TSS



There have been two approaches to the phenomenon of contour split in the previous research. One is to assume that the TBU in Shanghai is mora, and that every syllable in the connected speech bears only one mora (see Duanmu 1993, 1994b, Yip 2002). Given this analysis, all it takes to derive the contour-split pattern is a higher-ranking constraint requiring one tone per mora. However, as I have already argued in section

3.3.2, smooth syllables in Shanghai differ from checked syllables in that they bear two moras. In Consequence, the attempt to attribute the split of the initial contour tone to the restriction of TBU appears to be inapplicable in the present analysis.

The other approach in the literature resorts to the notion of contour-tone licensing. According to Wightman et al. (1992) and Zhang (2001, 2002), the occurrence of contour tones is positionally restricted, and the restrictions are durationally based; That is, *ceteris paribus*, contour tones prefer to occur on the final syllable of a given prosodic domain to non-final syllables due to the durational advantage afforded by final lengthening. This can be captured by the Coincidence constraints (Zoll 1996, 1997, 1998), which requires that the marked structure in question coincide with some prosodically strong constituent. In line with the formulation of the Coincidence, I devise a version for contour-tone licensing in this case, as proposed in (37).

(37) COINCIDE(Contour, Rightmost(σ, PrWd) (abbr. COINCIDE(C, PrWd-Final):

Assign one violation mark for every contour tone that does not coincide with the final syllable of a prosodic word.

COINCIDE(Contour, PrWd-final) provides a greater incentive for a contour to spread across the sandhi domain from the initial syllable rather than from the final syllable, because the initial syllable is under greater pressure to simplify its contour. It follows that COINCIDE(Contour, PrWd-final) forces the split of the initial contour only within polysyllabic domains, since a syllable in isolation is the final syllable itself, thereby it can also serve as the legitimate licenser for contour tones, as shown below.

(38) TSS in disyllabic domain: COINCIDE is active

$\sigma_{\mu\mu}$ $\sigma_{\mu\mu}$ HLMH	COINCIDE (C, PrWd-Final)	ANCHOR-L ($t_{\sigma 1}$, $\acute{\sigma}$)	MAX(T)$_{\sigma 1}$	*t
☞a. ($\acute{\sigma}_{\mu\mu}$ $\sigma_{\mu\mu}$) H L				**
b. ($\acute{\sigma}_{\mu\mu}$ $\sigma_{\mu\mu}$) HL	*W			**

(39) Smooth tones in monosyllabic domain: COINCIDE is inactive

$\sigma_{\mu\mu}$ HL	COINCIDE (C, PrWd-Final)	ANCHOR-L ($t_{\sigma 1}$, $\acute{\sigma}$)	MAX(T)$_{\sigma 1}$	*t
☞a. ($\acute{\sigma}_{\mu\mu}$) HL				**
b. ($\acute{\sigma}_{\mu\mu}$) H			*W	*L
c. ($\acute{\sigma}_{\mu\mu}$)		*W	*W	**

Candidate (38b), copied from the undesirable winner (34a) and (36b), is now banished since it incurs a fatal violation of the top-ranked COINCIDE(Contour, PrWd-Final). By contrast, the optimal candidate (38a), which is copied from the attested output (36a), avoids violating it by splitting the initial contour. As for the monosyllabic domain in (39), it is another story, where COINCIDE(Contour, PrWd-Final) becomes irrelevant to the word-final contour tone. Consequently, the contour tone resists simplification and faithfully surfaces as expected, as indicated by the winning candidate (39a)

Note, however, that the derivation of TSS could still run into problems with the increase in the number of syllables within the tone-sandhi domain. The problem arises from the fact that no matter how many syllables the TSS-domain contains, the initial contour tone always shifts to the second syllable after splitting. However, this locality is apparently beyond the scope of COINCIDE(Contour, PrWd-Final), which only serves to prompt the split of the non-final contour tone, and is indifferent to where the splitting tones should dock. It follows that we need another constraint to obtain the effect of locality.

Baker (2003) provides a formal definition for locality, stating that all TBU which are newly associated with a tone must be contiguous with a correspondent of a TBU which was associated with the tone in the input. In other words, an output tone cannot be linked to a TBU which is not adjacent to its host. This formulation is given in (40).

(40) LOCALITY (abbr. Local):

> Assign one violation mark for every tone segment associated with a TBU that is not adjacent to its host (Myers 1997, Yip 2002, Baker 2003).

Together with COINCIDE(Contour, PrWd-Final), LOCAL can in effect attain the local split of the initial contour tone in TSS. Tableau (41) shows the result of this cooperation, where MAX(T)$_{\sigma 1}$ and ANCHOR-L($t_{\sigma 1}$, $\acute{\sigma}$) are not involved in the decision, and are therefore put aside.

(41) Locality: /k^{h}e.mu.səʔ/ *'opening ceremony'*

$\sigma_{\mu\mu}\,\sigma_{\mu\mu}\,\sigma_{\mu}$ HLHL H	COINCIDE (C, PrWd-Final)	LOCAL
a. ($\acute{\sigma}_{\mu\mu}\,\sigma_{\mu\mu}\,\sigma_{\mu}$) HL	*W	
☞b. ($\acute{\sigma}_{\mu\mu}\,\sigma_{\mu\mu}\,\sigma_{\mu}$) H L		
c. ($\acute{\sigma}_{\mu\mu}\,\sigma_{\mu\mu}\,\sigma_{\mu}$) H L		*W

Candidates (41a) and (41c), either with no split or with the splitting tone shift two syllables away, are repelled by COINCIDE(Contour, PrWd-Final) and LOCAL, respectively. Candidate (41b), with the local re-distribution of the initial contour tone, then can be correctly selected as the output form for TSS.

3.5 Summary of This Chapter

Briefly speaking, in TSS and TSYI the process of tone mapping is subject to positional faithfulness by which the base tone of the initial syllable is anchored to the stressed syllable in the output. This was captured by a set of tone-placement constraints, in the special reference to Anchoring. In this view, the anomaly of tone movement in TSYI follows to emerge as a result of the displacement of the stress: the stress falls on the initial syllable that carries a smooth tone; only in TSYI domain where the initial syllable is a checked syllable does the stress shift onto the second position. With checked syllables and smooth syllables posited as light and heavy, respectively. The analysis in this chapter proposes a set of stress-placement constraints to derive the different stress positions in TSYI and TSS: the general left prominence of TSS is mediated by TROCHEE » IAMB, and the idiosyncratic right-headed pattern in TSYI is interpreted by further ranking the TROCHEE above a Coincidence constraint which demands that stressed light syllables be foot-final.

CHAPTER FOUR

YANGRU TONE SANDHI

In Chapter 3, I have presented that the metrical quantity of smooth syllables vs. checked syllables play a key role in the difference in tone mapping between TSS and TSYI. However, TSYI is only a part of the irregular TSC. For a fuller picture, in this chapter I will examine the case of the other checked tone, the tone sandhi of *Yangru* (TSYA), which will be shown to be of great significance in the tone-stress interaction for a number of reasons: (i) it once more validates the intimate connection between quantity-sensitive stress and tonal behavior; and (ii) it further brings to light the repercussions of contour tone licensing on the parsing of metrical feet. These features of TSYA will be discussed in this chapter through a constraint-based analysis from the perspective of OT.

This chapter is arranged as follows. Section 4.1 is devoted to an inspection of the TSYA patterns, with some related preliminary analyses. Section 4.2 focuses on one of the TSYA patterns, referred to as Pattern B, illustrating the effect of contour tone licensing on foot-parsing. The discussion in section 4.3 turns to the other pattern, termed Pattern A, in which a set of rhythmic licensing constraints will be proposed to explain lapse avoidance. Also, in this section I will offer a co-phonological treatment founded on the theory of Partially Ordered Grammar for the variable distribution of Pattern A vs. Pattern B. Section 4.4 summarizes the issues discussed in this chapter.

4.1 Patterns of TSYA

TSYA resembles TSS and TSYI in that it also features "left-prominence" typology in the sense of Yue-Hashimoto (1987). To recap the case of the left-prominent rhythm: the initial tone is the dominant tone that determines the surface tone pattern in a tone-sandhi domain. It follows, as seen in Chapter 3, that two domains beginning with an identical tone – in this case, *Yangru* – are exactly the same with respect to the melodic shape, regardless of the tonal categories lexically associated with the non-initial syllables, of which the example is illustrated in (1).

(1) Neutralization of non-initial tones in TSYA

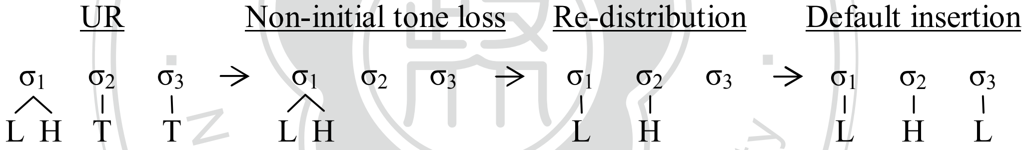
a. ɲiʔ 'day' + sɨ 'book' = ɲiʔ.sɨ 'ancient almanac'
LMʔ HL L^{ʔ}-LH
b. ɲiʔ 'hot' + sɨ 'water' = ɲiʔ.sɨ 'hot water'
LMʔ MH L^{ʔ}-LH

However, given that the case of TSYA and that of TSS and TSYI have this trait of left-prominence in common, they are crucially different in two respects: TSYA has more than one surface pattern, in contradiction to the sensible consequence – which holds true in TSS and TSYI – that possible distinct tonal strings in a left-prominent language like Shanghai can be reduced to one if the initial tone holds invariant. Another distinction of TSYA concerns the derivation: one of its possible surface patterns does not appear to be derived by the spreading approach as seen in TSS, or by the local movement derivation shown in TSYI, thus making it whimsical in Shanghai tone sandhi. For ease of discussion, in what follows I will break down the introduction of TSYA patterns into two parts, each of which discusses one pattern, and then at the end of this section, special attention will be given to the distribution of such patterns in TSYA.

4.1.1 Pattern A as TSS

As a checked tone, the tone value of *Yangru* implements itself in isolation as a short low rising (LMʔ), different from the level tone of *Yinru*. As reviewed in Chapter 2, some of the previous analyses (Zee & Maddieson 1979, Yip 1996, Jin 1997, among others) have therefore regarded the short rising of *Yangru* as an allotone of long rising tones carried by smooth syllables, (i.e. *Yinqu* and *Yangqu*), according to their complementary distribution with respect to syllable types. Analyses of this sort predicts that *Yangru* should undergo the parallel process of tone sandhi with the long rising tones, with which we are already familiar via the analysis of TSS patterns: after the loss of non-initial tones, re-distribution or re-association of the initial underlying tones then takes place, yielding the surface tone patterns where the initial contour splits over the first two syllables in a domain, and a L is inserted by default in the otherwise toneless syllables, if any, as depicted below, where the initial syllable carries one of the smooth tones, *Yangqu*, for example.

(2) Contour-splitting derivation:



Indeed, in one of TSYA patterns, referred to as Pattern A, the initial *Yangru* resembles its smooth counterparts (i.e. the long rising tones *Yinqu* and *Yangqu*) in that it not only features left-prominence to resist neutralization, but undergoes re-distribution over the first two syllables. Table (3) provides Pattern A of TSYA, where the initial rising contour surfaces with the starting point, L, on the first syllable and the ending point, M, on the second syllable. The derivation of Pattern A is given in (4). Notice that Pattern A shows up exclusively in quadrisyllabic or longer domains.

(3) Pattern A

Initial σ	σσσσ	σσσσσ
Yangru **LMʔ**	**L**^{ʔ}-**M**-L-L	**L**^{ʔ}-**M**-L-L-L

(4) The derivation of Pattern A

a. quadrisyllabic

	ɲɪʔ.zã.sɨ.tɕjɤ
	‘year in, year out; over the years’
base	LMʔ.LH.MH.MH
tone deletion	LMʔ. o. o. o
re-distribution	L^{ʔ}. M. o. o
default L	L^{ʔ}. M. L. L

b. pentasyllabic

	ɲɪʔ.noŋ.du.dɤ.hwəɲ
	‘to lose one’s head’
base	LMʔ.LH.LH.LH.HL
tone deletion	LMʔ. o. o. o. o
re-distribution	L^{ʔ}. M. o. o. o
default L	L^{ʔ}. M. L. L. L

Tone-sandhi domains in Shanghai rarely include four or more syllables, as compounds of four or more syllables are usually torn down into smaller domains by prosodic scanning. Therefore, pattern A, which can only surface in such long domains, appears to be small in distribution, hence the minority for TSYA.

4.1.2 Pattern B as Long-distance Movement

In addition to Pattern A, there is another little-discussed pattern that can surface in TSYA, referred to as Pattern B hereafter. According to virtually all the sources (Lu 1986, Xu et al. 1987, Zee 1988, Qian 1992, Jin 1997, among others), this additional pattern is much more common than Pattern A. Specifically, it can occur as the surface in all but pentasyllabic or longer domains. Therefore, it appears to be the predominant pattern for TSYA, as illustrated in (5), of which the data is laid out behind.

(5) Pattern B

Initial σ	σσ	σσσ	σσσσ
Yangru LMʔ	L$^{\text{ʔ}}$-LM	L$^{\text{ʔ}}$-L-LM	L$^{\text{ʔ}}$-L-L-LM

(6) Examples of Pattern B

a. disyllabic

	ɲɪʔ.hwəɲ	moʔ.dɤ
	‘to lose one’s head’	‘wood’
base	LMʔ-HL	LMʔ-LH
sandhi	L$^{\text{ʔ}}$-LM	L$^{\text{ʔ}}$-LM

b. trisyllabic

	ɲɪʔ.sɨ.biɲ	moʔ.moʔ.kø
	‘thermos’	‘touch (tentative)’
base	LMʔ-MH-LH	LMʔ-LMʔ-MH
sandhi	L$^{\text{ʔ}}$-L-LM	L$^{\text{ʔ}}$-L$^{\text{ʔ}}$-LM

c. quadrisyllabic

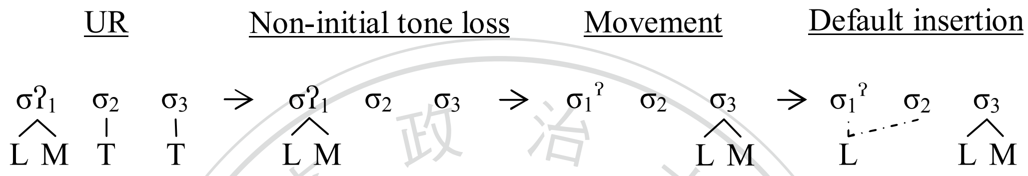
	ɲɪʔ.hwəɲ.ti.tɔ	moʔ.dɤ.moʔ.nɔ
	‘to lose one’s head’	‘slow-witted’
base	LMʔ-HL-HL-MH	LMʔ-LH-LMʔ-LH
sandhi	L$^{\text{ʔ}}$-L-L-LM	L$^{\text{ʔ}}$-L-L$^{\text{ʔ}}$-LM

The point of interest here is that the TSS-like re-distribution well-attested in pattern A seems not to work for Pattern B, the predominant pattern – especially as regards tri-syllabic and quadrisyllabic domains, in which cases the consecutive Ls over the first two syllables appear to be less derivable from the initial underlying rise. Accordingly, the existence of pattern B falsifies the previous assumption that *Yangru* is no more than an allotone of smooth rising tones, since the assumption may under-predict the possible patterns for TSYA – it predicts that the TSS-like Pattern A is the exclusive one.

The derivation behind Pattern B is another point that merits attention. Although

Pattern B is non-derivable through an analysis of the re-distribution of the contour, the derivation of pattern B can be otherwise rather straightforward. As noted by Li (2003: 143), "[w]hat happens in this less frequently discussed pattern [namely, Pattern B,] is . . . that the initial tone contour (LM) moves to the final syllable," and the previous toneless syllable(s) ends up with a L by default, as schematized below.

(7) Tone movement in Pattern B



Under this view, the case of Pattern B seems to present the mobility of tone by a long-distance movement of the initial LMʔ. As seen above, the lexical tone of the first syllable is moved two or more syllables away from its source in the mapping process, and the distance by which it moves from the lexical source depends on the size of tone-sandhi domains, because the movement aims to land the initial tone as a whole at the domain-final syllable. A question to be asked, then, is what motivates this long-distance movement. A discussion will be provided in section 4.2.

4.1.3 Aged-based Variations

Before we leave this introductory section, we will address an issue regarding the distribution of both patterns. Given that Pattern A surfaces in quadrisyllabic or longer domains and Pattern B in quadrisyllabic or shorter ones, we can find that these two patterns of TSYA overlap when the domain consists of exactly four syllables. In other words, in a four-syllable domain, there appears to be alternative readings between pattern A and pattern B for TSYA.

In noting this alternative, Jin (1997:127) concludes, via consulting several native speakers of Shanghai, that Pattern A is not as common as Pattern B and Pattern B is considered “more natural” in this regard. However, according to my personal observation and the intuition of my informant, a twenty-year-old male native speaker, the frequency of the use of Pattern A has increased in recent years, mostly among the younger generation born after the year 1980. Hence, the alternative readings found in quadrisyllabic domains appear to be an age-based variation: For the older generation, Pattern B could be more natural and common in quadrisyllabic domains as Jin states in his study, whereas for younger generation, the picture is reversed, with Pattern A becoming more predominant in replacing Pattern B. This is illustrated in (8), where the distribution of Pattern B (represented by the shaded cells) is less restricted in Old shanghai than in New Shanghai.

(8) Variations of TSYA

a. Old Shanghai

Initial σ	σσ	σσσ	σσσσ	σσσσσ
Yangru LMʔ	*Pattern B*			*Pattern A*
	L^{ʔ}-LM	L^{ʔ}-L-LM	L^{ʔ}-L-L-LM	L^{ʔ}-M-L-L-L

b. New Shanghai

Initial σ	σσ	σσσ	σσσσ	σσσσσ
Yangru LMʔ	*Pattern B*		*Pattern A*	
	L^{ʔ}-LM	L^{ʔ}-L-LM	L^{ʔ}-M-L-L	L^{ʔ}-M-L-L-L

Two questions arise out of (8), which must be accommodated in the present analysis: (a) what causes TSYA to produce Pattern B in shorter domains but to generate Pattern A when the syllables in a domain increase to a certain number? And (b) given a quadrisyllabic domain, how does TSYA surface as Pattern B in one variety but as pattern A in the other? Both of these questions will be addressed in section 4.3.

4.2 Tone-driven Stress

In this section I will focus on Pattern B of TSYA, where I intend to show how the restriction on the licensing of a contour tone plays a crucial role in the long-distance tone movement. The present analysis begins in section 4.2.1 with an inspection of the unbounded foot-parsing, which is a strategy for Pattern B to satisfy the requirement of the need for the word-initial contour tone to be licensed; the unwelcome contour-split strategy is excluded in section 4.2.2.

4.2.1 Unbounded Foot-parsing

As mentioned in section 4.1.2, what is remarkable in the predominant pattern B of TSYA is that its surface form involves the operation of tone movement, a minor process in Shanghai. This operation is reminiscent of TSYI in which a similar movement of the initial lexical tone is also observable (based on our analysis in Chapter 3). However, the tone movement manipulated in Pattern B differs crucially from the operation in TSYI in regard to the position of the landing-site of the movement. The following comparison displays that in Pattern B the initial tone is transposed to the final syllable across the entire domain. By contrast, it is always the case that TSYI moves the initial tone to the second place. This difference becomes visible especially within trisyllabic or longer domains, where the initial tone undergoes a long-distance movement in Pattern B, but only a local shift in TSYI, as in (9b) and (9c).

(9) Tone movement in Pattern B of TSYA vs. TSYI

		Pattern B	*TSYI*	
a.	Disyllabic	bəʔ.ɕiã	tsoʔ.ɕin	
		'play'	'probably'	
		LMʔ.HL	Hʔ.HL	UR
		$o^ʔ$. LM	$o^ʔ$. H	Sandhi form
b.	Trisyllabic	ɲioʔ.mø.dɤ	paʔ.jɤ.vəɲ	
		'meat-filled buns'	'backseat driver'	
		LMʔ.LH.LH	Hʔ.LH.LH	UR
		$o^ʔ$. o. LM	$o^ʔ$. H. o	Sandhi form
c.	Quadrisyllabic	zaʔ.məʔ.sã.dɤ	ɪʔ.t^hi.sɨ.ka	
	UR	'suddenly'	'all over the place'	
	Sandhi form	LMʔ.LMʔ.HL.LH	Hʔ.HL.MH.MH	UR
		$o^ʔ$. $o^ʔ$. o. LM	$o^ʔ$. H. o. o	Sandhi form

o = zero tones, or unspecified for tone

This difference in the landing-site is due to a matter of stress assignment. Recall the dual-prominence theory (Li 2003). The landing-site to which the initial tone moves is where the stress falls on. Therefore, let us assume as a first approximation that the difference in the landing-site of tone movement in Pattern B and TSYI arises from different positions of metrical stress: the final syllable of the entire domain is always stressed in Pattern B, but the second syllable is singled out as the metrical head in TSYI, as depicted in (10a) vs. (10b).

(10) Tone movement with different head positions

a. Pattern B

$$\begin{array}{ccccccc} & \underline{\text{UR}} & & & & \underline{\text{Final stress}} & \\ \sigma_1 & \sigma_2 & \sigma_3 & \rightarrow & \sigma_1 & \sigma_2 & \acute{\boldsymbol{\sigma}}_{\mathbf{3}} \\ | & | & | & & & & | \\ \mathbf{T_i} & T_j & T_k & & & & \mathbf{T_i} \end{array}$$

b. TSYI

$$\begin{array}{ccccccc} & \underline{\text{UR}} & & & & \underline{\text{Stress on the second}} & \\ \sigma_1 & \sigma_2 & \sigma_3 & \rightarrow & \sigma_1 & \acute{\boldsymbol{\sigma}}_{\mathbf{2}} & \sigma_3 \\ | & | & | & & & | & \\ \mathbf{T_i} & T_i & T_k & & & \mathbf{T_i} & \end{array}$$

The different positions of stress assignment can be attributed to the way that metrical feet are built. According to the analysis of TSYI in Chapter 3, metrical head on the second syllable is generated from a binary iambic foot left-aligned with the PrWd, as schematized below, where the foot-head coincides with the second syllable in a domain of TSYI.

(11) Foot-parse in TSYI

$$\begin{array}{ccc} (\,. & \text{X}) & . \\ \sigma_1 & \boldsymbol{\sigma}_{\mathbf{2}} & \sigma_3 \\ & | & \\ & \mathbf{H} & \end{array}$$

Based on the edgemostness of stress assignment, it is then reasonable to infer that the word-final stress in Pattern B ought to be aligned with the foot boundary as in the case of TSYI, or, to put it in another way, the foot-parsing for Pattern B need to meet the following requirements: (a) it must be right-headed, and (b) right-aligned with the PrWd. Both warrant that the metrical head will fall on the rightmost syllable in a given domain. Bracketed forms in (12) present two approaches to the requirements, holding all of the feet right-headed. One approach is to parse all syllables into a single foot; hence, there is an unbounded parsing in words of three or more syllables, as in (12a). The other approach is to build a binary foot aligned with the right word-edge, leaving all of the remaining syllables to the left unparsed, if any, as in (12b).

(12) Possible foot-parse for Pattern B

	Disyllabic	Trisyllabic	Quadrisyllabic
a.	[(σσ́)]	[(σσσ́)]	[(σσσσ́)]
b.	[(σσ́)]	[σ(σσ́)]	[σσ(σσ́)]

There appears at first to be no need to decide which foot-parse, (12a) or (12b), is the actual foot-parsing for Pattern B of TSYA, because it is hardly possible to distinguish between them in the auditory form. Nonetheless, I permit only the exhaustive-parsing feet of (12a) to be those that are possible for Pattern B, since the foot-parse in (12b) may lead to the unwelcome trochaic foot-type.

Recall that trochaic rhythm is subject to Trochee, and that this constraint has been argued in Chapter 3 to be dominated by Coincide($\acute{\sigma}_{\mu}$, Ft-Final), which disfavors feet beginning with a stressed light syllable. Such a ranking leads to an inference: the foot-head position in Shanghai is contingent on the syllabic weight of the foot-initial syllable. All feet beginning with heavy syllables (i.e. smooth syllables) are left-headed; only when the initial syllable is light (i.e. checked syllables) does the head shift to the right foot-edge, forming an iambic rhythm. This ranking result is recapped through the winner-loser pairs in (13), where the weight of the foot-final syllable is unspecified for its being irrelevant.

(13) Dependency between the weight of the initial syllable and foot-types

Inputs	Winners	Losers	Coincide($\acute{\sigma}_{\mu}$, Ft-Final)	Trochee
a. $\sigma_{\mu\mu}\sigma$	$(\boldsymbol{\acute{\sigma}_{\mu\mu}}\sigma)$	$(\sigma_{\mu\mu}\boldsymbol{\acute{\sigma}})$		W
b. $\sigma_{\mu}\sigma$	$(\sigma_{\mu}\boldsymbol{\acute{\sigma}})$	$(\boldsymbol{\acute{\sigma}_{\mu}}\sigma)$	W	L

Since the initial syllable in TSYA-domains is always a light syllable carrying *Yangru*, a metrical foot beginning with this syllable in the forms like (12a) can ensure that the foot remains right-headed. By contrast, the presence of the right-aligned binary foot-parsing in the forms like (12b) leads to an unwelcome prediction: that the foot-type will fluctuate between trochee and iamb within trisyllabic or longer words, because the foot-initial syllable in these cases is free to be either bimoraic or monomoraic. The following tableau presents this unwelcome fluctuation. If the foot-initial syllable is heavy, as in (14a) and (14c), the intended winner with an iambic rhythm is wrongly beaten by the unwanted trochaic one. This proves that (12a) rather than (12b) is the only correct foot-parsing for Pattern B.

(14) Unwelcome prediction under the foot-parsing of (12b)

Inputs	Winners	Losers	COINCIDE($\acute{\sigma}_{\mu}$, FT-Final)	TROCHEE
a. $\sigma\sigma_{\mu\mu}\sigma$	$\sigma(\boldsymbol{\acute{\sigma}_{\mu\mu}}\sigma)$	$\sigma(\sigma_{\mu\mu}\boldsymbol{\acute{\sigma}})$		W
b. $\sigma\sigma_{\mu}\sigma$	$\sigma(\sigma_{\mu}\boldsymbol{\acute{\sigma}})$	$\sigma(\boldsymbol{\acute{\sigma}_{\mu}}\sigma)$	W	L
c. $\sigma\sigma\sigma_{\mu\mu}\sigma$	$\sigma\sigma(\boldsymbol{\acute{\sigma}_{\mu\mu}}\sigma)$	$\sigma\sigma(\sigma_{\mu\mu}\boldsymbol{\acute{\sigma}})$		W
d. $\sigma\sigma\sigma_{\mu}\sigma$	$\sigma\sigma(\sigma_{\mu}\boldsymbol{\acute{\sigma}})$	$\sigma\sigma(\boldsymbol{\acute{\sigma}_{\mu}}\sigma)$	W	L

For the unbounded parsing of (12a) to beat the right-aligned binary parsing of (12b), in terms of OT ALLFTL must dominate FTBINMAX, which were left unranked with respect to one another in the previous chapter. This ranking is validated in (15), where the foot of both candidates is controlled to be right-headed for ease of comparison (i.e. with the foot-initial syllable kept monomoraic), so the constraints responsible for the foot-head position are irrelevant and omitted from this tableau.

(15) ALLFTL » FTBINMAX

$\sigma\sigma\sigma$	ALLFTL	FTBINMAX
☞a. $(\sigma_{\mu}\sigma\acute{\sigma})$		*
b. $\sigma(\sigma_{\mu}\acute{\sigma})$	*W	L

Tableau (15) presents an incomplete picture, however, because this tableau is insufficient yet to allow for the intended winner, the unbounded parsing of (15a), to surface as the output instead of the left-aligned bounded parsing we have seen in TSYI. This insufficiency becomes apparent when we add the candidate with the foot-parsing of TSYI, $(\sigma_\mu\acute{\sigma})\sigma$, to the bottom of tableau (15), thereby creating (16). It is obvious from this tableau that the added candidate (16c) threatens to beat the intended winner (16a) because it obeys both of the constraints involved. In other words, we cannot yet assign the foot-head to the rightmost syllable for Pattern B with the current ranking AllFtL » FtBinMax.

(16) Tableau (15) with the foot-parse of TSYI $(\sigma_\mu\acute{\sigma})\sigma$ added

σσσ	AllFtL	FtBinMax
a. $(\sigma_\mu\sigma\acute{\sigma})$		W*
b. $\sigma(\sigma_\mu\acute{\sigma})$	*W	
💣c. $(\sigma_\mu\acute{\sigma})\sigma$		

To rid the undesired winner (16c), one might rank Parse-σ higher than FtBinMax, because Parse-σ seems to be the constraint that favors the intended winner (16a) over the unwanted candidate (16c). This move overrides the analysis of TSYI, however, since the candidate (16c), which must be removed by Parse-σ in this case, has been argued to surface in TSYI. This dilemma leads to a ranking paradox: Parse-σ must dominate FtBinMax for TSYI to have perfectly binary feet in the form of (16c), and it must be dominated by FtBinMax so that the exhaustive foot-parsing of (16a) can correctly surface in Pattern B. Tableau (17) shows this inconsistent ranking argument (indicated by the inverted W-L pairs) in a comparative format.

(17) Ranking paradox between different foot-parses in TSYI and Pattern B

Inputs	Tone Sandhi	Winners	Losers	FtBinMax	Parse-σ
$\sigma_\mu\sigma\sigma$	TSYI	$(\sigma_\mu\acute{\sigma})\sigma$	$(\sigma_\mu\sigma\acute{\sigma})$	W	L
	Pattern B	$(\sigma_\mu\sigma\acute{\sigma})$	$(\sigma_\mu\acute{\sigma})\sigma$	L	W

The ranking paradox in (17) shows that Parse-σ may not be the responsible constraint. We still need another constraint to solve the problem. Because this paradox concerns the discrepancy between TSYI and TSYA, an inspection of the underlying difference between *Yinru* and *Yangru* could offer clues to specifying some of the properties of that constraint.

The table in (18) shows a comparison between *Yinru* and *Yangru* with respect to their underlying forms. As it appears, they have the short duration in common, but otherwise they are quite different: *Yinru* is a high-register tone with level shape, while *Yangru* is a low-register tone with a rising contour.

(18) Contrast in *Yinru* vs. *Yangru*

	Yinru (Hʔ)	*Yangru* (LMʔ)
Duration	short	short
Register	high	low
Contour	level	rising

Given that *Yangru* is a contour tone in contrast to *Yinru*, it is likely to be subject to the restriction of contour tone licensing: there is a great preference for contour tones to be licensed word-finally (Wightman *et al.* 1992, Zhang 2001, 2002). It is then reasonable to assume that the parsing of the unbounded foot in Pattern B of TSYA is an attempt to satisfy the requirement of the need to license the contour tone of the initial *Yangru*, because only in this way does the foot-head (i.e. the landing-site for the initial-tone movement) coincide with the word-final syllable. Clearly, this assumption is based on the premise that the left-aligned bounded foot-parsing in TSYI is the general pattern in Shanghai. The change of metrical structure from bounded parsing to an unbounded parsing in Pattern B is simply imposed by tonal preference.

This idea is helpful for us to resolve the ranking paradox in (17) by positing that (a) PARSE-σ is dominated by FTBINMAX, just identical to what we have analyzed for TSYI, and that (b) the constraint compelling the unbounded foot-parsing in Pattern B concerns the positional restriction on contour-tone licensing. Among the constraints posited in Chapter 3, we already have COINCIDE(Contour, PrWd-Final) that can serve as such a responsible constraint, with the definition repeated in (19). Therefore, all it takes to derive the unbounded parsing for Pattern B is to rank this constraint over FTBINMAX. The constraint ranking proposed is summarized in (20), and the tableaux in (21) and (22) show that this ranking is indeed valid and workable for the difference in the foot-parsing in TSYI and Pattern B. Since the feet in both cases are equally aligned with the left word-edge, ALLFTL favors neither the winner nor the loser in the competition, and we can omit it from these tableaux accordingly.

(19) COINCIDE(Contour, Rightmost(σ, PrWd):

Assign one violation mark for every contour tone that does not coincide with the final syllable of a prosodic word.

(20) COINCIDE(Contour, PrWd-Final) » FTBINMAX » PARSE-σ

(21) Bounded parsing in TSYI

σσσ H	COINCIDE (Contour, PrWd-Final)	FTBINMAX	PARSE-σ
a. (σ_μσσ́) H		*W	L
☞b. (σ_μσ́)σ H			*

(22) Unbounded parsing in Pattern B

σσσ LM	COINCIDE (Contour, PrWd-Final)	FTBINMAX	PARSE-σ
☞a. (σ_μσσ́) LM		*	
b. (σ_μσ́)σ LM	*W	L	*W

It is clear from the tableaux that COINCIDE(Contour, PrWd-Final) exerts pressure only on the assessment of Pattern B, by which the ideally binary foot-parse in (22b), which is preferred by the lower-ranking FTBINMAX, ends up losing the competition. Hence, the emergence of the unbounded parsing in Pattern B is arguably a strategy to avoid the violation of the higher-ranking COINCIDE(Contour, PrWd- Final).

In the analysis thus far, COINCIDE(Contour, PrWd-Final) serves as the constraint responsible for the unbounded parsing of Pattern B, so it must dominate all constraints that may help bounded parsing win out. LOCAL is one of such constraints in addition to FTBINMAX, because it favors local movement of the initial tone, which entails the bounded foot-parsing. The following tableau offers the arguments that LOCAL must also be dominated by COINCIDE(Contour, PrWd-Final) as FTBINMAX.

(23) COINCIDE(Contour, PrWd-Final) » LOCAL

σσσ ^ LM	COINCIDE (Contour, PrWd-Final)	LOCAL	FTBINMAX	PARSE-σ
☞a. (σ_μσσ́) ^ LM		*	*	
b. (σ_μσ́)σ ^ LM	*W	L	L	*W

With the relevant constraint ranking settled, we shall examine whether the move of COINCIDE(Contour, PrWd-Final) in this section undermines the analysis of TSS, given that the initial tones of TSS-domains are also contour tones. The result is shown in tableau (24) utilizing the established constraint ranking COINCIDE(Contour, PrWd-Final) » {LOCAL, FTBINMAX} » PARSE-σ, with ANCHOR-L($t_{\sigma 1}$, σ́) added as well. Note that the ranking of ANCHOR-L($t_{\sigma 1}$, σ́) with respect to the three other constraints is unknown up to now, so ANCHOR-L($t_{\sigma 1}$, σ́) has been separated in this tableau by a double line. The candidate set contains two ways of parsing syllables into feet. Candidates (24a-d) employ TSYI-like foot-parsing: the left-aligned bounded parsing differs only in the positions of the retained initial contour tone. On the other hand, candidates (24e-h) employ the unbounded foot-parsing seen in Pattern B, with the initial tones deployed in a parallel way. The head of both groups lies on the initial heavy syllable under the control of TROCHEE. Since the candidate set incurs no violation of ALLFTL, COINCIDE(σ́$_\mu$, FT-Final) and TROCHEE, these constraints can be ignored with no peril to the analysis.

Recall that the foot-parse of TSS is in the form of [(σ́σ)σ], with the underlying contour tone of the initial syllable split over the syllables within the foot. The winning candidate (24b) does meet this description, and hence proves that that there is no danger of TSS patterns being derived in the current ranking. LOCAL and FTBINMAX, though demoted in the ranking, remain active to exclude the undesired candidates

(24c), (24f) and (24g). The long-distance tone movement of (24d) and (24h), with or without unbounded foot-parsing, is removed either by ANCHOR-L($t_{\sigma 1}$, σ́) or by LOCAL (this uncertainty resulting from disjunctive ranking will be addressed later).

(24) Bounded parsing of TSS with contour split: t^hɔ.za.i *'annoying'*

$\sigma_{\mu\mu}\sigma\sigma$ MH	ANCHOR-L ($t_{\sigma 1}$, σ́)	COINCIDE (C, PrWd-Final)	LOCAL	FTBINMAX	PARSE-σ
a. [(σ́$_{\mu\mu}$σ)σ] MH		*W			*
☞b. [(σ́$_{\mu\mu}$σ)σ] M H					*
c. [(σ́$_{\mu\mu}$σ)σ] M H			*W		*
d. [(σ́$_{\mu\mu}$σ)σ] MH	*W		*W		*
e. [(σ́$_{\mu\mu}$σσ)] MH		*W		*W	L
f. [(σ́$_{\mu\mu}$σσ)] M H				*W	L
g. [(σ́$_{\mu\mu}$σσ)] M H			*W	*W	L
h. [(σ́$_{\mu\mu}$σσ)] MH	*W		*W	*W	L

Clearly, tableau (24) shows that the strategy for TSS to escape violation of COINCIDE (Contour, PrWd-Final) must be to split the initial contour tone, rather than to employ the long-distance movement observed in Pattern B, crucially because there is no way of putting the foot-head to the word-final syllable in TSS, even with the bounded foot changed to an unbounded foot. As a result, any attempt for TSS to move the contour tone as a whole to the final syllable is doomed to failure.

4.2.2 Contour-split Strategy

The split of the initial contour tone in the output form of TSS raises the question of whether the contour-split strategy is also available for Pattern B. It is important to address this issue, since there is the potential that using contour-split strategy to avoid the violation of Coincide(Contour, PrWd-Final) may undermine the analysis already established for Pattern B in the last section.

To begin with, we present a total of six possibilities that adopt the contour-split strategy for Pattern B to elude the violation of Coincide(Contour, PrWd-Final) (with three possible splitting patterns in trisyllabic words multiplied by two foot-parses in the discussion). All of them are contained in tableau (25) as the intended losers, since the intended winner adopts the strategy of moving the initial contour tone away from its source under the unbounded foot-parse. Coincide(Contour, PrWd-Final) becomes irrelevant to the choice between the word-final contour of the intended winner and the split level tones of all of the intended losers (25a-f), so it is omitted from this tableau.

(25) Possible splitting patterns for Pattern B in a comparative format

Input	Winner	Losers	Anchor-L ($t_{\sigma 1}$, σ́)	Local	FtBinMax	Parse-σ
$\sigma_\mu\sigma\sigma$ MH	[($\sigma_\mu\sigma$σ́)] LM	a. [($\sigma_\mu\sigma$σ́)] LM	W	L		
		b. [($\sigma_\mu\sigma$σ́)] L M	W			
		c. [($\sigma_\mu\sigma$σ́)] LM	W			
		d. [(σ_μσ́)σ] LM	W	L	L	W
		e. [(σ_μσ́)σ] L M	W		L	W
		f. [(σ_μσ́)σ] LM			L	W

According to Prince (2002a) and McCarthy (2008), in a comparative tableau like (25) every loser-favoring constraint ought to be dominated by some winner-favoring constraint. It follows that we need to check that every L has some W to its left across a solid line. This reveals that ANCHOR-L($t_{\sigma1}$, σ́) – which has been unranked with respect to the other three – must dominate LOCAL and FTBINMAX, or else each of the contour-split patterns in (25a), (25d) and (25e) would have an L without some W dominating it. To put it another way, if the ANCHOR-L($t_{\sigma1}$, σ́) were to be ranked below LOCAL and FTBINMAX, those unwelcome candidates would otherwise threat to beat the intended winner in the long run. Only with ANCHOR-L($t_{\sigma1}$, σ́) ranked higher can we readily eliminate all of the three intended losers, together with those in (25b) and (25c). There is then no problem with the first five contour-split patterns. However, the remaining candidate still threatens to subvert our analysis, as revealed in row (25f), where there is an L that is not dominated by a W. This candidate can be a threat to the intended winner because it fares better on FTBINMAX, and is equally perfect in the eyes of ANCHOR-L($t_{\sigma1}$, σ́) due to the fact that the first part of the split tone happens to coincide with the metrical head. The presence of this unwelcome candidate suggests that the current ranking remains inadequate, so I propose an anchoring constraint for the intended winner to beat candidate (25f). The definition of this constraint is as follows.

(26) ANCHOR-R($t_{\sigma1}$, FT)

Let input tonal tier = $t_1t_2t_3$ … t_n and output tonal tier = $T_1T_2T_3$ …T_m.

Assign one violation mark for every t_x if t_x is at the right edge of the tonal tier, which is associated with the word-initial syllable, and there is no T_y at the right edge of the metrical foot where $t_x \boldsymbol{\mathcal{R}} T_y$ (McCarthy & Prince 1993a, 1995).

As tableau (27) illustrates, with ANCHOR-R($t_{\sigma1}$, FT) also ranked above FTBINMAX, we can readily eliminate the problematic candidate (27a) (copied from candidate (25f)), because the second half of its initial tone is not enclosed by the foot at all, and hence is in violation of the higher-ranked ANCHOR-R($t_{\sigma1}$, FT). This forecloses the final way in which the initial contour tone of pattern B could take advantage of the splitting strategy to elude the violation of COINCIDE(Contour, PrWd-Final).

(27) ANCHOR-R($t_{\sigma1}$, FT) » FTBINMAX

$\sigma_\mu\sigma\sigma$ LM	COINCIDE (C, PrWd-Final)	ANCHOR-L ($t_{\sigma1}$, $\acute{\sigma}$)	ANCHOR-R ($t_{\sigma1}$, FT)	FTBINMAX
a. [($\sigma_\mu\acute{\sigma}$)σ] L M			*W	L
☞b. [($\sigma_\mu\sigma\acute{\sigma}$)] LM				*

Before we leave the discussion of Pattern B, something remains to be said about the newly proposed constraint, ANCHOR-R($t_{\sigma1}$, FT). First, given that none of the surface patterns of Shanghai tone sandhi infringes the stipulation made by ANCHOR-R($t_{\sigma1}$, FT), as demonstrated in table (28), we can safely conclude that ANCHOR-R($t_{\sigma1}$, FT) must be undominated.

(28) No violation of ANCHOR-R($t_{\sigma1}$, FT) throughout

	TSS	TSYI	Pattern B
Input	$\sigma_{\mu\mu}\sigma\sigma$ t t	$\sigma_\mu\sigma\sigma$ t	$\sigma_\mu\sigma\sigma$ t t
Output	($\acute{\sigma}_{\mu\mu}\sigma$)σ t t	($\sigma_\mu\acute{\sigma}$)σ t	($\sigma_\mu\sigma\acute{\sigma}$) t t

Second, ANCHOR-R($t_{\sigma1}$, FT) usurps the function of other two constraints. One of them is LOCAL, which was proposed in Chapter 3 to explain the locality of contour-split in TSS. ANCHOR-R($t_{\sigma1}$, FT) subsumes this effect because the split contour tones are properly enclosed with the binary foot. It follows that we can analyze TSS employing ANCHOR-R($t_{\sigma1}$, FT) in substitution for LOCAL, as shown in the following tableau.

(29) Substitution for LOCAL

$\sigma_{\mu\mu}\sigma\sigma$ MH	ANCHOR-L ($t_{\sigma1}$, $\acute{\sigma}$)	ANCHOR-R ($t_{\sigma1}$, FT)	FTBINMAX
☞b. $[(\acute{\sigma}_{\mu\mu}\sigma)\sigma]$ M H			
c. $[(\acute{\sigma}_{\mu\mu}\sigma)\sigma]$ M H		*W	

The other constraint that can be replaced is MAX(T)$_{\sigma1}$. The tableau in (30) reveals that ANCHOR-R($t_{\sigma1}$, FT) together with ANCHOR-L($t_{\sigma1}$, $\acute{\sigma}$) amounts to the protection effect of MAX(T)$_{\sigma1}$ on the initial tones if both of the anchoring constraints dominate *t.

(30) Substitution for MAX(T)$_{\sigma1}$

$\sigma_{\mu\mu}\ \sigma\ \ \sigma$ MH LHMH	ANCHOR-L ($t_{\sigma1}$, $\acute{\sigma}$)	ANCHOR-R ($t_{\sigma1}$, FT)	*t
☞a. $[(\acute{\sigma}_{\mu\mu}\sigma)\sigma]$ M H			**
b. $[(\acute{\sigma}_{\mu\mu}\sigma)\sigma]$ M		*W	*L
c. $[(\acute{\sigma}_{\mu\mu}\sigma)\sigma]$ H	*W		*L

In sum, ANCHOR-R($t_{\sigma1}$, FT) takes over the necessary work that has been attributed to LOCAL and MAX(T)$_{\sigma1}$ respectively. The reasoning of Occam's Razor demands that we dispense with those two constraints from the present analysis since ANCHOR-R($t_{\sigma1}$, FT) is proven to be sufficient.

4.3 Lapse Avoidance

In this section I proceed to deal with Pattern A of TSYA. Section 4.3.1 gives an account of lapse licensing for the emergence of Pattern A in quadrisyllabic or longer words. Section 4.3.2 provides a co-phonological approach to the variable thresholds of Pattern A.

4.3.1 The Emergence of Pattern A

As introduced in section 4.1.1, the manipulation of the retained tone in Pattern A conforms to the processing of TSS, causing the initial contour tone to be re-distributed over the first two syllables. This contour-split pattern goes beyond our expectation, however, given that the initial contour tone, *Yangru*, is carried by a light syllable and therefore its best way of satisfying COINCIDE(Contour, PrWd- Final) must be to move as a whole to the end of the word (i.e. surfacing as Pattern B), given the top-ranked ANCHOR-L($t_{\sigma 1}$, $\acute{\sigma}$) and COINCIDE($\acute{\sigma}_{\mu}$, FT-Final). This less harmonic output leads to the question of what motivates the contour split of Pattern A, as this operation seems impossible under the current constraint ranking, as illustrated in (31). Even if we suppose that Pattern A obeys COINCIDE(Contour, PrWd-Final), COINCIDE($\acute{\sigma}_{\mu}$, FT-Final), ALLFTL and ANCHOR-R($t_{\sigma 1}$, FT), Pattern A will lose to Pattern B on ANCHOR-L($t_{\sigma 1}$, $\acute{\sigma}$) because the first part split from the initial contour tone (L) is inevitably misaligned by one syllable with the foot- head.

(31) Failure of Pattern A on ANCHOR-L($t_{\sigma 1}$, $\acute{\sigma}$)

Input	Patterns		ANCHOR-L($t_{\sigma 1}$, $\acute{\sigma}$)
σσσσ ^ LM	*Pattern A*	(σσ́)σσ | | LM	*
	Pattern B	(σσσσ́) ^ LM	

Nevertheless, Pattern A is doing necessary work for TSYA, which becomes clear in reference to the distribution of Pattern A vs. Pattern B. Consider table (32). It shows that Patterns A and B are in complementary distribution with respect to word length (as highlighted in the shaded areas): Pattern B occurs in disyllabic or trisyllabic words, whereas Pattern A shows up elsewhere. If we maintain the view that Pattern B is the preferable surface tone pattern for TSYA, then the ill-formedness of *o$^{\text{ʔ}}$-o-o-LM and *o$^{\text{ʔ}}$-o-o-o-LM in (32a) suggests that this superior pattern turns out to be unqualified in words of four or more syllables. It follows that the emergence of Pattern A in such contexts serves as a substitute.

(32) Complementary distribution of Patterns A and B in TSYA

Initial σ (LMʔ)	σσ	σσσ	σσσσ	σσσσσ
a. *Pattern B*	o$^{\text{ʔ}}$-LM	o$^{\text{ʔ}}$-o-LM	*o$^{\text{ʔ}}$-o-o-LM	*o$^{\text{ʔ}}$-o-o-o-LM
b. *Pattern A*	*L$^{\text{ʔ}}$-M	*L$^{\text{ʔ}}$-M-o	L$^{\text{ʔ}}$-M-o-o	L$^{\text{ʔ}}$-M-o-o-o

Given the hypothesis that Pattern A emerges in substitution for Pattern B, we have to find out why Pattern A is favored over Pattern B in such longer words, in spite of the dispreference for the tone-head misalignment. For this purpose, we translate the one-dimensional surface tone patterns in (32) into metrically conditioned tone mapping in accordance with the present analysis, creating the winner~loser comparison in (33). It is obvious from this comparison that Pattern B suffers from a rhythmic defect in all situations except in a disyllabic word: it contains more stress lapses than Pattern A. Hence, what is demonstrated in (33) is by and large a choice between the fewer lapses under Pattern A and the proper tone-head alignment of Pattern B. To be specific, the comparison in (33b) involves comparing Pattern B with a lapse adjacent to the stress peak against Pattern A with tone-head misalignment. In this case Pattern B is the winner, suggesting that the rhythmic advantage of no lapse over a lapse adjacent to the stress peak is insufficient to override the dispreference for the tone-head misalignment. Conversely, the choice in (33c) tells that the tone-head misalignment of Pattern A becomes tolerable if the alternative, Pattern B, requires that lapses be separated from the stress. The comparison in (33d) follows the same pattern already established in (33c): the violation of ANCHOR-L($t_{\sigma 1}$, σ́) is incurred due to the need to avoid the situation where lapses stand apart from the peak.

(33) Comparison of Pattern A vs. Pattern B in TSYA

	Input	Winner	Loser	Comparison
a.	σσ LM	(σσ́) LM	*(σ**σ́**) **L**M	None vs. t_1~σ́ misalignment
b.	σσσ LM	$(\underline{\sigma\sigma}\acute{\sigma})$ LM	*(σ**σ́**)σ **L**M	Lapse by peak vs. t_1~σ́ misalignment
c.	σσσσ LM	(σ**σ́**)σσ **L**M	$*(\underline{\sigma\sigma}\sigma\acute{\sigma})$ LM	t_1~σ́ misalignment vs. isolated lapse
d.	σσσσσ LM	(σ**σ́**)σσσ **L**M	$*(\underline{\sigma\sigma\sigma}\sigma\acute{\sigma})$ LM	t_1~σ́ misalignment vs. isolated lapses

A generalization ensues: Lapses are only allowed to occur beside the stress peak. This is consistent to what is observed in Kager (2001), where she concludes from a cross-linguistic study that lapses often occur immediately before the stress peak, as in Piro, or immediately after the peak, as in Gawara. This restricted distribution arises from the effect of positional prominence. Since lapses are marked configurations generally, they are licensed only at a prominent position. Kager proposes a rhythmic licensing constraint for peak to serve as such a licensor, as stated in (34). This constraint can in effect license lapses abutting against the main-stressed syllable by disallowing lapses everywhere else.

(34) Lapse-at-Peak (abbr. LapsPk)

Assign one violation mark for every pair of adjacent unstressed syllables that is not adjacent to the main-stressed syllable. (Kager 2001)

Seeing that the preference for lapses adjacent to the peak overrides the dispreference of Anchor-L($t_{\sigma1}$, σ́) for the tone-head misalignment of Pattern A (as indicated by the comparison in (33c) and (33d)), LapsPk must outrank Anchor-L($t_{\sigma1}$, σ́) to obtain the emergence of Pattern A in words of four or five syllables. The tableaux below show the practicability of this ranking, where instances of the violation of LapsPk are underlined.

(35) Disyllabic TSYA: Pattern B as the winner

$\sigma_\mu\sigma$ LM	LapsPk	Anchor-L ($t_{\sigma1}$, σ́)
a. [(σσ́)] LM		*W
☞b. [(σσ́)] LM		

(36) Trisyllabic TSYA: Pattern B as the winner

$\sigma_\mu\sigma\sigma$ LM	LapsPk	Anchor-L ($t_{\sigma1}$, σ́)
a. [(σσ́)σ] LM		*W
☞b. [(σσσ́)] LM		

(37) Quadrisyllabic TSYA: the emergence of Pattern A

$\sigma_{\mu}\sigma\sigma\sigma$ LM	LAPSPK	ANCHOR-L ($t_{\sigma1}$, σ́)
☞a. [(σ σ́)σσ] LM		*
b. [($\underline{\sigma\sigma}$σσ́)] LM	*W	L

(38) Pentasyllabic TSYA: the emergence of Pattern A

$\sigma_{\mu}\sigma\sigma\sigma\sigma$ LM	LAPSPK	ANCHOR-L ($t_{\sigma1}$, σ́)
☞a. [(σ σ́)σ$\underline{\sigma\sigma}$] LM	*	*
b. [($\underline{\sigma\sigma\sigma}$σσ́)] LM	**W	L

To recapitulate, in all of the four tableaux above, candidates (a) present Pattern A and candidates (b) present Pattern B. The pattern selected as the output for TSYA is crucially decided by the higher-ranking LAPSPK. Tableaux (35) and (36) show the result for two- and three-syllable words, in which cases the patterns tie on LAPSPK due to the fact that neither contain any instance of a violation of LAPSPK. Consequently, the next constraint down, ANCHOR-L($t_{\sigma1}$, σ́), selects Pattern B as the output by eliminating Pattern A. The tie on LAPSPK is broken, however, when the number of syllables in the words increases to four or more. In these cases, Pattern B acquires more violation-marks from LAPSPK than Pattern A (specifically, one for Pattern B vs. zero for Pattern A in (37), and two for Pattern B vs. one for Pattern A in (38)). It thus follows that Pattern B is ruled out by LAPSPK and Pattern A emerges in longer words.

Note, however, that LAPSPK cannot contribute to the contour split of Pattern A so straightforwardly as in the tableaux in (37) and (38). All it does is to change stress placement. Suppose there is a candidate with the same foot-parsing as Pattern A, but with the initial contour tone left intact on the stressed syllable, namely Pattern A with a contour tone moved as a whole. It turns out that this candidate will win because it ties with the contour-split Pattern A on the higher-ranked LAPSPK, and fares better on the next constraint down, ANCHOR-L($t_{\sigma1}$, σ́). Therefore, to cause the contour tone to be split in Pattern A, we have to further assume that COINCIDE(Contour, PrWd-Final) is also ranked higher than ANCHOR-L($t_{\sigma1}$, σ́), as shown in (39). This move forecloses the possibility of contour-tone movement in Pattern A regardless of the length of the TSYA domains. For illustration, tableaux (40) and (41) show that COINCIDE(Contour, PrWd-Final) » ANCHOR-L($t_{\sigma1}$, σ́) obtains the intended Pattern A in a four- and five-syllable word (as evidenced by the winning candidates in (40a) and (40d)), and does not undermine the preference for Pattern B in three-syllable words (as evidenced by the winning candidates of (41b)). Contour-moving candidates (40c), (40f) and (41c) lose in all of the cases.

(39) COINCIDE(Contour, PrWd-Final) » ANCHOR-L($t_{\sigma1}$, σ́)

(40) Longer TSYA: contour-splitting Pattern A

i. Quadrisyllabic TSYA

$\sigma_\mu\sigma\sigma\sigma$ LM	COINCIDE (C, PrWd-Final)	LAPSPK	ANCHOR-L ($t_{\sigma1}$, σ́)
☞a. [(σσ́)σσ] LM			*
b. [(σσσσ́)] LM		*W	L
c. [(σσ́)σσ] LM	*W		L

ii. Pentasyllabic TSYA

$\sigma_{\mu}\sigma\sigma\sigma\sigma$ LM	COINCIDE (C, PrWd-Final)	LAPSPK	ANCHOR-L ($t_{\sigma1}$, $\acute{\sigma}$)
☞d. $[(\sigma\,\acute{\sigma})\sigma\underline{\sigma\sigma}]$ LM		*	*
e. $[(\underline{\sigma\sigma\sigma}\sigma\acute{\sigma})]$ LM		**W	L
f. $[(\sigma\acute{\sigma})\sigma\underline{\sigma\sigma}]$ LM	*W	*	L

(41) Shorter TSYA: contour movement allowed only for Pattern B

$\sigma_{\mu}\sigma\sigma$ LM	COINCIDE (C, PrWd-Final)	LAPSPK	ANCHOR-L ($t_{\sigma1}$, $\acute{\sigma}$)
a. $[(\sigma\,\acute{\sigma})\sigma]$ LM			*W
☞b. $[(\sigma\sigma\acute{\sigma})]$ LM			
c. $[(\sigma\acute{\sigma})\sigma]$ LM	*W		

Thus far LAPSPK appears plausible in that it dominates ANCHOR-L($t_{\sigma1}$, $\acute{\sigma}$) to decide the competition between Pattern A and Pattern B. However, the higher-ranked LAPSPK subverts our analysis by allowing a number of undesired winners with relatively fewer offending lapses. The menacing candidates arise in the following situations.

The first situation occurs within pentasyllabic TSYA, where the intended winner, Pattern A, correctly defeats Pattern B for its slighter violation of LAPSPK, as in tableau (39). Unfortunately, Pattern A itself also acquires one violation-mark from LAPSPK, so it can be undesirably defeated by another candidate which perfectly satisfies LAPSPK by the same token. The following tableau provides a list of the possible threat of this sort. The candidates are transcribed in a one-dimensional representation to save space, where the syllables are replaced directly by the tone they carry (o stands for a toneless syllable), and the stress peak is indicated by the superscript vertical bar before the syllable bearing it. Apparently, all of these threatening candidates have the peak on the third syllable – the only way of perfectly satisfying LAPSPK. Hence, to keep the stress at this position, the third syllable must be controlled to be bimoraic, otherwise candidates (42c) and (42d) will gain a word-final peak because of the higher-ranking COINCIDE($\acute{\sigma}_\mu$, FT-Final). It then follows that the candidate set in this tableau contains no violation of COINCIDE($\acute{\sigma}_\mu$, FT-Final), so it is omitted here because it assesses blanks, (note that COINCIDE(Contour, PrWd-Final) is omitted for the same reason). Instead, we add ALLFTL and TROCHEE to this tableau as the competition between the intended winner and the other candidates involves different foot-parsing and stress placement. Note particularly that the ranking of ALLFTL and TROCHEE is not yet decided with respect to LAPSPK and ANCHOR-L($t_{\sigma 1}$, $\acute{\sigma}$), so we have placed these constraints to the right of the ranked portion.

(42) Threats to pentasyllabic TSYA

$\sigma_\mu\sigma\sigma_{\mu\mu}\sigma\sigma$ ^ LM	LAPSPK	ANCHOR-L ($t_{\sigma 1}$, $\acute{\sigma}$)	ALLFTL	TROCHEE
Intended winner				
[(L.ˈM).o.$\underline{\text{o.o}}$]	*	*		*
Threatening candidates				
a. [(L.o.ˈM).o.o]	L	*		*
b. [o.(L.ˈM).o.o]	L	*	*W	*
c. [o.o.(ˈL.o.M)]	L	L	*W	L
d. [o.o.(ˈL.M).o]	L	L	*W	L

Likewise, pentasyllabic TSYI runs into trouble with the high-ranking LAPSPK, given that its metrical structure is exactly the same as in Pattern A of TSYA in our analysis. Tableau (43) presents the threatening candidates, which are parallel to those in tableau (42).

(43) Threats to pentasyllabic TSYI

$\sigma_{\mu}\sigma\sigma_{\mu\mu}\sigma\sigma$ H	LapsPk	Anchor-L ($t_{\sigma1}$, σ́)	AllFtL	Trochee
Intended winner				
[(o.ˈH).o.o.o]	*			*
Threatening candidates				
a. [(o.o.ˈH).o.o]	L			*
b. [o.(o.ˈH).o.o]	L		*W	*
c. [o.o.(ˈH.o.o)]	L		*W	L
d. [o.o.(ˈH.o).o]	L		*W	L

There are problems with TSS as well, though the situation is slightly different. Recall that TSS has a word-initial peak all the way in the output, say, (σ́σσ), so TSS happens to be the mirror image of Pattern B of TSYA. Therefore, the violation-marks assigned by LapsPk for TSS and Pattern B are on a par: zero violation-mark is assessed for trisyllabic or shorter words, one assessed for quadrisyllabic words, and an additional mark for pentasyllabic words. The existence of violation-marks makes words of four or five syllables a hazard – given that the intended winner of TSS is obliged to lose out if there is any candidate that better satisfies LapsPk in such longer contexts. Tableaux (44) and (45) provide such threatening candidates, with six for quadrisyllabic words and 12 for pentasyllabic words. Since all of them have the stress on the medial syllables to eliminate the violation of LapsPk, again, we keep the syllables bimoraic so that the effect of Coincide($\acute{\sigma}_{\mu}$, Ft- Final) can be set aside.

(44) Threats to quadrisyllabic TSS

$\sigma_{\mu\mu}\sigma_{\mu\mu}\sigma_{\mu\mu}\sigma$ LH	LAPSPK	ANCHOR-L $(t_{\sigma1}, \acute{\sigma})$	ALLFTL	TROCHEE
Intended winner				
[(ˈL.H).o.o]	*			
Threatening candidates				
a. [(L.ˈH).o.o]	L	*W		*W
b. [(L.o.ˈH).o]	L	*W		*W
c. [o.(L.ˈH).o]	L	*W	*W	*W
d. [o.(ˈL.H).o]	L		*W	
e. [o.o.(ˈL.H)]	L		*W	
f. [o.(ˈL.o.H)]	L		*W	

(45) Threats to pentasyllabic TSS

$\sigma_{\mu\mu}\sigma_{\mu\mu}\sigma_{\mu\mu}\sigma_{\mu\mu}\sigma$ LH	LAPSPK	ANCHOR-L $(t_{\sigma1}, \acute{\sigma})$	ALLFTL	TROCHEE
Intended winner				
[(ˈL.H).o.o.o]	**			
Threatening candidates				
a. [(L.ˈH).o.o.o]	*L	*W		*W
b. [(L.o.ˈH).o.o]	L	*W		*W
c. [(L.o.o.ˈH).o]	*L	*W		*W
d. [o.(L.ˈH).o.o]	L	*W	*W	*W
e. [o.(L.o.ˈH).o]	*L	*W	*W	*W
f. [o.o.(L.ˈH).o]	*L	*W	*W	*W
g. [o.o.o.(ˈL.H)]	*L		*W	
h. [o.o.(ˈL.o.H)]	L		*W	
i. [o.o.(ˈL.H).o]	L		*W	
j. [o.(ˈL.H).o.o]	*L		*W	
k. [o.(ˈL.o.H).o]	*L		*W	
l. [o.(ˈL.o.o.H)]	*L		*W	

Putting together all the situations from (42) to (45), there are 26 threatening candidates in total. Most of them can be erased by ALLFTL and TROCHEE, however, as indicated by the considerable Ws in the isolated columns. Only two of them remain uncanceled, (42a) and (43a), copied below. They seem to involve the same foot-parse a ternary parsing, which is distinct from the binarity of the intended winners. Hence, one might resort to the constraint banning the big foot-parsing – FTBINMAX. This is of no help either, however, because FtBinMax has been argued to be dominated by Anchor-L($t_{\sigma1}$, σ́), and thus there is no way that FtBinMax can overrule the higher-ranked LapsPk.

(46) a. The uncanceled threat to Pentasyllabic TSYA

$\sigma_\mu\sigma\sigma\sigma\sigma$ LM	LapsPk	Anchor-L ($t_{\sigma1}$, σ́)	AllFtL	Trochee
Intended winner				
[(L.ˈM).o.o.o]	*	*		*
Threatening candidate				
(=42a) [(L.o.ˈM).o.o]	L	*		*

b. The uncanceled threat to Pentasyllabic TSYI

$\sigma_\mu\sigma\sigma\sigma\sigma$ H	LapsPk	Anchor-L ($t_{\sigma1}$, σ́)	AllFtL	Trochee
Intended winner				
[(o.ˈH).o.o.o]	*			*
Threatening candidates				
(=43a) [(o.o.ˈH).o.o]	L			*

The existence of the uncanceled threat implies that there is a need to find out a new constraint. The properties of that constraint can be specified by deliberating upon why those threatening candidates can win out. Consider (46) again. The intended winners appear to lose out due to an additional lapse in the final position, suggesting that the constraint we call for has the property of allowing final lapses. This motivates another rhythmic licensing constraint, as defined in (47), which provides for a great preference for lapses to be word-final. The preference is empirically supported by the fact that final lapses are widespread in stress languages, for example in Pintupi, in contrast to the sharp dispreference for initial lapses (Kager 2001).

(47) LAPSE-AT-END (abbr. LAPSED):

> Assign one violation mark for every pair of adjacent unstressed syllables that is not word-final. (Kager 2001)

Note, however, that this constraint cannot alone counteract the loser-favoring LAPSPK in (46), because it favors neither the intended winners nor the threatening candidates in (47). To solve this problem, one might assume that LAPSPK ought to be crucially dominated by some winner-favoring constraint (say, FTBINMAX), with ANCHOR-L($t_{\sigma1}$, σ́) dominated only by LAPSED. This demotion will fail in TSYA, though, since in the absence of the higher-ranked LAPSPK, the ranking LAPSED » ANCHOR-L($t_{\sigma1}$, σ́) will wrongly predict a wider distribution for Pattern A – Pattern A can further emerge in a three-syllable words.

It follows that we are, on one hand, obliged to demote LAPSPK in the hierarchy, and on the other we still wish to hold its activeness/inactiveness relative to the higher-ranked ANCHOR-L($t_{\sigma1}$, σ́). This motivates an idea of conjoining LAPSPK with LAPSED in the sense of Smolensky (1995), forming [LAPSPK & LAPSED]$_{\omega}$, which is violated once by any instance of PrWd that contains violations of LAPSPK and LAPSED. This conjoined constraint, through crucially dominating ANCHOR-L($t_{\sigma1}$, σ́), can yield the effect on the switch of TSYA patterns, which had been attributed to LAPSPK. This is shown in the tableaux in (48), which are copied from (40) and (41), with LAPSPK replaced by the conjoined constraint.

(48) Substitution for LAPSPK: [LAPSPK & LAPSED]$_\omega$ » ANCHOR-L($t_{\sigma1}$, σ́)

i. Trisyllabic TSYA: Pattern B as the winner

$\sigma_\mu\sigma\sigma$ LM	COINCIDE (C, PrWd-Final)	[LAPSPK & LAPSED]$_\omega$	ANCHOR-L ($t_{\sigma1}$, σ́)
a. [(σ σ́)σ] LM			*W
☞b. [(σσσ́)] LM			
c. [(σσ́)σ] LM	*W		

ii. Quadrisyllabic TSYA: Pattern A as the winner

$\sigma_\mu\sigma\sigma\sigma$ LM	COINCIDE (C, PrWd-Final)	[LAPSPK & LAPSED]$_\omega$	ANCHOR-L ($t_{\sigma1}$, σ́)
☞d. [(σ σ́)σσ] LM			*
e. [(σσσσ́)] LM		*W	L
f. [(σσ́)σσ] LM	*W		L

iii. Pentasyllabic TSYA: Pattern A as the winner

$\sigma_\mu\sigma\sigma\sigma\sigma$ LM	COINCIDE (C, PrWd-Final)	[LAPSPK & LAPSED]$_\omega$	ANCHOR-L ($t_{\sigma1}$, σ́)
☞g. [(σ σ́)σσσ] LM			*
h. [(σσσσσ́)] LM		**W	L
i. [(σσ́)σσσ] LM	*W		L

In addition to sustaining the soundness of the analysis of TSYA, the conjoined lapse-licensing constraint works to our advantage when it comes to dealing with the aforementioned threatening candidates. First, it makes it possible for the uncanceled threats in (46) to be excluded. To take pentasyllabic TSYA for example, tableau (49) once more presents the comparison between the remaining threats and the threatened intended winner, but with LapsPk replaced by the conjoined constraint. As it appears, the advantage of this conjoined constraint manifests itself in two regards: (a) [LapsPk & LapsEd]$_\omega$ does not prefer the undesired candidate (49a) as LapsPk does. Instead, with the local conjunction, [LapsPk & LapsEd]$_\omega$ resembles LapsEd in treating both of the candidates alike, thereby leaving the choice up to the next constraint down; and (b) given that the locally-conjoined [LapsPk & LapsEd]$_\omega$ can take over the necessary work of the loser-favoring LapsPk on TSYA, there is no danger of ranking LapsPk below the winner-favoring FtBinMax. This demotion makes the intended winner that ties on the top two constraints surface as expected.

(49) Eliminating the threat of (46) with FtBinMax » LapsPk

$\sigma_\mu\sigma\sigma\sigma\sigma$ (TSYA) LM	[LapsPk & LapsEd]$_\omega$	Anchor-L ($t_{\sigma 1}$, $\acute{\sigma}$)	FtBinMax	LapsPk
Intended winner: Pattern A				
☞ [(L.ˈM).o.o.o]		*		*
Threatening candidate (=42a)				
a. [(L.o.ˈM).o.o]		*	*W	L

Recall that apart from the uncanceled threat in (46), there are a number of threatening candidates listed above from (42) through (45), which are unproblematic only if they are precluded by AllFtL and Trochee. Accordingly, we have to rank both of these constraints above [LapsPk & LapsEd]$_\omega$ to make sure that all the threatening candidates are really settled. We can re-examine the threatening candidates in pentasyllabic TSS as an example of the eliminating effect of this constraint ranking. The result is shown in tableau (50), where the candidate set is copied from (45). FtBinMax and LapsPk are omitted from this tableau as they are ranked too low to play a role in this competition.

(50) {ALLFTL, TROCHEE} » [LAPSPK & LAPSED]$_{\omega}$: the elimination of threat from TSS

$\sigma_{\mu\mu}\sigma_{\mu\mu}\sigma_{\mu\mu}\sigma_{\mu\mu}\sigma$ LH	ALLFTL	TROCHEE	[LAPSPK & LAPSED]$_{\omega}$	ANCHOR-L ($t_{\sigma1}$, σ́)
Intended winner				
☞ [(ˈL.H).o.o.o]			*	
Threatening candidate (=45)				
a. [(L.ˈH).o.o.o]		*W	L	*W
b. [(L.o.ˈH).o.o]		*W	L	*W
c. [(L.o.o.ˈH).o]		*W	*	*W
d. [o.(L.ˈH).o.o]	*W	*W	L	*W
e. [o.(L.o.ˈH).o]	*W	*W	*	*W
f. [o.o.(L.ˈH).o]	*W	*W	*	*W
g. [o.o.o.(ˈL.H)]	*W		*	
h. [o.o.(ˈL.o.H)]	*W		L	
i. [o.o.(ˈL.H).o]	*W		L	
j. [o.(ˈL.H).o.o]	*W		L	
k. [o.(ˈL.o.H).o]	*W		L	
l. [o.(ˈL.o.o.H)]	*W		L	

In this tableau only three candidates (i.e. (50c), (50e) and (50f)) incur no trouble from the ranking [LAPSPK & LAPSED]$_{\omega}$ » ANCHOR-L($t_{\sigma1}$, σ́). Most of the other candidates threaten to beat the intended winner due to gaining an L in the column of [LAPSPK & LAPSED]$_{\omega}$; candidate (50g), though not favored by [LAPSPK & LAPSED]$_{\omega}$, threaten to tie with the intended winner. Both of the threatening situations are readily foreclosed, however, with the aid of the top-ranked ALLFTL and TROCHEE. The ranking proposed for [LAPSPK & LAPSED]$_{\omega}$ and ANCHOR-L($t_{\sigma1}$, σ́) is then further borne out.

4.3.2 Variable Thresholds of Pattern A

Since the violation of [LAPSPK & LAPSED]$_{\omega}$ begins within quadrisyllabic Pattern B, prior to the case of Pattern A, the conjoined constraint serves to filter Pattern B in words of four or more syllables. A threshold is then set for the emergence of Pattern A in four-syllable-long words. Nonetheless, as described in section 4.1.3, older native speakers seem to have a different threshold for Pattern A compared to younger ones.

The intra-linguistic variations of TSYA with such different thresholds are repeated in the tables in (51).

(51) = (8) Intra-linguistic variations of TSYA

a. Old Shanghai

Initial σ	σσ	σσσ	σσσσ	σσσσσ
Yangru LMʔ	*Pattern B*			*Pattern A*
	L^{ʔ}-LM	L^{ʔ}-L-LM	L^{ʔ}-L-L-LM	L^{ʔ}-M-L-L-L

b. New Shanghai

Initial σ	σσ	σσσ	σσσσ	σσσσσ
Yangru LMʔ	*Pattern B*		*Pattern A*	
	L^{ʔ}-LM	L^{ʔ}-L-LM	L^{ʔ}-M-L-L	L^{ʔ}-M-L-L-L

Clearly, what we have been dealing with so far is the case of New Shanghai, in which the threshold for Pattern A is set in four-syllable words, as in (51b). The emergence of Pattern A in four-syllable words is not the case in the other variation, Old Shanghai, however, in which case Pattern B continues to surface in a quadrisyllabic word, with the threshold of Pattern A retracted to much longer words, as in (51a). It follows that [LAPSPK & LAPSED]$_{\omega}$ would be too severe on Pattern B in Old Shanghai – it wrongly punishes quadrisyllabic Pattern B.

Therefore, a less stringent constraint is called for to obtain the later threshold of Pattern A in Old Shanghai. We posit for this purpose the self-conjunction of [LAPSPK & LAPSED]$_{\omega}$ in the domain of PrWd – written here as [LAPSPK & LAPSED]^{2} – which is violated once by any instance of the PrWd that contains at least two distinct violations of [LAPSPK & LAPSED]$_{\omega}$. With this locally self-conjoined constraint crucially dominating ANCHOR-L($t_{\sigma1}$, $\acute{\sigma}$), which in turn dominates [LAPSPK & LAPSED]$_{\omega}$, we can derive the case of Old Shanghai in which the retraction of Pattern A is observable. The later threshold of Pattern A is illustrated in the tableaux in (52), in which candidates (a) are all Pattern A and candidates (b) all Pattern B. It is obvious from these tableaux that Pattern B survives in quadrisyllabic words because it only incurs a single instance of the offending lapse, which is tolerated by the less stringent self-conjoined constraint, as in (52.i). When there is another offending lapse added to Pattern B in five-syllable words, however, Pattern B turns out to fail on [LapsPk & LapsEd]^2 and thus Pattern A takes its place, as in (52.ii).

(52) Old Shanghai: [LapsPk & LapsEd]^2 » Anchor-L($t_{\sigma1}$, σ́) » [LapsPk & LapsEd]$_\omega$

i. Quadrisyllabic TSYA: Pattern B as the winner

$\sigma_\mu\sigma\sigma\sigma$ LM	[LapsPk & LapsEd]^2	Anchor-L ($t_{\sigma1}$, σ́)	[LapsPk & LapsEd]$_\omega$
a. $[(\sigma\acute{\sigma})\sigma\sigma]$ LM		*W	L
☞b. $[(\underline{\sigma\sigma}\sigma\acute{\sigma})]$ LM			*

ii. Pentasyllabic TSYA: the emergence of Pattern A

$\sigma_\mu\sigma\sigma\sigma\sigma$ LM	[LapsPk & LapsEd]^2	Anchor-L ($t_{\sigma1}$, σ́)	[LapsPk & LapsEd]$_\omega$
☞a. $[(\sigma\acute{\sigma})\sigma\sigma\sigma]$ LM		*	
b. $[(\underline{\sigma\sigma\sigma}\sigma\acute{\sigma})]$ LM	*W	L	**W

Note particularly that in Old Shanghai, AllFtL is required to dominate Anchor-L($t_{\sigma1}$, σ́) lest there is any undesired candidate that fails to be eliminated by the top-ranking [LapsPk & LapsEd]^2. Tableau (53) offers an example with the case of pentasyllabic TSYA, where the otherwise threatening candidate (53c) is ruled out by AllFtL. This tableau validates the ranking proposed.

(53) ALLFTL » ANCHOR-L($t_{\sigma1}$, σ́) validated by pentasyllabic TSYA

$\sigma_{\mu}\sigma\sigma_{\mu\mu}\sigma\sigma$ LM	[LAPSPK & LAPSED]^2	ALLFTL	ANCHOR-L ($t_{\sigma1}$, σ́)	[LAPSPK & LAPSED]$_{\omega}$
☞a. [(σ σ́)σσσ] LM			*	
b. [(<u>σσσ</u>σσ́)] LM	*W		L	**W
c. [σσ(σ́σ)σ] LM		*W	L	

Overall, the two variations (i.e. Old Shanghai and New Shanghai) differ only in quadrisyllabic TSYA: Old Shanghai surfaces as Pattern B and New Shanghai as Pattern A. In pentasyllabic TSYA, they turn out to converge on Pattern A. Since the emergence of Pattern A is subject to the higher-ranking [LAPSPK & LAPSED]$_{\omega}$, then setting up the threshold of Pattern A is simply a matter of whether [LAPSPK & LAPSED]$_{\omega}$ is ranked higher or lower than ANCHOR-L($t_{\sigma1}$, σ́), all else being equal. This alternative leads to the ranking permutation in (54): when [LAPSPK & LAPSED]$_{\omega}$ is crucially dominated by ANCHOR-L($t_{\sigma1}$, σ́), we attain the variation of Old Shanghai, as in (54a), and conversely, when [LAPSPK & LAPSED]$_{\omega}$ crucially dominates ANCHOR-L($t_{\sigma1}$, σ́), we attain the variation of New Shanghai, as in (54b).

(54) Ranking permutation in two variations

	/$\sigma_{\mu}\sigma\sigma\sigma$/ LM	/$\sigma_{\mu}\sigma\sigma\sigma\sigma$/ LM
a. Old Shanghai {ALLFTL, [LAPSPK & LAPSED]^2} » ANCHOR-L($t_{\sigma1}$, σ́) » *[LAPSPK & LAPSED]$_{\omega}$*	(σσσσ́) LM Pattern B	(σ σ́)σσσ LM *Pattern A*
b. New Shanghai ALLFTL » {[LAPSPK & LAPSED]^2, *[LAPSPK & LAPSED]$_{\omega}$*} » ANCHOR-L($t_{\sigma1}$, σ́)	(σ σ́)σσ LM *Pattern A*	(σ σ́)σσσ LM *Pattern A*

Two comments on the ranking relationship of (54) are in order here. First, Note that the self-conjunction is always ranked higher than ANCHOR-L($t_{\sigma 1}$, σ́) to guarantee that both of the variations converge on Pattern A in pentasyllabic TSYA. Thus, [LAPSPK & LAPSED]^2 happens to be unranked with respect to its original version, [LAPSPK & LAPSED]$_\omega$, in New Shanghai, as in (54b), suggesting that there is no need to conjoin [LAPSPK & LAPSED]$_\omega$ with itself in this variation. In other words, the self-conjoined constraint and its original version merge when they are unranked with respect to each other. This merger is not unreasonable because any constraint and its self-conjunction are in a stringency relation (Prince 1997b, 1997c, de Lacy 2002). Formally speaking, the violations of the less stringent self-conjunction are a proper subset of the violations of the more stringent original version. Therefore, if the more stringent [LAPSPK & LAPSED]$_\omega$ is ranked higher than ANCHOR-L($t_{\sigma 1}$, σ́), it subsumes the effect of its self-conjunction in practice, so there is no need to distinguish the demarcation between them.

The ranking of ALLFTL is another point that merits attention here. It appears that the constraint immediately dominated by ALLFTL is different in the two variations. Nevertheless, the ranking relation holds constant – ALLFTL invariably dominates both [LAPSPK & LAPSED]$_\omega$ and ANCHOR-L($t_{\sigma 1}$, σ́).

With all of the relevant ranking relationships taken care of, we are now in a position to explain why the ranking permutation is permitted in a single language. Here I adopt one of the co-phonological theories that derive variation from a single grammar – the theory of Partially Ordered Grammars (see Anttila 1997, 2002a, Anttila & Cho 1998). In terms of this theory, grammars are defined as a partial order in a set of constraints. A partial order is, in the words of Anttila (2007:527), a "binary relation (i.e. a set of ordered pairs) that is irreflexive, asymmetric and transitive." A language with internal variations is a Partially Ordered Grammar where only some pairs are ordered (i.e. specified for the ranking). Variations of this language share these ordered pairs, with the other unordered ones specified variably. Re-ranking in this view then arises from the alternative way of specifying unordered pairs of constraints. Therefore, the ranking permutation in (54) can be translated into two sets of ordered pairs, with each of them crucially different in the ordering. This is spelled out in the diagram in (55), where every node stands for a grammar of Shanghai, each annotated with the derived output pattern for quadrisyllabic TSYA. The constraints included in this grammar lattice are only those that are concerned in the alternation of TSYA patterns.

(55) Grammar lattice of Shanghai

a. Master grammar

AllFtL » Anchor-L($t_{\sigma1}$, $\acute{\sigma}$)
AllFtL » [LapsPk & LapsEd]$_{\omega}$
[LapsPk & LapsEd]^2 » Anchor-L($t_{\sigma1}$, $\acute{\sigma}$)

{Anchor-L($T_{\sigma1}$, $\acute{\sigma}$), [LapsPk & LapsEd]$_{\omega}$}

Pattern A ~ Pattern B

b. Old Shanghai

AllFtL » Anchor-L($t_{\sigma1}$, $\acute{\sigma}$)
AllFtL » [LapsPk & LapsEd]$_{\omega}$
[LapsPk & LapsEd]^2 » Anchor-L($t_{\sigma1}$, $\acute{\sigma}$)

Anchor-L($T_{\sigma1}$, $\acute{\sigma}$) » [LapsPk & LapsEd]$_{\omega}$

Pattern B

c. New Shanghai

AllFtL » Anchor-L($t_{\sigma1}$, $\acute{\sigma}$)
AllFtL » [LapsPk & LapsEd]$_{\omega}$
[LapsPk & LapsEd]^2 » Anchor-L($t_{\sigma1}$, $\acute{\sigma}$)

[LapsPk & LapsEd]$_{\omega}$ » Anchor-L($T_{\sigma1}$, $\acute{\sigma}$)

Pattern A

In diagram (55), the master grammar on the superordinate node contains a set of partially ordered pairs, to which the individual sub-grammars on the terminal node must conform. This is implemented by the conclusion of these pairs in both sub-grammars. The master grammar also contains a pair of unordered constraints placed in the braces:

ANCHOR-L($t_{\sigma1}$, σ́) and [LAPSPK & LAPSED]$_{\omega}$. Their ranking is variably specified in the two sub-grammars. Specifically, in sub-grammar (55a) – Old Shanghai – [LAPSPK & LAPSED]$_{\omega}$ outranks ANCHOR-L($t_{\sigma1}$, σ́); while in sub-grammar (55b) – New Shanghai – the ordering is inversed, with ANCHOR-L($t_{\sigma1}$, σ́) ranked above [LAPSPK & LAPSED]$_{\omega}$. The partially ordered pairs in both the sub-grammars can be incorporated into totally ranked constraint sets as those in (54), thereby deriving pattern A in one variation and Pattern B in the other. This grammar lattice then makes transparent that the variable thresholds set for Pattern A are parameterized by the partially ordered pairs of the master grammar.

4.4 Summary of This Chapter

TSYA surfaces as two patterns contingent on how many syllables there are in the tone-sandhi domain: Pattern A is derived in longer words and Pattern B in shorter ones. Among the two, Pattern B was argued in this chapter to be the major pattern for TSYA; its distinctive unbounded foot-parsing is motivated by the requirement for the initial contour tone to be licensed word-finally. This idea was captured in terms of OT by COINCIDE(Contour, PrWd-Final) » FTBINMAX. Pattern A, on the other hand, serves as the substitute for Pattern B in longer domains. The substitution was treated as a result of lapse avoidance, provided that Pattern B invokes more offending lapses than Pattern A. It then follows that the emergence of the variable thresholds for Pattern A depends on the extent to which the unwelcome lapses are tolerated. This analysis was submitted to a pair of lapse-licensing constraints, namely [LAPSPK & LAPSED]$_{\omega}$ and its self-conjunction. With the self-conjunction holding higher, the present analysis has claimed, founded on the theory of Partially Ordered Grammar, that the variable thresholds of Pattern A are subject to the alternative way of ordering [LAPSPK & LAPSED]$_{\omega}$ and ANCHOR-L($t_{\sigma1}$, σ́), which are left unordered in the grammar of Shanghai.

CHAPTER 5

CONCLUDING REMARKS

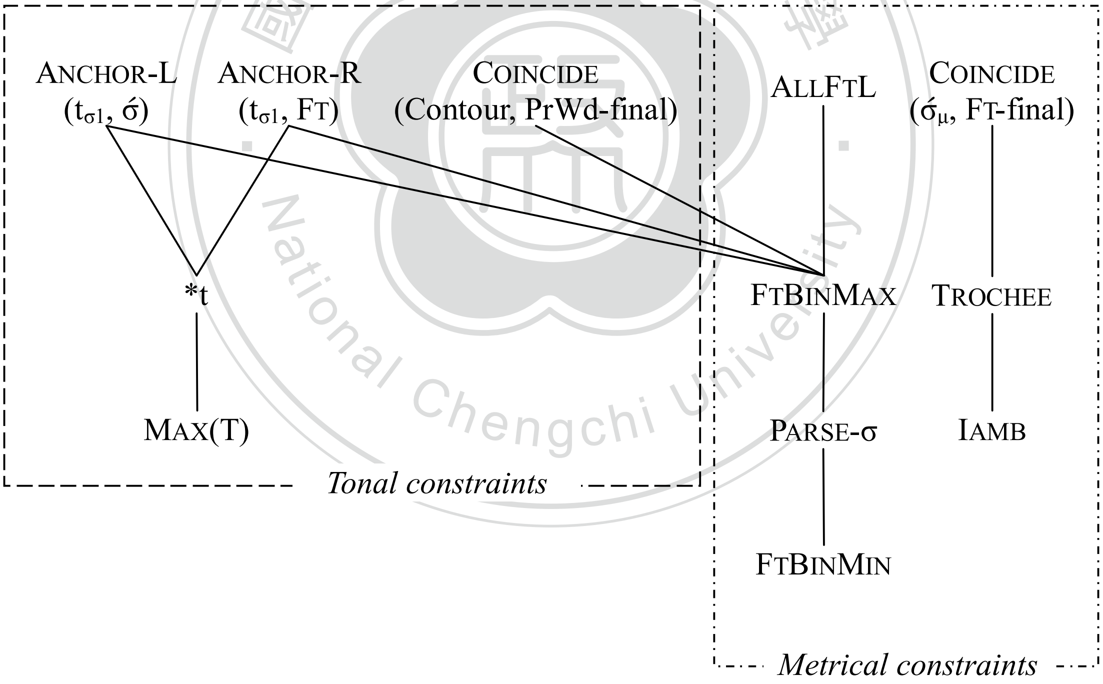
5.1 Summary of the Thesis

This thesis aims to provide a unified account of TSC and TSS, as the placement of the initial tone appears to be implemented in an inconsistent way. The analysis in the foregoing chapters showed that the operation of the seemingly anomalous TSC is in fact as regular a process as that of TSS from the perspective of asymmetry between prominent and non-prominent positions. Tone mapping in both the sandhi processes is closely correlated with three kinds of prominent positions – prosodic edges, metrical head, and heavy syllables. This three-way prominence manifests itself in Shanghai tone sandhi as follows: Heavy syllables are likely to be singled out as the metrical head, by which it serves as the privileged position for a tone at the left word-edge to dock at. Under this view the difference in tone mapping between TSC and TSS can simply be attributed to the difference in the quantity of checked syllables vs. smooth syllables. To be specific, the initial-tone movement occurs in TSC but not in TSS precisely because TSC begins with a light checked syllable, making it necessary for the tone associated with that syllable to move away in search of somewhere promising. This is not the case for TSS, of course, as the initial syllable thereof is smooth, namely, a heavy syllable which is more prominent than checked syllables in our analysis.

At the same time, the present study has further settled the question of the non-uniformity in TSC, with the discrepancy in landing-sites between TSYI and Pattern B of TSYA successfully reconciled. The idea is that the great preference for the word-final contour tones contributes to the long-distance tone movement accompanied with an exceptional unbounded foot-parsing in Pattern B of TSYA, because the tone undergoing movement in this case is a rising contour. By contrast, given the assumption that the moving tone in TSYI is underlyingly a level tone, it follows that TSYI has nothing to do with the restriction of contour tone licensing and the target tone turns out to shift just one syllable away due to the normal bounded parsing.

This analysis has been recast in a single constraint ranking under the framework of OT, as diagramed below. The constraints are grouped into two sets: one determines tone mapping, with a special reference to the constraint formulation of Anchoring and Coincidence. The other governs the metrical structure, which consists of foot-parsing constraints and those responsible for stress placement.

(1) A single ranking for the unified account of TSS, TSYI, and Pattern B of TSYA



The ranking {ANCHOR-L($t_{\sigma1}$, $\acute{\sigma}$), ANCHOR-R($t_{\sigma1}$, FT)} » *t » MAX(T) derives tone retention on the initial syllable and tone realization on the metrical head, with the head position set by COINCIDE($\acute{\sigma}_{\mu}$, FT-final) » TROCHEE » IAMB, which implies that the foot-type in Shanghai is basically trochaic, except when the foot-initial syllable bears one mora. These constraint rankings explain the inconsistency in the realization of the first tone between TSS and TSC. As for the difference in the goal of the tone movement between TSYI and Pattern B of TSYA, we posited the ranking AllFtL » FtBinMax » Parse-σ » FtBinMin for the maximally binary foot-parse in TSYI, and we further proposed that FtBinMax is ranked below other three tonal constraints – Coincide (Contour, PrWd-final), Anchor-L($t_{\sigma1}$, $\acute{\sigma}$) and Anchor-R($t_{\sigma1}$, Ft) – by which we can derive Pattern B of TSYA where the initial contour tone moves to the word-final position under an unbounded foot-parsing.

In addition to the constraints in (1), a set of lapse-licensing constraints were proposed to provide for the great preference for Pattern A to emerge in substation for Pattern B within longer TSYA-domains: Pattern A incurs less offending lapses in such contexts. Given that the threshold for the emergence of Pattern A varies between Old Shanghai and New Shanghai, the lapse-licensing constraints were utilized with re-ranking founded on the theory of Partially Ordered Grammar. The respective ordered pairs involved are tabulated in (2), both of which have the constraint rankings in (1) in common.

(2) Ranking permutation regarding the threshold for Pattern A of TSYA

Subgrammars	Partially ordered pairs
a. Threshold is 5-syllable words	AllFtL » Anchor-L($t_{\sigma1}$, $\acute{\sigma}$)
	AllFtL » [LapsPk & LapsEd]$_{\omega}$
	[LapsPk & LapsEd]^2 » Anchor-L($t_{\sigma1}$, $\acute{\sigma}$)
	FtBinMax » LapsPk
	Anchor-L($t_{\sigma1}$, $\acute{\sigma}$) » [LapsPk & LapsEd]$_{\omega}$
b. Threshold is 4-syllable words	AllFtL » Anchor-L($t_{\sigma1}$, $\acute{\sigma}$)
	AllFtL » [LapsPk & LapsEd]$_{\omega}$
	[LapsPk & LapsEd]^2 » Anchor-L($t_{\sigma1}$, $\acute{\sigma}$)
	FtBinMax » LapsPk
	[LapsPk & LapsEd]$_{\omega}$» Anchor-L($t_{\sigma1}$, $\acute{\sigma}$)

The analysis shows that the crucial pair of constraints on the variation is {ANCHOR-L ($t_{\sigma1}$, σ́), [LAPSPK & LAPSED]$_{\omega}$}, so the ordering of this pair was parameterized (represented by the shaded cells of (2)), holding all else constant. In sub-grammar (2a) (i.e. Old Shanghai), ANCHOR-L($t_{\sigma1}$, σ́) outranks [LAPSPK & LAPSED]$_{\omega}$, and hence Pattern A starts to emerge from five-syllable words under the control of the self-conjunction – [LAPSPK & LAPSED]^{2}; in sub-grammar (2b) (i.e. New Shanghai), the reverse is the case, and Pattern A starts to be selected as the output for TSYA from four-syllable words instead. Accordingly, this thesis concluded that the ranking of those crucial constraints is left unspecified in the master grammar, hence making possible an account of intra-linguistic variation.

5.2 Theoretical Implications

This analysis provides an account of Shanghai tone sandhi quite different from previous ones, and there are certain theoretical implications which will be discussed below. These implications are provisional; their validity and plausibility await the determination of future research.

5.2.1 Autonomy of Checked Tones

It has long been argued in reductionist terms that checked tones can be treated as the allotones of their smooth counterparts, as they are in complementary distribution with respect to syllable types (Wang 1958, Haas 1958, Roberts & Li 1963, Li, 1966, Chiang 1967, Jones 1967, Luo 1988, Barrie 2007, among others). This view has been proven not to be the case in Shanghai, however. As shown in the foregoing chapters, categorizing the checked tones, *Yinru* (Hʔ) and *Yangru* (LMʔ), as the same tonemes with the smooth tones, *Yinqu* (MH) and *Yangqu* (LH), would bring about a wrong prediction for the output of Pattern B of TSYA. The present analysis argued for another ground that the citation form of the checked tones can be fully independent of smooth ones, even in the underlying form. This analysis, as we have seen, has been borne out by the difference in the tone movement between TSYI and TSYA, and therefore lends support to the assumption that there is no need for checked tones as an allotone of their smooth counterparts.

5.2.2 Subtler Interaction Between Tone and Stress

Linguists have long noted that across languages around the world, tonal system and metrical system can interact in various ways, (for an overview of this, see Pearce (2006) and references cited there). What chiefly concerns this thesis is the interaction between tone and foot-heads, of which De Lacy (2002) has elaborated two systems: (a) heads are attracted to a high-toned syllable – a tone-driven stress system; and (b) high tone tends to move to the position of foot-heads – a stress-driven tone system. In other words, there is an affinity between higher tone and metrical prominence. This thesis, however, provides an instance of a different type of tone-stress interaction. Regarding stress-driven tone, the present analysis of Shanghai tone sandhi, following Li's (2003) dual-prominence hypothesis, showed that an underlying tone retained on the leftmost edge is realized on a stressed syllable, even though this may lead to a coincidence between non-high tones and foot-heads. Regarding tone-driven stress, our analysis of Pattern B of TSYA showed that the need to license contour tones transposes foot-heads to the word-final position. From the analysis we can draw an implication that tone and stress can interact in a subtler way: both tonal contrasts and tonal inclination are referred to as factors that interact with the placement of the head. This is certainly an area of typology that merits further investigation.

5.3 Further Issues

This thesis should be followed up by further inquiry into several issues. First of all, given that Shanghai tone sandhi concerns an interaction between tonal constraints and metrical constraints, an analysis of Shanghai tonal phonology cannot be complete without answering a theoretical question: should all candidates be evaluated by the two sets of constraints in parallel, or in serial stages – with the evaluation of metrification preceding that of tone mapping? For the moment the present proposal supposes a parallel evaluation in line with the basic premises of classic OT, and leaves to future investigation the question of whether parallelism or serialism is superior both theoretically and empirically.

Next, according to the present analysis, the stress is predicted to fall on the first syllable in TSS, but somewhere else in TSC. Therefore, our proposal deviates from previous analyses in the departure of left-prominence in TSC. However, it has been claimed that the left-prominence at the word level creates a stress clash which contributes to the correct circumscription of sandhi domains at the phrasal level (Duanmu 1991, 1992a, 1993a, Chen 2000). Therefore, future research on Shanghai must also examine whether the prediction that TSC displays right-prominence at the word level works beyond word-level sandhi processes.

Despite the restricted scope and the uncertainties that remain, this thesis provides an account of a case in which the non-prominence of checked syllables exerts its influence on the derivation of tone mapping. Whether this assumption is universally true needs further research on other Chinese languages – especially the related Wu dialects – to find supports.

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