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從輕聲與韻律外現象
看漢語方言中虛化的功能詞

Grammaticalized Function Words in Chinese Dialects:
Neutral Tone and Prosodic Invisibility

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Abstract

This dissertation concerns the prosodization of function words in Chinese dialects in terms of neutral tone and prosodic invisibility. Neutral tone refers to the pitch pattern derived by complete loss of original lexical contrast; prosodic invisibility describes a phenomenon where a tone is extraprosodic and thus is excluded from some general tonal process. Both phenomena are considered derived from the status of prosodic clitic, meaning independent syntactic words that are not prosodized as independent prosodic words, and the occurrence of such prosodic clitics is subject to a universal distinction between lexical words and function words. Words of lexical categories strongly correlate with prosodic word status, whereas words of functional categories correspond to more than one prosodic type, ranging from independent prosodic word to free prosodic clitic, and therefore members of functional categories may diverge from one another in whether to perform neutral tone and/or prosodic invisibility. Two prosodic classes are found in the current survey, termed prominent function words on the one hand, and non-prominent function words on the other. Members of the former class exhibit a similar prosodization to lexical word while the class of non-prominent function words is vulnerable to the neutral tone process and prosodic invisibility. The central problem to be addressed in this dissertation is the formal characterization of prosodic distinctions between these subclasses within functional categories. The conventional response to this problem is to take an interface constraint approach grounded by morphosyntax, which assumes that different prosodizations of functional elements directly follow from differences in their morphosyntactic properties and language-specific constraint rankings. However, this straightforward correlation does not uniformly hold in the case that serves as a basis of the dissertation, the neutral tone

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and prosodic invisibility of Chinese dialects, where function words exhibit a considerable overlap in their morphosyntactic distributions that precludes any differentiation rooted in morphosyntax. This dissertation, though employing a set of interface constraints too, proposes that the ranked interface constraints are grounded by not only morphosyntactic properties but semantic/pragmatic information. By taking an overall look at various types of function words which have potential to perform neutral tones and/or prosodic invisibility, I conclude that the distinction between prominent and non-prominent classes of function words can be drawn along the scale of grammaticalization. The idea is based on the general conception in the literature of grammaticalization that phonological erosion and semantic bleaching usually come hand in hand. As a function word becomes more semantically bleached during the course of grammaticalization, it is more likely to be non-prominent, or weak, to license certain constituents in the prosodic structure. By encoding this information of grammaticalization in the interface constraint, this dissertation offers a formalized mechanism to make use of both morphosyntactic properties and information from semantics-syntax interface. This approach thus leads to a unified account of prosodic distinction between subclasses within functional categories.

Keywords: grammaticalization, prosodization, syntax-phonology interface

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1. Introduction

1.1 The scope and aim

This dissertation concerns the prosodization of function words in Chinese dialects in terms of neutral tone and prosodic invisibility. Neutral tone refers to the pitch pattern derived by complete loss of original lexical contrast; prosodic invisibility describes a phenomenon where a tone is extraprosodic and thus is excluded from some general tonal process. Both phenomena are considered derived from the status of prosodic clitic, meaning independent syntactic words that are not prosodized as independent prosodic words, and the occurrence of such prosodic clitics is subject to a universal distinction between lexical words (i.e. words belonging to 'open' classes such as nouns, verbs, adverbs and adjectives) and function words (i.e. words ascribed to 'closed' categories like pronouns, determiners, auxiliaries, complementizers, and other sorts of particles etc.). Words of lexical categories strongly correlate with prosodic word status, forming a uniform prosodic class which is prominent and immune to neutral tone phenomenon and prosodic invisibility, whereas words of functional categories exhibit a much more erratic pattern, generally corresponding to more than one prosodic type, ranging from independent prosodic word to free prosodic clitic, and therefore members of functional categories may diverge from one another in whether to perform neutral tone and/or prosodic invisibility. A typical example in Standard Mandarin is given in (1). While a lexical word, such as the verb *mai*^{2} 'to buy' in this case, uniformly assumes the status of prosodic word and thus always bears a full lexical tone (1a-d), distinct types of function words may corresponds to different prosodizations: an aspect marker is outside any instance of prosodic word and therefore bears a neutral tone (1b), a phasal

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complement carries a full tone by building its own prosodic word (1c), and a directional complement has an option between the two (1d & 1e). Clearly, function words correspond to two prosodic classes, termed prominent function words on the one hand, and non-prominent function words on the other. Members of the former class exhibit a similar prosodization to lexical word, while the class of non-prominent function words is vulnerable to the neutral tone process and prosodic invisibility.

(1) Neutral tone in lexical words and different types of function words

a. (*Qu*^{4}) (*Mai*^{4})
Go to.buy
T T
'Go buy it.'

b. (*Mai*^{4}) *le*^{0}
To.buy PFV
T o
'To have bought it already'

c. (*Mai*^{4}) (*hao*^{3})
To.buy done.for
T T
'To (properly) done the shopping'

d. (*Mai*^{4}) (*lai*^{2})
To.buy DIR
T T
'To get it by buying.'

e. (*Mai*^{4}) *lai*^{0}
To.buy DIR
T o
'To get it by buying.'

The central problem to be addressed in this dissertation is the formal characterization of prosodic distinctions between these subclasses within functional categories, which

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consists of several interrelated questions. First, how are those subclasses of function words correspond to different prosodizations? Second, what types of function words does each class comprise? What motivates the distinction between the subclasses?

A relatively simple and straightforward response to this problem is presented in Selkirk (1995b), which takes an interface constraint approach grounded by morphosyntax, where all prosodic differences among English words, including those among distinct prosodic types within the functional class, are analyzed by positing a single set of ranked constraints on prosodic structures, and on their interface to morphosyntactic structures. Under this analysis, different prosodizations of functional elements directly follow from differences in their morphosyntactic properties and language-specific constraint rankings. However, what is proposed to be a straightforward correlation between a function word's prosody and its morphosyntax does not hold generally. Little such correlation is found in the case that serves as a basis of the dissertation, the neutral tone and prosodic invisibility of Chinese dialects. In these cases, just as the examples in (1) show, function words exhibit a considerable overlap in their morphosyntactic distributions that precludes any differentiation rooted in morphosyntax.

On the other hand, many formal accounts (e.g. Zec and Inkelas 1990, Zec 2005) see cliticness as arbitrary, derived from an underlying feature, classification, or subcategorization that distinguishes between specific types of function words. In this subcategorization approach, constraints on prosodizations refer to specific types or even tokens of function categories in an arbitrary way, and therefore it falls short on attaining a more general mechanism.

This dissertation advocate the interface constraint approach and yet propose that the ranked interface constraints are grounded by not only morphosyntactic properties

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but semantic/pragmatic information. By taking an overall look at various types of function words which have potential to perform neutral tones and/or prosodic invisibility, I conclude that the distinction between prominent and non-prominent classes of function words can be drawn along the scale of grammaticalization. The idea is based on the general conception in the literature of grammaticalization that phonological erosion and semantic bleaching usually come hand in hand. As a function word becomes more semantically bleached during the course of grammaticalization, it is more likely to be non-prominent, or weak, to license certain constituents in the prosodic structure.

By encoding this information of grammaticalization in the interface constraint, this dissertation offers a formalized mechanism to make use of both morphosyntactic properties and information from semantics-syntax interface. This approach thus leads to a unified account of prosodic distinction between subclasses within functional categories.

1.2 Organization of the dissertation

The dissertation is organized as follows. In the rest of chapter 1, I provide the theoretical framework of the dissertation (§1.3), and preliminary notes on some important terms and concepts (§1.4).

Chapter 2 is devoted to the mechanisms justifications for the currently proposed framework, which serves as the central approach to the phenomena that we address in this study.

I then proceed to the core analysis of neutral tone and prosodic invisibility in grammaticalized words in Chinese dialects. Chapter 3 investigates the case of Miaoli Sixian Hakka and Cantonese; Chapter 4 is devoted to Taiwanese and Standard

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Mandarin, and Chapter 5 addresses the case of Shanghainese.

Chapter 6 gives some theoretical remarks on the overall picture of the dialects according to what is established in the previous chapters. And chapter 7 summarizes the conclusion of this dissertation.

1.3 Theoretical background

1.3.1 Prosodic phonology

The prosodic framework to be used in this study is an adaptation of what may be called classical Prosodic Phonology (Selkirk 1978, 1981, 1984, 1986, Nespor and Vogel 1982, 1983, 1986, Hayes 1984, 1989). I'll briefly describe here the important elements of the classical theory.

The Prosodic Phonology framework rests on at least four general premises:

- The Indirect Reference Hypothesis: the domains of phonological phenomena are delimited by phonological representations, not syntactic representations.
- Phonological representations are organized into prosodic structures.
- Prosodic structures are based on, but not isomorphic to, syntactic structures.
- Prosodic structures are built from a Prosodic Hierarchy of constituent types, and are combined according to principles of Strict Layering.

The motivation for distinct prosodic and syntactic structures consists in phonological phenomena that take effect within domains that may be partly syntactically determined, but which don't necessarily correspond to any syntactically definable constituent. Nespor and Vogel (1986) undertake a comprehensive study of such phenomena, presenting cross-linguistic evidence for every constituent type of the Prosodic

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Hierarchy.

For the purposes of the present study, I'll assume that the Prosodic Hierarchy consists of the types of constituent listed in (2).

(2) Prosodic Hierarchy

Constituents	**Abbreviations**
Intonational phrase	ι
Phonological phrase	ϕ
Prosodic word	ω
metrical foot	Σ
syllable	σ
mora	μ

A constituent is omitted here, the clitic group, which is posited as intermediate between prosodic word and phonological phrase, its function being to group clitics with prosodic words (Hayes 1984, Nespor and Vogel 1986, Nespor 1999). However, I follow others in seeking descriptions of clitic structures in terms of elements not specific to clitics (Berendsen 1986, Zec and Inkelas 1991, Zec 1993, Selkirk 1995a, see next subsection).

Prosodic constituents in the classical theory are organized by Strict Layering. In concise terms, Strict Layering requires that a constituent of level p on the Prosodic Hierarchy be parsed exhaustively into constituents of level p–1. For example, an intonational phrase dominates only phonological phrases, which dominate only prosodic words, and so on. However, we will see that there are reasons to think that not all prosodic structures respect Strict Layering.

Another important aspect of prosodic structures is their role in the organization of phonological prominence. The idea is that every constituent has exactly one head, which is the most prominent of its sub-constituents, and that every head is aligned to all the heads beneath it (Halle and Vergnaud 1987, Hayes 1995, Selkirk 2002).

As for the mapping from syntactic to prosodic structures, there are several

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proposals for how this happens, including the mapping algorithms of Nespor and Vogel (1982, 1986), Selkirk's (1986) end-based theory, and relation-based mapping (Zec & Inkelas 1990). For an overview, see Inkelas and Zec (1995). For present purposes, I'll adopt the mapping constraints of Prosodic Clitic Theory, to which I turn next.

1.3.2 Prosodic clitic theory

This dissertation adopts a version of Prosodic Phonology that's based on several further hypotheses proposed in Selkirk (1995a, 1996, 2005) and Truckenbrodt (1995, 1999). Following some other scholars (Basri et al. 1998, Parker 1999), I'll call this version of the classical framework Prosodic Clitic Theory (PCT).

The distinguishing premises of PCT are non-strict layering, an explicit set of syntax-prosody correspondences, and an implementation of the building of prosodic structure by Optimality Theoretic constraints. PCT matters a lot to our study because the premises it proposes directly determine how lexical and functional categories can be distinct in the prosodic structure.

Selkirk (1995a) proposes to revise Strict Layering by decomposing it into four separate principles, two of which aren't absolute. By this revision, prosodic structures must obey the requirements of Headedness and Layeredness, but can sometimes violate those of Nonrecursivity and Exhaustivity:

(3)

Principles	**Violability**	**Definition**
Headedness	inviolable	a (constituent of level) p has a head $q = p–1$
Layeredness	inviolable	a p doesn't parse a q, $q > p$
Nonrecursivity	violable	a p doesn't parse a q, $q = p$
Exhaustivity	violable	a p doesn't parse a q, $q < p–1$

With the violable principles, the emergence of level recursion and/or level skipping is

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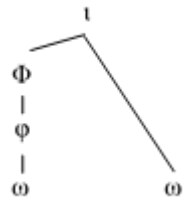
possible, as illustrated in (4). Note that given the nested ϕ-structure in this case, a distinction can be made between what Ito and Mester (2007, 2009) call maximal ϕ (marked by Φ) — a ϕ not dominated by any other ϕ — and non-maximal ϕ (marked by φ), the former being higher than the latter on the hierarchy. As discussed later in this paper, contour-tone licensing in Shanghai makes appeal to these subtypes.

(4) An instance violating Nonrecursivity and Exhaustivity



Another goal of PCT is an explicit and restrictive set of correspondences between syntactic and prosodic structures. Selkirk (2005) proposes to limit these to the following one-way correspondences, and labels them the Syntactic Grounding Hypothesis:

(5) The Syntactic Grounding Hypothesis

syntactic constituent		**prosodic constituent**
comma phrase (CmmP)	→	intonational phrase
lexical maximal projection (LexP)	→	major phonological phrase
branching syntactic constituent	→	minor phonological phrase
lexical word (Lex)	→	prosodic word

In short, prosodic structure-building principles that relate syntactic and prosodic constituents can refer only to these pairs. Note that the division of phonological phrases into major phrase and minor phrase (Selkirk and Tateishi 1988) is omitted in this dissertation since it is of little importance to neutral tone and prosodic invisibility. Therefore, there is only one phonological phrase corresponding rule is available in this dissertation.

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In regard to the grounding of intonational phrase, the "comma phrase" of (5) replaces Nespor and Vogel's identification of intonational phrases with a heterogeneous set of constituents comprising root clauses, parentheticals, and non-restrictive relatives. The term comma phrase is introduced by Potts (2005) as a cover term for a similar class of intonational phrase determining constituents. He proposes that these constituents have in common a semantically significant feature COMMA, which is responsible for their semantic interpretation, and for their comma intonation. Precisely, Potts is concerned not with comma phrases in general, but with their intersection with another class of expressions ("supplements") which consist of nonrestrictive relatives, parentheticals, and appositives. Therefore, Potts doesn't claim that all comma phrases share a uniform syntax or semantics. Nonetheless, Potts's treatment builds support for a unified class of comma phrases, thereby improving on previous, less unified characterizations of intonational phrase correspondents.

Selkirk (2011), however, proposes a new definition for determining intonational phrase that, which using the notion "clause" that is purely syntactically defined. She introduces at least two notions of clause come into play: "the standard clause" and the '"illocutionary clause." The standard clause is understood as "the constituent that is the complement of the functional head C. In modern syntactic theory, C, is commonly assumed to introduce the canonical sentence, which consists of an explicit or an implied subject, a predicate and a locus for Tense: CP [Comp0 [standard clause]]." The illocutionary clause "is the highest syntactic projection of the sentence and carries its illocutionary force, which determines its appropriateness in a discourse context (...); the syntactic structure for this clause type [is] assumed to be ForceP [Force0 [illocutionary clause]]." In a different paper (Selkirk, 2009), a slightly different formulation is given, where it is proposed that the term "clause" for interface mapping could apply to "the

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complement of any functional head of the [Rizzi (1997)-style] 'complementizer-layer'" (i.e. TopicP or FocusP). In Shanghainese, we will see that employing this syntactically-grounded C to define intonational phrase results in different prosodization that is significant for the analysis.

The Grounding Hypothesis also incorporates an idea that plays a crucial role in our analysis: prosodic structures are based only on lexical syntactic constituents, ignoring functional ones (Selkirk and Shen 1990). Truckenbrodt articulates this as the Lexical Category Condition:

(6) The Lexical Category Condition (LCC) (Truckenbrodt 1999:226)

Constraints relating syntactic and prosodic categories apply to lexical syntactic elements and their projections, but not to functional elements and their projections, or to empty syntactic elements and their projections.

This condition is based on the long observed phenomenon that function words, though being X^0s in the syntax — Ds and Cs among others — they consistently fail to assume the status of prosodic word, and thus tend to have a different prosody from lexical words. This idea has been carried over virtually wholesale into work making use of syntactically grounded interface constraints. The following discussion from (Selkirk, 2011, 453) is representative:

> [I]t's likely that lexical and functional phrasal projections — LexP and FncP — have to be distinguished [...] The functional vs. lexical distinction is important for syntactic-prosodic correspondence at the word level (Fnc0 vs. Lex0): lexical category words are standardly parsed as prosodic words (°), while functional

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> category words like determiners, complementizers, prepositions, auxiliary verbs, etc. — in particular the monosyllabic versions of these — are not [...] If instead of a general Match XP this correspondence constraint were limited to lexical categories, then, on the basis of the syntactic structure [VP Verb [FncP Fnc NP]], the F-domain structure (FVerb Fnc (FNP)) would be predicted [...]

Similar claims can be found in Selkirk (1984, 1995, 2011); Hale and Selkirk (1987); Selkirk and Shen (1990); Truckenbrodt (2007); Chung (2003); Werle (2009); Selkirk and Lee (2015), among others. The common thread running through these works is that there is no impetus to parse function words as ωs. Yet the corollary of this — that the phrasal projections of functional categories should not be parsed as Fs — has been challenged. For instance, Elfner (2012) shows that small clauses and TPs in Irish, both of which are headed by a functional category, are preferentially mapped to ϕs. Furthermore, in the same vein, Tyler (2018) argues that mapping at the word level indiscriminately demands that all syntactic heads, lexical and functional, be mapped to prosodic words. In doing so, the word-leveling is brought in line with its fellow the mapping at the phrase level, which Elfner has argued applies to the phrasal projections of both lexical and functional categories too. In this dissertation, I also adopt the same assumption that at either the word level or phrase level, mapping from morphosyntax to prosody does not distinguish between lexical categories and functional categories. In other words, the LCC is not assumed in this dissertation.

1.3.3. Constraints on prosodic structures

The last premise that distinguishes PCT is its implementation of interface conditions on syntax-prosody correspondences, as well as purely prosodic conditions

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on the well-formedness of prosodic structures, as Optimality Theoretic (OT) constraints (Prince and Smolensky 1993). That is, these conditions are ranked and violable, and are assumed to comply with whatever parameters define well-formed OT constraints.

In addition to Non-recursivity (NRC) and Exhaustivity (EXH), the ALIGN and WRAP constraint schemata are proposed, which can be specified to apply to various types of prosodic constituents (P-cats) and syntactic categories (S-cats). The ALIGN schema for prosodic structure determination (Selkirk 1995a) is essentially a renaming, in terms of Generalized Alignment (McCarthy and Prince 1993b), of the non-Optimality Theoretic end-based theory of prosodic structure determination (Selkirk 1986). The WRAP schema is argued by Truckenbrodt (1995, 1999) to be necessary to account for P-phrase construction in several languages.

(7) OT schemata for Prosodic Clitic Theory constraints

a. NRC(p): a p-cat of level p doesn't parse a p-cat of level p.

b. EXH(p, q): a p-cat of level p doesn't parse a p-cat of level q, q < p–1.

c. WRAP(s, p): every s-cat of category s is contained in some p-cat of level p.

d. ALIGN(x, L/R, y, L/R): the left/right edge of every constituent of type x is aligned to the left/right edge of some constituent of type y.

Later on, Selkirk (2011) proposes a new version of constraints on the syntax-prosody mapping relation Match Theory, following Alignment Theory. In Selkirk's (2011: 451) original definition reproduced in (8), MATCH is actually not a new type of constraint, but simply two-sided Alignment.

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(8) Match Theory

a. MATCH(α,π) [= SP faithfulness]

The left and right edges of a constituent of type α in the input syntactic representation must correspond to the left and right edges of a constituent of type π in the output phonological representation.

b. MATCH(π,α) [= PS faithfulness]

The left and right edges of a constituent of type π in the output phonological representation must correspond to the left and right edges of a constituent of type α in the input syntactic representation.

This schemata of Match constraints has been revised at two dimensions, however. First, Elfner (2012: 28), in a move away from the gradient evaluation implied in the alignment-based conception of MATCH, proposes an all-or-nothing categorical version of MATCH-PHRASE given in (9). The subscript "T" indicates that the constraint is stated with reference to terminal nodes, which overcomes some problems with the version in (8).

(9) MATCH-PHRASE

Suppose there is a syntactic phrase (XP) in the syntactic representation that exhaustively dominates a set of one or more terminal nodes α. Assign one violation mark if there is no phonological phrase (ϕ) in the phonological representation that exhaustively dominates all and only the phonological exponents of the terminal nodes in α.

As a categorical constraint, this terminal-node-based version is easy to evaluate and is

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thus assumed in this dissertation.

The other revision is argued by Ito & Mester (2019). They point out that MATCH-constraints as in (8) or (9) create a serious redundancy within OT-phonology since the theory already contains not only the (semi-)equivalent edge Alignment constraints, but also a fully-worked-out subsystem of faithfulness constraints that militates against all conceivable kinds of input-output discrepancies, and syntax-prosody correspondence is just one kind of correspondence relation There is no need for MATCH constraints to duplicate their work. Accordingly, they suggest to replace the current conception of MATCH by a purely existential conception, and the constraints can thus be replaced by the familiar MAX/DEP constraints of General Correspondence Theory, as applied to the syntax-prosody relation. As such, SP: MAX/DEP constraints require nothing but the existence of a correspondent in the output, as defined in (10), whereas IDENT and other faithfulness constraints deal with detailed aspects of correspondence, together with the usual one-sided Alignment constraints.

(10) SP-Correspondence Constraints

Let S be an input syntactic representation and P its corresponding output phonological representation.

a. SP:MAX: A constituent of type α with phonological content in S corresponds to some constituent of type π in P.

b. PS:DEP: A constituent of type π in P corresponds to some constituent of type α in S.

This revised existential schemata is proved to be more precise and applicable, and thus it is also applied throughout this dissertation.

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1.3.4. A typology of function word parses

The combined assumptions of PCT result in a particular conception of prosodic clitics. Non-strict layering permits several different prosodic analyses of clitic parsing. Selkirk (1995a) proposes three potential analyses, exemplified in (11) with English phrases appearing in a "function word+lexical word" configuration (examples abstracted from Ito & Mester 2019). By this proposal, a function word can share a prosodic word with a host ('internal clitic'), be parsed with a host in a recursive prosodic word ('affixal clitic'), or be parsed directly by a higher constituent like phonological phrase ('free clitic').

(11) Three kinds of prosodic clitics

a. Internal clitics

{ $_{\phi}$}

($_{\omega}$)

the students

b. Affixal clitics

{ $_{\phi}$}

(($_{\omega}$) $_{\omega}$)

could stay

c. Free clitics

{ $_{\phi}$}

($_{\omega}$)

at home

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Here the crucial constraints are at the word level, where lexical status is not distinguished from functional status, as opposed to the version proposed by Ito and Mester (2019).

(12) Word-level correspondence constraints (cf. SP:MAX-*Lex* of Ito & Mester 2019)

a. SP:MAX-X^0:

A constituent of type X^0 (syntactic word) with phonological content in S corresponds to some constituent of type ω (prosodic word) in P.

b. PS:DEP-ω:

A constituent of type ω (prosodic word) in P corresponds to some constituent of type X^0 (syntactic word) in S.

SP:MAX-X^0 is only completely fulfilled in candidate (11b), because both the lexical word and function word have their respective correspondents ωs. Although the ω built for the function word is no exact match, with the right edge misaligned, SP:MAX-X^0 is not violated since it only cares about the existence of the correspondent ω. Therefore, candidates (11a) and (11c) each violate SP:MAX-X^0 once, for the lack of correspondent ω built on the function words. Note that exact correspondence (preservation of edges, no deletion, no insertion, uniqueness of mapping, order preservation, etc.) is enforced by the other faithfulness constraints (IDENT, LINEARITY, UNIFORMITY, INTEGRITY, etc.) and one-sided edge ALIGN, so in (11b), the misaligned right edge of the ω built on the function word is enforced by high-ranking Align-R(ω, Lex), which dictates that the right edge of ω be licensed by the right edge of some lexical word. As we will see in the following chapters, this is crucial for the distinction between lexical and functional categories given the non-discriminated MATCH version.

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1.4 Preliminaries of neutral tone

In complex tonal languages such as Beijing Mandarin, F0 contours are utilized to lexically contrast every syllable, known as lexical tones. Yet syllables in unstressed positions, typically being grammatical morphemes, or the second syllable of certain disyllabic or trisyllabic words, may surface with none of the lexical tones; instead, they are referred to as having the so-called neutral tone, known in Chinese as qingsheng 'light tone.' The term neutral tone was first introduced by Chao in the 1920s to describe the pitch pattern of unstressed syllables in Beijing Mandarin which shows variability as a function of the preceding lexical tone (1932, 1933, 1968). To illustrate, the directional verb lai 'to come' bears the rising lexical tone [35] when it is stressed. As a post-verbal complement in *guo-lai* 'to come over here' and *chu-lai* 'to come out, where it often gets destressed, lai has a neutral tone with a surface mid-to-low pitch and a surface high-to-mid pitch, respectively, depending on which lexical tone the preceding syllable is associated. Since the F0 realization of neutral tone is largely determined by the lexical tone of the preceding syllable, a neutral-toned syllable is traditionally considered toneless/ targetless (Yip 1980; Wang 2000, 2003; Li 2004) or "unspecified for tone" (Duanmu 2000) in phonological terms.

In one word, stresslessness and tonelessness are generally accepted to be the intrinsic characteristics of neutral tone. In the remainder of this section, however, I will argue that, although stresslessness indeed catches the nature of neutral tone, tonelessness is better to be replaced by complete (paradigmatic) neutralization. Besides, a preliminary formalization of neutral tone based on the currently proposed definition is also attained.

1.4.1 Definition of neutral tone

Since the initialization of Chao (1968), a cover term such as "stresslessness" or the like

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has often been used to explain why underlying tones are lost or neutralized in neutral-toned syllables. The idea is that neutral-toned syllables usually have the phonetic properties which are regarded as the phonetic correlates associated with stresslessness. One of the properties is shortened duration (probably the most-mentioned one as regards the nature of neutral tone). A substantial literature (Lin & Yan 1980; Cao 1986; Chen & Xu 2006; Lee & Zee 2008; Hsieh & Chuang 2008; Chen 2015, among others) indicates that, at least for most Mandarin dialects, the mean duration of neutral-toned syllables is about 50%-60% of the full lexical-toned syllables. Another significant phonetic property of neutral tone for stresslessness is weak articulatory strength (Chen & Xu 2006; Huang 2015). For example, Huang (2015) contends that neutral tone in Taiwan Mandarin, though not consistently shortened, is still "unaccented" because its articulatory strength is weaker than the full lexical tones in the similar pitch range. Taken together, neutral-toned syllables are often realized with clear acoustic reductions. Specifically, at the segmental level, vowels in neutral-toned syllables are often centralized, devoiced, or even elided (Zadoenko 1958; Chao 1968; Cheng 1973; Gao 1980; Lin and Yan 1980, 1990; Lin 1983; Cao 1986; Chen 1986; Li 1990; Yang 1991; Duanmu 2000; Wang 2004; Lee and Zee 2008). Tonal neutralization is therefore nothing but a sign of reduction motivated by stresslessness at the tonal level (Hsieh & Chuang 2008).

As regards the processing of tonal neutralization itself, the view has been widely held that neutral-toned syllables are toneless at some point during the derivation, because it can better account for the variable surface pitch pattern and its dependency on the preceding lexical tones. To illustrate this point, let us consider two types of neutral tones in derivational terms. The first type, as depicted in (1), is inherent neutral tone, which refers to the case where syllables are always neutral-toned, even in

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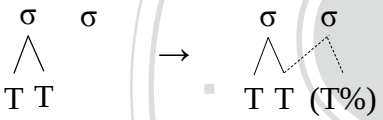
supposedly stressed positions. That is, they have lexicalized the status of being neutral-toned. Morphemes of this type in Beijing Mandarin include the sentence-final particles, such as ba, and ma, and the possessive marker de, among many others. These syllables have no lexical tones and thus are analyzed as underlyingly toneless.

Consequently, the last resort for the toneless syllable to surface with some pitch is either spreading from the preceding lexical tone (Yip 1980), or from the interpolation between the preceding lexical tone and a boundary tone (represented as T%, see Li 2003). Either way, tonelessness serves as a motivation for the mechanism deriving the surface pitch pattern of inherent neutral tone.

(13) Inherent neutral tone: underlying tonelessness



The other type of neutral tone is non-inherent, as sketched in (14). Take for example the directional verbs *lai* ‘to come’ and *qu* ‘to go’ in Beijing Mandarin. These verbs are underlyingly specified for tone in citation, the former being [35] and the latter [51], whereas as an unstressed post-verbal complement in *chu-lai* ‘to come out’ and *chu-qu* ‘to go out,’ their tonal contrast are neutralized through two stages: tone loss in unstressed positions and tonal spreading/interpolation. In this case, the tonelessness of non-inherent neutral tone is not underlying, in contrast to the case of inherent neutral tone in (13); rather, the tonelessness of non-inherent neutral tone is derived as a result of stresslessness, and it is this derived tonelessness that feeds the tonal spreading/interpolation, in the very same way as the underlying tonelessness in (13)

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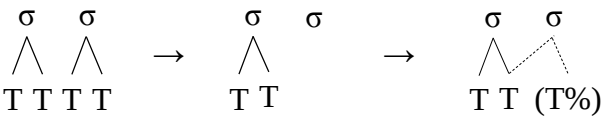
does. In other words, tonelessness, in conjunction with stresslessness, contribute to the surface pitch pattern of non-inherent neutral tone.

(14) Non-inherent neutral tone: derived tonelessness



Note that in both cases (13) and (14), tonelessness is never a surface-true statement. Especially in the latter case (14), the derived tonelessness in unstressed syllables is at an intermediate stage in the derivation. Therefore, this non-surface true tonelessness will run into difficulties fitting in with a surface-oriented non-derivational framework, such as Optimality Theory (henceforth OT). Specifically, the only mechanism in OT that can capture tonelessness derived in weak positions is positional markedness, as indicated in the constraint ranking: *TONE/σ̆ ≫ MAX(TONE), which prohibits unstressed syllables associated with a tone. And yet, this ranking wrongly rules out the surface form in (14), where the unstressed neutral-toned syllable is linked to the preceding lexical tone (and the boundary tone if it exists). This is why the previous accounts (e.g. Li 2003) for the tonelessness in OT resort to positional faithfulness instead, along with an economy constraint (i.e. *STRUC): MAX(TONE)/ˈσ ≫ *STRUC (TONE) ≫ MAX(TONE). Despite the applicability, this approach is still far from flawless in two regards. First, it attributes the derived tonelessness in (14) to the effect of * STRUC(TONE), failing to capture the insight in the derivation that the derived tonelessness is motivated by stresslessness. Second, as Gouskova (2003) argues, the economy constraints like *STRUC(TONE) should be excluded from CON, given the principle that "for every markedness constraint, there is at least one non-null structure that fully satisfies it."

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(Gouskova 2003:17) Accordingly, we may say that tonelessness, more precisely the derived tonelessness, is incompatible with a surface-oriented theory like OT.

Besides the theoretical incompatibility, the tonelessness account also acts counter to experimental results that the F0 realization of neutral tone does exhibit its own tonal target (e.g. Chen & Xu 2006 for Beijing Mandarin; Huang 2018 for Taiwan Mandarin; Li & Chen 2019 for Tianjin Mandarin). For example, in Chen & Xu (2006), the number of neutral-toned syllables was manipulated from one to three. Their results showed that, when there was only one neutral-toned syllable, the F0 realization of neutral tone was varied greatly as a function of previous full lexical tones. In contrast, as the number of neutral-toned syllables increased, the F0 realization of neutral tone showed a clear tendency of merging into a stable mid-low target of its own, regardless of the preceding and following full lexical tones. The authors argue that, due to occurring in unstressed positions, neutral tone in Beijing Mandarin is implemented with much weaker articulatory strength compared to the full lexical tones. Therefore, neutral tone is less effective in overcoming the influence of the surrounding full lexical tones, and also takes more than one neutral-toned syllable to approach its tonal target, resulting in more surface F0 variability observed in the neutral-tone realization.

Given both the theoretical problems and the experimental evidence, I propose a new definition for neutral tones based on surface-orientedness, in replacement of the non-surface true "tonelessness" view, as stated below.

(15) Surface-oriented definition of neutral tones

a. Neutral-toned syllables are unstressed.

b. The lexical tones are completely (paradigmatically) neutralized in neutral-toned syllables.

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c. Neutral-tone realization is acquired by:

   i. The influence of surrounding tones; and/or

   ii. The emergence of a (default) reduced tone.

Note that this definition disassociates neutral tone from shorter duration and weaker energy. That is to say, neutral tone can be characteristic of the two properties, and yet neither of these properties are sufficient or necessary to define whether it is a neutral tone or not. Consequently, neutral tone in this dissertation comprises not only the typical type as in Beijing Mandarin, which is shorter and weaker, it also covers a few cases that is traditionally termed tonal neutralization. For example, the default or variable tonal manifestation of (some) sentence-final particles in Cantonese and Hakka Chinese, and the tone loss and spreading/redistribution of the preceding tone involved in normal tone sandhi in Shanghainese. These cases are under the scope of neutral tone in this dissertation because they involve stresslessness, complete neutralization of paradigmatic contrast, and the surface pitch in these cases is acquired by spreading of the offset of the preceding full tone, emergence of a default reduced form, or association with the boundary tone.

1.5 Language background

There are five Chinese dialects/languages investigated in this dissertation, each representing one of the major Sinitic families. Cantonese is the prestige variety of Yue Chinese originating from the city of Guangzhou. Miaoli Sixian Hakka is the prevailing subdialect of Northern Sixian Hakka spoken in Miaoli County, Taiwan. Standard Mandarin is the official language in both mainland China and Taiwan, and is thus the

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representative of Mandarin Chinese. Taiwanese is a famous variety of Southern Min Chinese in Taiwan, and Shanghainese is the best-known dialect of (northern) Wu Chinese.

(16) Languages investigated

Languages/dialects	**Affiliations**	**Distribution**
Miaoli Sixian Hakka	Hakka Chinese	(Northern) Taiwan
Cantonese	Yue Chinese	Guangdong, Hong Kong
Standard Mandarin	Mandarin Chinese	Mainland China, Taiwan
Taiwanese	(Southern) Min Chinese	Taiwan, Xiamen
Shanghainese	(Northern) Wu Chinese	Shanghai

Note in particular that Standard Mandarin comprises two varieties in this dissertation. One is known as Putonghua (普通話), which is the standard version in mainland China. The other is called Guoyu (國語), a variety of Standard Mandarin localized in Taiwan. I will distinguish the two where necessary by dubbing the former mainland "Standard Mandarin" and the latter "Taiwan Mandarin." This contrast is important because the two varieties show differences in the patterns of neutral tones that are significant to the current analyses.

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2. Prosodic Prominence and Degree of Grammaticalization

2.1 Prosodic licensing by edge-alignment

In virtually all the prosodic analyses making use of Match theory or its predecessors, it is usually taken for granted in the syntax-phonology mapping principles that there is a conventional dichotomy between lexical and functional categories. Only members of lexical categories can uniformly assume the status of an independent prosodic constituent. Members of functional categories exhibit a much more erratic pattern cross-linguistically, generally corresponding to more than one prosodic type which allegedly follows straightforward from differences in their syntactic distribution. However, this dichotomy does not hold generally in the case which serves as a basis of this dissertation, that of Chinese dialects. In a range of branches of Chinese family, there are certain dialects, such as those in Yue Chinese and Hakka, where functional elements are as prosodically robust as lexical elements in terms of tonal phonology, and hence no need to distinguish between the two categories. On the other hand, in many Chinese dialects, including Standard Mandarin, words of functional category correspond to two prosodic classes with respect to particular phonological processes, prosodically prominent function words on the one hand, and prosodically non-prominent function words on the other. Members of the former class are parsed into the prosodic hierarchy on a par with words of lexical categories, that is, assuming a prosodically salient status by inclusion in a crucial prosodic constituent. This salience protects them from particular phonological reduction. In contrast, the class of non-

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prominent function words is characterized by absence of such salience due to its being excluded from the very prosodic constituent; therefore, members of this class are closer than those of the prominent class to what is traditionally defined as function words in the sense that they are reduced in form and/or eligibility for taking part in normal phonology. Significantly, the two classes of function words in Chinese dialects exhibit a considerable overlap in their morphosyntactic distributions. This case, together with the former one, where the lexical/functional contrast is unavailable, jointly calls for a more sophisticated system to deal with the function words which fare the same way as lexical ones in prosody, while keeping the distinction between lexical category and (phonologically reduced) functional category.

In this dissertation, I propose a formal mechanism that not only captures the two prosodic asymmetries empirically attested – the asymmetry between words of lexical and functional categories, and between the two prosodic classes of functional elements – but also accommodates the situation where there is no asymmetry at all. The core of the proposal is as follows. In principle, the interface grammar grants words of functional category a correspondent in the prosodic structure which is equivalent to that of words of lexical category, contra the convention in the literature. Nevertheless, the correspondents of these categories does not fare alike generally with respect to the prosodic markedness. While lexical correspondent is always prosodically well-formed, the correspondent of functional category is prone to be incompatible with the prosodic structure, and the incompatibility of the two prosodic classes of functional elements differs in an implicational way: if it is illegitimate for the non-prominent class to have a correspondent, then so is it for the prominent class, not vice versa. In other words, lexical category and the two classes of functional elements are in a ordering relation, forming. This can be schematically represented by a hierarchy regarding prosodic

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salience, as in (1), with lexical category at the most salient end, the non-prominent function word at the opposite end, and the prominent function word in between, where "A › B" is read as "A is more salient than B," the details of which will be discussed in the next section.

(1) Lexical word › prominent function word › non-prominent function word

The conception is cast in Optimality Theory by a set of interface constraints, following the revised version of Match Theory argued by Ito and Mester (2019), as laid out below.

(2) Interface constraints

Let *S* be an input syntactic representation and *P* its corresponding output phonological representation.

a. SP-MAX(α, π): Assign a violation mark for every constituent of type α with phonological content in *S* that does not correspond to some constituent of type π in *P*.

b. ALIGN-L/R(π, α): Assign a violation mark for every constituent of type π that is not left- or right-aligned with its corresponding constituent of type α in *S*.

This system principally consists of two well-known families of constraints. The SP-MAX in (2a) is a faithfulness constraint requiring Syntax-to-Prosody Maximality, and as such, it differs from the generally adopted MATCH constraint, according to Ito and Mester (2019), in having a purely existential conception. That is, for an element given in the input syntactic representation, SP:MAX insists merely on the existence of some

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corresponding prosodic constituent in the output phonological representation, rather than on exact correspondence, which is enforced by the other SP-faithfulness constraints. What is crucial is that this existential correspondence constraint is indifferent to whether the input element belongs to lexical category or functional category. The potential asymmetry between the categories is then governed by the Prosody-to-Syntax edge Alignment in (2b), the other family of constraints that principally makes up our system, which requires an output prosodic constituent in alignment on one side of some particular type of syntactic constituent. To capture the ordering effect in hierarchy (1), the value of the variable α for edge alignment in (2b) refers to contiguous ranges in the hierarchy, resulting in a set of stringency constraints (see De Lacy 2002), as illustrated in the following tableau, where "ω" stands for prosodic word, "Lex" for lexical word, "Fnc^{Prm}" for prominent function words, "Fnc^{NonPrm}" for non-prominent function words, and "X^0" for morphosyntactic word.

(3) Edge Alignment with stringency formulation

	ALIGN-R (ω, Lex)	ALIGN-R (ω, Lex-Fnc^{Prm})	ALIGN-R (ω, X^0)
a. ($_{\omega}$ Lex)($_{\omega}$ Fnc^{Prm}) ($_{\omega}$ Fnc^{NonPrm})	**	*	
b. ($_{\omega}$ Lex)($_{\omega}$ Fnc^{Prm}) Fnc^{NonPrm}	*		
c. ($_{\omega}$ Lex) Fnc^{Prm} Fnc^{NonPrm}			

With these two sets of constraints, the different mapping status can be treated as a result of the interaction of the SP-faithfulness and the stringent edge Alignment. The permutation of these two families of constraints produces the typology in (4), including the asymmetry between lexical and functional categories (4c), the asymmetry between the two classes of functional words (4b), and even no asymmetry (4a). As we can see, the conventional lexical/functional dichotomy arises as long as ALIGN-R(ω, Lex) is ranked above SP:MAX-X^0. If SP:MAX-X^0 is undominated, there is no asymmetry

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available, lexical and functional categories are equally salient by assuming the same prosodic status. With SP-MAX-X^0 above ALIGN-R(ω, Lex), while being dominated by ALIGN-R(ω, Lex-Fnc^{Prm}), the asymmetry between the two classes of function words is observed.

(4) Factorial typology

language Type	**Grammar**
a. (ω Lex)(ω Fnc^{Prm}) (ω Fnc^{NonPrm})	SP:MAX-X^0 ≫ ALIGN-R(ω, Lex), ALIGN-R(ω, Lex-Fnc^{Prm})
b. (ω Lex)(ω Fnc^{Prm}) Fnc^{NonPrm}	ALIGN-R(ω, Lex-Fnc^{Prm}), ≫ SP:MAX-X^0 ≫ ALIGN-R(ω, Lex)
c. (ω Lex) Fnc^{Prm} Fnc^{NonPrm}	ALIGN-R(ω, Lex-Fnc^{Prm}), **ALIGN-R(ω, Lex) ≫ SP:MAX-X^0**
	ALIGN-R(ω, Lex) ≫ SP:MAX-X^0 ≫ ALIGN-R(ω, Lex-Fnc^{Prm})

2.2 Conflation of grammaticality[1]

One might think that the subclasses of function words, namely the prominent function words and the non-prominent function words, is as arbitrary as the subcategorization approach, in the sense that the classification appears to be stipulated based on nothing but the phonological behavior of function words, and that members of the two classes may be different from one dialect to another. This inconsistency is shown in table (5), which gives a cross-dialectal summary of the members of the two prosodic classes within functional category, based on the (non-)application of tonal reduction. As we can see, the prominent class contains the largest range of distinct types of function words in Sixian Hakka, but the smallest range in Shanghai. The non-prominent class

[1] The term designates the degree of grammaticalization in Lehmann's (2015) sense.

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exhibits the reverse.

(5) Prominent and non-prominent function words

	NUM[2]	PHA	CL	PRO	DIR	ASP	MOD	SFP
Sixian Hakka							Prm	NonPrm
Taiwan Mandarin					Prm	NonPrm		
Southern Min			Prm	NonPrm				
Shanghainese	Prm	NonPrm						

NUM = Numerals
PHA = Phasal complements
CL = Classifiers
PRO = Object pronouns
DIR = Directional complements
ASP = Aspect markers
MOD = Modifier markers
SFP = Sentence final particles
Prm = Prominent function words
NonPrm = Non-prominent function words

Inconsistent and variable as it appears, the classification is clearly implicational. In other words, these distinct types of function words form an implicational hierarchy. The reduction of a given type in the scale entails the reduction of all the types to its left. This is by no means accidental. As I shall argue here, the ordering of these types reflects

[2] As one may notice, numerals do not form a typical functional category and are sometimes termed "semi-lexical" (Corver and van Riemsdijk 2001) or "lexical operator" (Keizer 2007) because they show both lexical and functional properties: (a) they belong to a semi-open class of elements (new numerals can be added, but new numerals are not as common as new nouns or verbs), (b) they are phonologically and morphologically independent, (c) they only combine with nouns, (d) they do not assign theta roles (though they do take arguments), and (e) they cannot be separated from their complements, two of which being lexical properties (class membership and independence) and three being functional properties (complements, theta roles, separability). By defining functional category in a broad sense, we suggest that numerals as having such a semi-lexical status should be taken as a member of functional category, just as pronouns, which is another instance of lexical operator in Keizer (2007). Another justification for grouping numerals into functional category is formal. In generative syntax, numerals are treated as the head of a functional projection "number phrase," or NumP, which is parallel to IP in CP domain.

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their grammaticality, that is, the degree of being grammaticalized. This idea is not as surprising as it may appear. In the literature of grammaticalization, there has long been a consensus that phonological attrition and semantic depletion, or bleaching, go hand in hand, as dubbed by the term: the coevolution of meaning and form. Accordingly, I argue in this section that the classification of prominent and non-prominent function words complies the degree of grammaticality, such that members of prominent class tend to be "less grammatical" than those of non-prominent class. Take the types of function words in (5) for example. I suggest a grammaticality scale for these types, which exactly follows the ordering that they are arranged in (5), as depicted below, where "A < B" is read as "A is less grammatical than B".

(6) Grammaticality Scale

NUM < PHA, CL < PRO, DIR < ASP < MOD < SFP

This scale can be justified using Lehmann's (1995) well-known parameters of grammaticalization, which are widely employed as a set of criteria to determine which of two linguistic items is more grammatical than the other. Lehmann's model is based on three principled aspects of the autonomy of a linguistic sign, weight, cohesion and variability, which can be analyzed from a paradigmatic and syntagmatic point of view. This results in six parameters, or six criteria, yet it is argued that only some of which are applicable to Chinese (Bisang 2020), as listed in (7).

(7) Parameters of grammaticality

a. Integrity: desemanticization (loss of semantic substance),

b. Bondedness: univerbation (boundary loss)

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c. Syntagmatic variability: fixation (decrease in syntactic freedom)

Of the three parameters, bondedness and syntagmatic variability distinguish only limited types on the scale in (6). For example, the parameter of syntagmatic variability tells that numerals are less grammatical than all the other types, because they have much higher freedom in syntactic distribution. But it fails to explain why classifiers, having an affix-like status, can be less grammatical than object pronouns, which are relatively free in syntactic distribution. By the same token, the related parameter, bondedness, though successfully recognizes the relatively lower grammaticality of phasal complements than aspect markers through the test of separability, it cannot tell us why phasal complements are less grammatical than directional complements on the one hand, and equally grammatical to classifiers on the other, given the fact that directional complements are as much separable as them from the preceding main verb, while classifiers are inseparable from the preceding numerals. In contrast, the last parameter, Integrity, is more reliable than the other two. This parameter manifests itself in desemanticization. The term either means loss of contentive meaning, or addition of more abstract meaning or function, where abstractness can be roughly defined as lack of mental image. This parameter helps distinguish the otherwise problematic pairs. For instance, phasal complements and classifiers are less grammatical than object pronouns and directional complements because they still keep contentive substance to some extent, while object pronouns and directional complements only has referential, deictic or aspectual function.

With the grammaticality scale in hand, the two prosodic classes of function words are therefore built on the hierarchy by ignoring, or "conflating" in De Lacy's (2002) term, some of the distinctions between the distinct types with different grammaticality.

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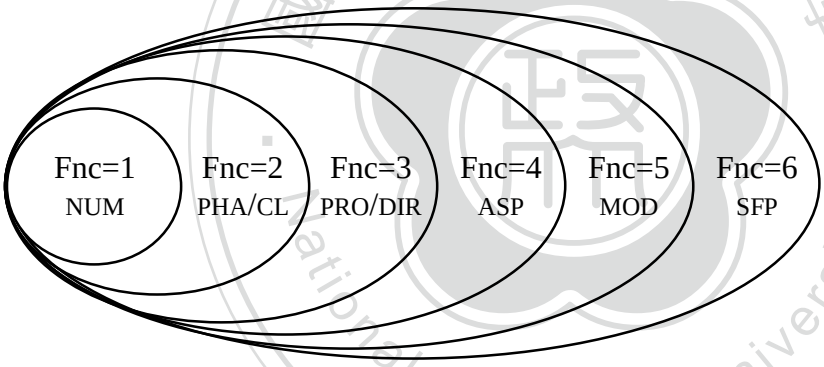
This processing of conflation is formalized using the stringent edge alignment proposed in 2.1. To begin with, let us suppose that each level in the hierarchy has a distinctive feature, or degree, in the form of a number that is greater or equals to 1. The greater the number, the higher the grammaticality. Therefore, lexical words have the feature value 0. The feature specifications shown in (8). It follows that the stringent edge alignment refers to contiguous ranges, following the revised definition given in (9). These can be seen as finer-grained divisions of ALIGN-R(ω, Lex-Fnc^{Prm}). To illustrate, ALIGN-R(ω, Fnc≤2) refers to the edge alignment of ω with a numeral, phasal complement or classifier.

(8)



(9) ALIGN-L/R(π, Fnc≤n):

Assign a violation mark for every constituent of type π that is not left- or right-aligned with a syntactic word of the type Fnc≤n in *S*.

The proposed constraint system captures both the universal and language-specific nature of the grammaticality–reduction relation. On the universal side, the system captures the fact that all else being equal, phonological reduction never seeks out a less grammaticalized function word in preference to a more grammaticalized one. On the

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language-specific side, the constraints in (3) allow conflation. Various conflations of grammaticality across Chinese dialects arise from the interaction between the stringent edge Alignment and SP-faithfulness. When SP-MAX is crucially outranked by edge Alignment referring to a range with maximum degree x, all the types of function words with grammatical degree ≤ x are conflated into the prominent class, and the rest types are the non-prominent class. For instance, in the case of Taiwan Mandarin, the boundary of prominent/non-prominent distinction is located between grammaticality degree 3 and 4; this amounts to the ranking: ALIGN-R(ω, Fnc≤3) ≫ SP-MAX.

2.3 Alignment at different levels

The stringent edge Alignment proposed for the present study serves as a mechanism of licensing function words with different degrees of grammaticality within a certain prosodic constituent. While higher-grammaticality function words have the priority to be licensed, lower-grammaticality function words tend to be excluded. This licensing is parameterized to be sensitive to the edges of a constituent at two distinct levels in the prosodic hierarchy, prosodic word and phonological phrase, as proposed below.

(10) a. ALIGN-L/R(ω, Fnc≤n)

b. ALIGN-L/R(ϕ, Fnc≤n)

Word-level Alignment as formalized in (10a) may position non-prominent function words outside prosodic word, allowing for only lexical word and prominent function words at that position, through the interaction with SP-faithfulness. The prosodic (non)licensing effect is observable in the presence/absence of tonal neutralization, given the assumption that tonal neutralization is derived from stresslessness, and that a

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syllable is unstressed for not being parsed in a prosodic word. Tonal neutralization thus serves as one of the basis for the word-level licensing. For example, in Taiwan Southern Min, function words with grammaticality degree greater than 2 are neutral-toned, which can be explained by the ranking ALIGN-R(ω, Fnc≤2) ≫ SP-MAX-X^0.

(11) Word-level licensing

Constraint ranking: ALIGN-R(ω, Fnc≤2) ≫ SP-MAX-X^0

Subclasses	**Prominent (Fnc≤2)**	**Non-prominent (Fnc>2)**
Prosodization	($_{\omega}$ Lex)($_{\omega}$ Fnc≤2)	($_{\omega}$ Lex) Fnc>2
Tonal neutralization	N/A	Neutralized

Phrase-level licensing effect can be observed through invisibility. This is a phenomenon where function words are invisible to the normal tone sandhi. An example is Sixian Hakka, in which case the modifier marker *ge*, a degree 5 function word, carries a full lexical tone which is a potential trigger of the processing of tone sandhi; however, the tone sandhi turns out to be blocked. Given that the tone sandhi is bound by the right edge of phonological phrase, the invisibility of modifier marker can be accounted for by ranking ALIGN-R(ϕ, Fnc≤4) above SP-MAX-X^0.

(12) Phrase-level licensing

Constraint ranking: ALIGN-R(ϕ, Fnc≤4) ≫ SP-MAX-X^0

Subclasses	**Prominent (Fnc≤4)**	**Non-prominent (Fnc>4)**
Prosodization	($_{\phi}$ Lex Fnc≤4)	($_{\phi}$ Lex) Fnc>4
Tone sandhi	Applied	Blocked

Word-level and phrase-level licensing effects may co-occur in the same language. Shanghainese serves as a good example. In the language, all the function words but numerals are tonally neutralized, with sentence final particles further showing

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significant invisibility by blocking the processing of tone spread. This results in different conflations. At the word-level prosody, function words with grammaticality degree greater than 1 are conflated into non-prominent class, undergoing tonal neutralization, as shown in (13). At the phrase-level, on the other hand, the non-prominent class only contains sentence final particles, the most grammatical function word in the proposed scale, as shown in (14). Therefore, most function words whose grammaticality is in between are partially reduced, in the sense that they only undergo one of the phonological reduction.

(13) Word-level: ALIGN-R(ω, Fnc≤1) ≫ SP-MAX-X^0

Subclasses	**Prominent (Fnc≤1)**	**Non-prominent (Fnc>1)**
Prosodization	($_{\omega}$ Lex)($_{\omega}$ Fnc≤1)	($_{\omega}$ Lex) Fnc>1
Tonal neutralization	N/A	Neutralized

(14) Phrase-level: ALIGN-R(ϕ^{max}, Fnc≤5) ≫ SP-MAX-X^0

Subclasses	**Prominent (Fnc≤5)**	**Non-prominent (Fnc>5)**
Prosodization	(ϕ^{max} Lex Fnc≤5)	(ϕ^{max} Lex) Fnc>4
Tone spread	Applied	Blocked

From this case emerge two theoretical implications. Firstly, the more grammatical a function words is, the more reduced it may be, and the degree of reduction can be measured by how many processes and/or which processes of phonological attrition applies to the function word. Secondly, the conflation of grammaticality is not only language-specific, but also process-specific. Different processes of reduction may call for different scenarios of conflation.

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2.4 Summary

This chapter proposes the theoretical model. Several major claims are made here. Function words do not form a monolithic and homogeneous group in prosody. They should be divided along the scale of grammaticalization degree into at least two prosodic classes: the prominent class, which is eligible for licensing the edge of prosodic constituents at either word level or phrase level, and the non-prominent class, which does not enjoy that licensing privilege and is therefore extraprosodic at either level, being vulnerable to tonal neutralization and/or prosodic invisibility. This distinction is formalized by the schemata of constraint ranking ALIGN-R(ω, Fnc≤n) ≫ SP:MAX-X^0 and ALIGN-R(Pcat, Fnc≤n) ≫ ALIGN-R(XP, Pcat).

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3. Grammaticalized Function Words in Cantonese and Sixian Hakka

3.0 Introduction

Yue Chinese and Hakka Chinese are known for having relative scarce neutral tone compared to all the other branches of Sinitic languages (Cheng and Tseng 1997). Certain languages in the two families, such as Cantonese and Miaoli Sixian Hakka, are reported to even have no neutral tones (e.g. Matthews and Yip 1994, Liu 2004); that is, in these languages each syllable, even those belonging to functional categories that are typical target for tonal neutralization in Beijing Mandarin, carries a distinct lexical tone. Cantonese and Miaoli Sixian Hakka are therefore taken in this dissertation as representatives of languages at the lowest end of the neutralization scale, and will be addressed in this very chapter. However, instead of following the no-neutralization view, I shall argue that the category of sentence-final particles serves as the one and only site for tonal neutralization, with the apparent full lexical tone carried by (a subset of) sentence-final particles analyzed as resulting from a boundary tone or default tone. Under this analysis, grammatical words in both Cantonese and Miaoli Sixian Hakka are held to be *minimally* neutralized. Only the most grammaticalized function words (i.e. sentence-final particles) get to undergo tonal neutralization.

Besides tonal neutralization, Tone sandhi in Miaoli Sixian Hakka also involves phenomenon called invisibility or extrametricality in this dissertation. That is, when

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highly grammaticalized function words, that is, modifier markers and sentence final particles, serve as the trigger, they tend to be invisible to the processing of tone sandhi, therefore the occurrence of underapplication.

Both of phenomena in question illustrate the distinction between the highly grammaticalized function words and the lower grammaticalized ones. They also show that distinct classes of the function words of lower grammaticality are all conflated into the unneutralized one, which is thus not difference from the lexical words in this regard, as diagramed in (1).

(1) Minimal neutralization of functional categories

NUM	**PHA/CL**	**DIR/PRO**	**ASP**	**MOD**	**SFP**
Visible				Invisible	
Unneutralized					Neutralized

In the following sections I give a detailed analysis of the neutralization of sentence-final particles and the non-neutralization of the other functional categories. §3.1.3 argues for the necessity of subclassification of sentence-final particles for the case of Miaoli Sixian Hakka. §3.2 deals with the issue of invisibility, which is followed by a chapter summary. The data in each section is primarily from my own observation, personal communication and consultation with informants. Part of data are adapted from online disctionaries and previous studies (e.g. H. Cheung 1972 for Cantonese; Luo 1990, 2007; Gu 2005 for Hakka).

3.1 Minimal Tonal Neutralization

3.1.1 Non-neutralization in majority of functional classes

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Cantonese and Miaoli Sixian Hakka have their majority of function words surface with one of the full lexical tones (the only exception being sentence-final particles, to which we will turn next). In this subsection we show this resistance to tonal neutralization by looking over the grammatical categories in the respective language that are potential to have a neutral tone.

Let us begin with Cantonese, the prestige variety of Yue Chinese originating from the city of Guangzhou. Cantonese has six lexical tones in phonemic terms (Yue-Hashimoto 1972, Yip 1980, Bao 1999, among others) — T1, a high level; T2, a high rising; T3, a mid level; T4, a low falling; T5, a low rising; and T6, a low level. On syllables ending in a voiceless stop, the three level tones (i.e. T1, T3, and T6) derive their respective checked tones, or short tones, which are significantly shorter than the non-checked counterparts. The detailed inventory is given in (2).

(2) Cantonese lexical tones

Category	**T1**	**T2**	**T3**	**T4**	**T5**	**T6**
Non-checked	55	35	33	21	13	22
Checked	5		3			2

Grammatical words in Cantonese are prescriptively marked as having one of the six lexical tones, based on the dictionary, language learning materials, and computer input system. The following list shows the prescriptive tonal specification of the relevant grammatical categories. The term ‘relevant’ means that function words in these categories may carry a neutral tone in many other Sinitic languages.

(3) Prescriptively marked tones of function words in Cantonese

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a. Modifier marker

ge[3]	(Adjectival) modifier marker, possessive marker

b. Aspect markers

gan[2]	Progressive marker
zyu[6]	Continuous marker
zo[2]	Perfective marker
gwo[3]	Experiential perfect marker

c. Directional complements

lai[4]	'towards the speaker'
heoi[3]	'away from the speaker'
soeng[5]	'upward'
lok[6]	'downward'
ceot[1]	'outward'
jap[6]	'inward'
hei[2]	'upward'
faan[1]	'back to'

d. Object pronouns

ngo[5]	'me'
nei[5]	'you'
keoi[5]	'him/her/it'

e. Phase Markers

jyun[4]	'finished, done for'
saai[3]	'all, completely'
can[1]	'as soon as'
dou[2]	'at, to'

f. Classifiers

go[3]	generic classifier
baa[2]	for something long and has a hilt or handle
baan[1]	for a flight, train or bus at a particular time; for a group of people
gaa[3]	for vehicle
gau[6]	for a clump or blob of thing that usually has some weight
tiu[4]	for long piece of thing

g. Numerals

jat[1]	'one'

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ji^{6}	'two'
saam^{1}	'three'
sei^{3}	'four'
ng^{5}	'five'
lok^{6}	'six'
cat^{1}	'seven'
baat^{3}	'eight'
gau^{2}	'nine'
sap^{6}	'ten'
baak^{3}	'hundred'
cin^{1}	'thousand'
maan^{6}	'ten thousand'

Besides being enacted in citation, the prescriptively marked lexical tone is also maintained in connected speech. No tonal neutralization is observed in the function words of these categories, as instantiated in (4-10).

(4) No neutralization for the modifier marker

a. *Ngo*^{5} *m*^{4} *zung*^{1}*ji*^{3} *taai*^{3} *nung*^{4}=***ge***^{3} *caa*^{4}
I NEG like too strong=**MOD** tea
'I do not like tea that is too strong.'

b. *Ngo*^{5}=***ge***^{3} *dei*^{6}*bou*^{6} *hai*^{2} *ni*^{1}*dou*^{6}
I=**POSS** address COP here
'My address is here.'

c. *Ngo*^{5} *zeoi*^{3} *zung*^{1}*ji*^{3}=***ge***^{3} *go*^{1}*sau*^{2} *hai*^{2} *keoi*^{5}
I most like=**MOD** singer COP s/he
'My favorite singer is s/he.'

(5) No neutralization for aspect markers

a. *A*^{3}*maa*^{1} *gam*^{1}*jat*^{6} *bou*^{1}-***zo***^{2} *tong*^{1}
Mother today stew-**PFV** soup
'Mom cooked soup today.'

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b. *Keoi*^{5} *daai*^{3}-***zyu***^{6} *jat*^{1}=*deng*^{2} *tau*^{4}*kwai*^{1}
S/he wear-**CONT** one=CL helmet
'S/he is wearing a helmet.'

c. *Ngo*^{5} *tong*^{4} *maa*^{1}*mi*^{4} *king*^{1}<***gan***^{2}>*gai*^{2}
I COM mummy <**PROG**>chat
'I am chatting with mummy.'

d. *Ngo*^{5} *mou*^{5} *heoi*^{3}-***gwo***^{3} *hoeng*^{1}*gong*^{2}
I NEG go-**EXP** Hong Kong
'I have never been to Hong Kong.'

(6) No neutralization for directional complements

a. *Keoi*^{5} *ngaam*^{1}*ngaam*^{1} *jau*^{4} *leon*^{4}*deon*^{1} *gwo*^{3}-***lai***^{4}
S/he just.now from London pass-**DIR**
'S/he has just come over from London.'

b. *Keoi*^{5} *bei*^{2} *ging*^{2}*caat*^{3} *laai*^{1}-*zo*^{2}-***heoi***^{3}
S/he PASS the.police arrest-PFV-**DIR**
'S/he was arrested by the police.'

c. *Zan*^{1}*hai*^{6} *mou*^{4}*liu*^{4}, *ngo*^{5} *m*^{4}=*soeng*^{2} *waan*^{2}-***lok***^{6}-***heoi***^{3}=*laa*^{1}
Really boring, I NEG=want play-**DIR-DIR**=SFP
'(That) is so boring; I do not want to mess around (with it) anymore.'

d. *Keoi*^{5}-*dei*^{6} *dat*^{6}*jin*^{4}*gaan*^{1} *cou*^{4}-***hei***^{2}-***soeng***^{5}-***lai***^{4}
S/he-PL suddenly make.noise-**DIR-DIR-DIR**
'They suddenly began to have rows with each other.'

(7) No neutralization for object pronouns

a. *Keoi*^{5} *ho*^{2}*ji*^{5} *gin*^{3}-*dou*^{2}=***ngo***^{5}
S/he be.allowed.to see-PHA=**me**
'They can see me.'

b. *Hou*^{2} *hoi*^{1}*sam*^{1} *sik*^{1}-*dou*^{2}=***nei***^{5}
Very happy know-PHA=**you.ACC**

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'Nice to meet you.'

c. *Ji⁵-cin⁴ jau⁵=go³ ging¹lei⁵ haam⁴sap¹=**keoi⁵***
Before there.is=CL manager sexually.harass=**him/her**
'There was a manager who sexually harassed him/her before.'

(8) No neutralization for phase markers

a. *Sik⁶-**jyn⁴** faan⁶ sin¹zi³ gai³=laa³*
Eat-**PHA** meal not.until to.plan=SFP
'(I will) have dinner first and then sort it out.'

b. *Nei⁵ haak³-**can¹**-zo²=keoi⁵*
You scare-**PHA**-ASP=him/her
'You scared him/her.'

c. *Bou⁶=sau²tai⁴din⁶wa² mou⁵-**saai³** din⁶*
CL=mobile.phone not.have-**PHA** electric.power
'The mobile phone is out of battery.'

d. *Nei⁵ hai²dou³-juk¹-lai⁴~juk¹-heoi³ ngo⁵ tai²-m⁴-**dou²** cin⁴min⁶=aa³*
You PROG-move-DIR~iterative-DIR I see-NEG-**PHA** in.front=SFP
'I cannot see the front as you keep moving.'

(9) No neutralization for classifiers

a. *Keoi⁵ mat¹-je⁵=dou¹ paa³, zing³ jat¹=**go³** mou⁵daam²guai²*
S/he what=FOC fear, really one=**CL** coward
'S/he is scared of everything. What a real coward s/he is.'

b. *Keoi⁵ maai⁵je⁵ laai⁶dai¹-zo²=**baa²** ze¹*
S/he go.shopping leave.behind=**CL** umbrella
'S/he has left his/her umbrella behind while shopping.'

c. *Taan²haak¹ce¹ hai⁶ jat¹=**gaa³** jau⁵ lei⁵daai²=ge³ zin³dau³ce¹*
Tank COP one=**CL** have caterpillar.track=MOD battle.vehicle
'A tank is a war machine with caterpillar tracks.'

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d. *Dam³=**tiu⁴*** *sing²* *lok⁶-heoi³*
drop.down=**CL** rope go.down-DIR
'Drop a rope down there.'

(10) No neutralization for numerals

a. ***Jat¹**=deoi⁶* *zuk¹kau⁴deo²* *jau⁵=**sap⁶-jat¹**=go³* *jan⁴*
One-massifier football.team there.be=**ten-one**=CL person
'A football team consists of eleven members.'

b. *Gei²si⁴* *dak¹haan⁴* *jam²=**loeng⁵**=bui¹=aa¹*
When have.free.time drink=**two**=cup=SFP
'When will you be free to have a drink (with me)?'

c. *Zoeng¹=toi²* *soeng⁶min⁶* *dak¹faan¹=**saam¹**=zek³* *bui¹*
CL=table on.top there.be.only=**three**=CL cup
'There are only three cups left on the table.'

Similar patterns are found in Miaoli Sixian Hakka, a subdialect of Northern Sixian Hakka spoken in Miaoli County, Taiwan. Like the other Northern Sixian varieties, Miaoli Sixian Hakka has four lexically contrastive tones (Luo 1990, 2007; Gu 2005; among many others) — T1, a low rising; T2, a low level; T3, a low falling; T4, a high level, as detailed in (11). Again, checked tones are treated here as derived from their non-checked counterparts on a closed syllable which ends in a voiceless stop.

(11) Lexical tones in Miaoli Sixian Hakka

Category	**T1**	**T2**	**T3**	**T4**
Non-checked	24	11	31	55
Checked			2	5

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All the grammatical categories, except sentence final particles, in Miaoli Sixian Hakka are prescriptively marked as having one of the four lexical tones, just like the case of Cantonese. The list in (12) shows the prescriptive tonal specification of the grammatical categories which are in principle suffixed/encliticized and thus have potential to acquire a neutral tone.

(12) Prescriptively marked tones of function words in Miaoli Sixian Hakka

a. Modifier marker

ge^{4}	(Adjectival) modifier marker, possessive marker

b. Aspect markers

den^{3}	Progressive marker, continuous marker
le^{2}	Perfective marker
go^{4}	Experiential perfect marker

c. Directional complements

loi^{2}	'towards the speaker'
hi^{4}	'away from the speaker'
song^{1}	'upward'
log^{4}	'downward'
ha^{1}	'downward'
cud^{3}	'outward'
ngib^{4}	'inward'
hi^{3}	'upward'
zon^{3}	'back to'

d. Object pronouns

ngai^{2}	'me'
ngi^{2}	'you'
gi^{2}	'him/her/it'

e. Phase Markers

ted^{3}	'completed'
ho^{3}	'finished, done for'
do^{3}	'at, to'

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f. Classifiers

zag[3]	generic classifier
ge[4]	for person
biong[1]	for a flight, train, or bus at a particular time
toi[3]	for vehicle
liang[1]	for clothes
teu[2]	for a cattle or plant

g. Numerals

id[3]	'one'
ngi[4]	'two'
sam[1]	'three'
xi[4]	'four'
ng[3]	'five'
liug[3]	'six'
qid[3]	'seven'
bad[3]	'eight'
giu[3]	'nine'
siib[4]	'ten'
bag[3]	'hundred'
qien[1]	'thousand'
van[4]	'ten thousand'

In Miaoli Sixian Hakka, function words of these categories also preserve their prescriptively marked lexical tones, which are shown in the following examples.

(13) No neutralization for the modifier marker

a. *Lia*[3]*=mi*[1] *ng*[2]*-e*[3] *han*[2]*=he*[4] *sang*[1]***=ge*[4]***
This=CL fish still=COP raw=**MOD**
'The fish remains undercooked.'

b. *Siin*[2]*mung*[2] *xin*[1]*sang*[1]***=ge*[4]*** *zii*[3]*-to*[1]
Thank teacher=**MOD** guidance
'I am grateful for your guidance, professor.'

c. *Ge*[4] *he*[4] *gi*[2] *zui*[4] *zung*[4]*i*[4]***=ge*[4]*** *xiong*[4]*pien*[4]
That COP s/he most like=**MOD** photo

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‘That is his/her favorite photo.’

(14) No neutralization for aspect markers

a. *Lia³=liang¹ sam¹ ga¹-**den³**, zang⁴ m⁴=voi⁴ hon²do³*
This=CL clothes add-**CONT**, just NEG=will to.catch.a.cold
‘Put more clothes on, so you will not catch a cold.’

b. *Siid⁴-**le²** fan⁴, ng² qiu⁴ hi⁴ tug⁴su¹*
Eat=**PFV** meal, you then to.proceed studying
‘You should study once you finish your dinner.’

c. *Lia³=**bun³** su¹ ngai² zang⁴ kon⁴-**go⁴** id³=bai³*
This=**CL** book I just read-**EXP** one-CL
‘I have only read the book once.’

(15) No neutralization for directional complements

a. *Lia³=tung³ sui³ kuan⁴-**hi³-loi²***
This=CL water carry-**DIR-DIR**
‘Pick up this barrel of water.’

b. *Gi²- liong³sa² da³-**hi³-loi²**=le²*
S/he-couple beat-**DIR-DIR**=SFP
‘They both came to blows.’

(16) No neutralization for object pronouns

a. *Gi² fad³kien³=ge⁴ha⁴, mog⁴=cab³=**gi²***
S/he get.angry=when, NEG-take.notice.of=**him/her**
‘Do not take any notice of him/her when s/he gets angry.’

b. *Ng² zo⁴ma³ge⁴ iu⁴ da³=**ngai²**=le¹*
You why again beat=**me**=SFP
‘Why did you hit me again?’

(17) No neutralization for phase markers

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a. *A^{1}po^{2}* *co^{1}=do^{4}* *den^{4}e^{2}-hong^{4}* *soi^{4}-**ted^{3}**=le^{1}*
Grandmother sit=at chair-on sleep-**PHA**=SFP
'Grandma fell asleep in the chair.'

b. *Sii^{3}ca^{1}e^{2}=ge^{4}* *sii^{2}jied^{3}* *han^{1}do^{4}lu^{3}* *oi^{4}* *zog^{3}-**ho^{3}**-loi^{2}*
Driving=MOD moment steering.wheel should hold-**PHA**-DIR
'(One) should properly hold the steering wheel while driving.'

c. *Gi^{2}* *dag^{3}-zag^{3}=ngied^{4}* *zo^{4}ded^{3}* *con^{4}-**do^{3}**^{4}* *ng^{3}-qien^{1}-kieu^{1}*
S/he every-CL=month to.be.able earn-**PHA** five-thousand-dollar
'S/he is able to earn five thousand dollars per month.'

(18) No neutralization for classifiers

a. *Lia^{3}=**toi^{2}*** *ca^{1}-e^{2}=ge^{4}* *en^{1}jin^{3}* *he^{4}* *ded^{3}gued^{3}* *zo^{4}=ge^{4}*
This=**CL** car=MOD engine COP Germany make=MOD
'The engine of this car was made in Germany.'

b. *Lia^{3}=**pien^{1}*** *vun^{2}zong^{1}* *iu^{1}* *gi^{3}do^{1}=**zag^{3}*** *sii^{4}*
This=CL essay have how.many=**CL** word
'How many words does the essay contain?'

(19) No neutralization for Numerals

a. *Siid^{4}=le^{2}* ***liong^{3}**=bi^{1}* *ca^{2}* *zang^{4}* *hi^{4}* *song^{1}ban^{1}*
This=PFV **two**=CL tea not.until go to.work
'(I) had some tea before going to work.'

b. *Lia^{3}=deu^{1}* *gieu^{3}zii^{3}* *iu^{1}* *sam^{1}=**zag^{3}*** *gieu^{3}gu^{3}e^{3}*
This=CL puppy have three=**CL** male.puppy
'There are three male puppies in the litter.'

In sum, function words within most grammatical categories in Cantonese and Miaoli Sixian Hakka mostly carry distinct leixcal tones, except sentence-final particles, which arguably have no authentic lexical tone like other function word categories. We will discuss this category in the next two subsections.

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3.1.2 Neutralization of sentence-final particles in Cantonese

Sentence-final particles in Sinitic languages are function words, which normally occur sentence-finally, and convey certain grammatical and pragmatic information, such as the speaker's attitude. Cantonese has been known for containing a rich inventory of sentence-final particles, the estimates being at least about 40. What is peculiar is that, contra Mandarin, every sentence-final particle recognized in Cantonese is traditionally described as inherently carrying one of the six lexical tones (see table (2)) in the same way that lexical words do, based on the prescriptive marking in dictionaries, language teaching materials, and computer input system. Table (20) gives a partial list examples.

(20) Prescriptively marked tones of sentence-final particles in Cantonese

laa^{3}	Realization of state
lo^{3}	Realization of state, noteworthiness
ge^{3}	Neutral assertion of relevance
gaa^{3}	Quite neutral assertion of relevance
aa^{3}	Smooth-alert
me^{1}	Used in yes or no questions
ze^{1}	Down-playing, disapproval, contempt
haa^{2}	Adhortative, negotiative, interrogative
waa^{2}	Used in (echo-)questions to emphasize the interrogativity, with adhortative touch
zaa^{4}	Turning statement into y/n-question: only so little/few?
e^{4}	Suggestion, expecting the hearer to comply/agree
wo^{5}	Noteworthiness, reporting hearsay information
le^{5}	Seeking re-assertion, almost rhetorically

However, Since H. Cheung (1972), the so-called "tones" superimposed on sentence-final particles have been argued to be distinguished from lexical tones, and are more affiliated with intonation. Some arguments for this claim are reviewed in order here.

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First, phonetic studies like Wu (2008, 2013) show that the sentence-final particle *me*^{1}, though generally described as having T1, namely a high level, turns out to carry a rising contour. Also, the pitch level and contour of the T5 particle *wo*^{5} was found different from those of T5 lexical words.

Second, a subset of the sentence-final particles in Cantonese may share the same segmental forms but differ only in tone, and may express the same basic meaning/function. As H. Cheung (1972) suggested, this subset is better treated as variant forms of a single sentence-final particle derived from the superimposition of intonational nuances. Table (21) gives some examples of such particles, and the sentences in (22) show the nuance between *wo*^{3} and *wo*^{4}; in fact, they are interchangeable occasionally.

(21) Pairs/groups of tonally contrastive sentence-final particles

a. Segmental form: *aa*

aa^{3}	Smooth-alert
aa^{1}	Smooth-alert, conversationally more lively than *aa*^{3}
aa^{4}	Smooth-alert, (i) with more certainty, or (ii) seeking confirmation
aa^{5}	Smooth-alert, implying speaker's high confidence

b. Segmental form: *laa*

laa^{3}	Realization of state
laa^{1}	Realization of state, less committed
laa^{4}	Forming interrogative to question or check the existence of the event

c. Segmental form: *lo*

lo^{3}	Realization of state, noteworthiness
lo^{1}	Realization of state, noteworthiness, evasive
lo^{4}	Realization of state, noteworthiness, most often used in answers, explaining certain aspects of one's behavior in a factual, neutral way

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d. Segmental form: *wo*

wo^{3}	Noteworthiness
wo^{4}	Noteworthiness, expressing the speaker's sudden awareness
wo^{5}	Noteworthiness, reporting hearsay news

(22) Nuance between *wo*^{3} and *wo*^{4}

a. *Ni*^{1}*dou*^{6} *jau*^{6} *jau*^{5} *so*^{1}*fa*^{2}=***wo***^{3}
Here also there.exist sofa=**SFP**
'(It's noteworthy to me that) here is another sofa.'

b. *Ni*^{1}*dou*^{6} *jau*^{6} *jau*^{5} *so*^{1}*fa*^{2}=***wo***^{4}
Here also there.exist sofa=**SFP**
'(It's just come to my notice and is thus noteworthy to me that) here is another sofa.'

The third argument for ascribing the tone prescriptively associated with sentence-final particles to intonational superimposition is that the relationship between the tone and the meaning/function of sentence-final particles in Cantonese is not arbitrary, but rather, this relationship is subject to the kinds of natural principles of what Enfield (2007) calls "iconic-indexical motivation that determine pragmatically meaningful pitch contours in non-tonal languages" (Enfield 2007:73). That is to say, the way tone is used for sentence-final particles shows a cross-linguistic tendency to serves the function of expressing a specific communicative or expressive attitudes. Previous work on this field has attained fruitful findings. For example, the high pitch (i.e. T1) and low pitch (i.e. T4) on sentence-final particles are analyzed as tonal morphemes conveying a "weaker force" and "stronger force" respectively (S. Law 1990), or from a more general perspective, they are treated as boundary tones, which exhibit universal characteristics: a high boundary tone denotes "hearer-oriented forward looking" while a low boundary tone expresses

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"speaker-oriented commitment" (Sybesma & Li 2007). Along this line of analysis, the mid pitch (i.e. T3) pervasively occurred in sentence-final particles is considered in many studies a default tone, meaning that it contributes nothing to the meaning/function of sentence-final particles and is brought into play only to avoid tonelessness. That is why in (21) a T3 particle is generally the semantically barest and most neutral member in a pair/group of tonally contrastive sentence-final particles. The T1/T4 members are characterizable as the T3 particle plus the correlate with the high/low boundary tone above.

The final argument for treating the tone of final particles as motivated by intonation is that, according to S. Law (1990), the tone normally superimposed on sentence-final particles may be attached to the final position of an utterance with no final particles present. Cases like this are extremely rare, as S. Law acknowledges, but here is an example adapted from her work. In (23b), to the utterance-final verb is attached a high boundary tone H% that conveys the speaker's need for confirmation/information from the side of the hearer (Sybesma & Li 2007), which makes the performance of assertion in this utterance more tentative than the one without the high tone attachment (23a).

(23) Attachment of boundary tone to utterance with no sentence-final particles present

a. *Keoi^{5}* *heoi^{3}*
S/he go
'S/he's going.'

b. *Keoi^{5}* *heoi$^{2(=T3+H\%)}$*
S/he go.tentative
'S/he may go.'

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I agree with the previous view (K. Cheung 1986; Law 1990; Sybesma & Li 2007) that sentence-final particles in Cantonese are "toneless carriers for intonation," in Yip's (2002: 272) terms; the pitch contours realized in sentence-final particles can be regarded as highly localized intonation that are incorporated into the system of sentence-final particles through phonologization and/or lexicalization. In this sense, the pitch implementation of sentence-final particles in Cantonese is nothing different from that in Mandarin and therefore should be treated as some kind of neutral tone by its very definition. The reason why Cantonese views the pitch contour superimposed on sentence-final particles as an inherent lexical tone is because "Cantonese is particularly sensitive to the distinctions of tone" (Lida 2018). As Wu (2008) puts it, "[s]ince the native speakers are very familiar auditorily with the contrastive lexical tones, when a syllable which has Fx [i.e. fundamental frequency] values close to one of the tone categories, the native speakers are likely to group this syllable into one of the contrastive tones." This is the position I adopt in this dissertation, so sentence-final particles in Cantonese are marked as T0 hereafter to indicate that they are virtually neutral-toned, as illustrated by the cluster of final particles in the following example (24).

(24) Neutral-toned sentence-final particles

Go^{2}=loeng^{5}=bun^{2}	*wong^{4}sik^{1}=ge^{3}*	*syu^{1}*	*keoi^{5}*	*hou^{2}ci^{5}*	*ling^{1}-zo^{2}-lok^{6}-heoi^{3}*
That=two=CL	yellow=MOD	book	s/he	seem	carry-PFV-DIR-DIR

'As for the two books with yellow covers, it seems that she has taken them downstairs,

*lau^{4}haa^{6}=**gaa^{0}**=**laa^{0}**=**wo^{0}***
downstairs=**SFP=SFP=SFP**
hasn't she?'

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With the discussions so far, we have presented a picture of tonal neutralization in Cantonese. That is, among the grammatical categories that have potential to carry a neutral tone, the class of sentence-final particles is the one and only category where tonal neutralization may occur. Function words of the other categories resist this type of reduction, and thus the latter are as prominent as ordinary lexical words in this regards. Given the grammaticality scale established in Chapter 2 (as repeated in (25), where the number denotes the degree of grammaticalization, in the sense that the greater the number, the more grammaticalized the category). This asymmetry of prominence between sentence-final particles and the other classes of grammatical words in Cantonese can be translated as follows: function words with the degree of grammaticalization lower than 6 (i.e. Fnc≤5) are all prosodically prominent enough to retain their lexical tones, showing no likelihood of tonal neutralization. The distinction between these categories are all conflated. That is, with respect to tonal neutralization, there is no distinction between degree 5 and degree 4, or between degree 4 and degree 3, and the like, as depicted in (26). Consequently, we may say that these lower grammaticalized categories are prosodically on the par with lexical categories in Cantonese.

(25) Grammaticality scale

NUM	PHA CL	DIR OP	ASP	MOD	SFP
1	2	3	4	5	6

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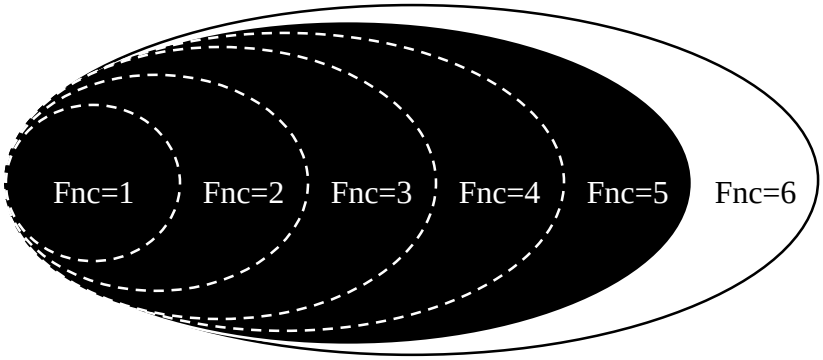
(26) Conflation of Fnc≤5



The neutralization vs. non-neutralization distinction between grammaticalization degrees 5 and 6 can be captured in the currently proposed framework by ranking ALIGN-R(ω, Fnc≤5) above SP-MAX-X^0. This version of alignment constraint dictates that every prosodic word must be right-aligned with some function word in the categories with grammaticality degree equal to or lower than 5, so when it outranks SP-MAX-X^0, which requires that every syntactic word have a corresponding prosodic word, only function words with grammaticality degree higher than 5 fail to build their own prosodic word. Tableau (27) gives an illustration using the sentence in (24), where various prosodizations of function words in categories with different degrees of grammaticality are evaluated. In CAND 1 every syntactic word is parsed in a prosodic word ω, even the consecutive sentence-final particles, which belong to the degree 6 category on the grammaticality scale, and therefore the prosodic words built on the final particles incur two violations of ALIGN-R(ω, Fnc≤5). This problem gets fixed in CAND 2 by leaving the sentence-final particles unparsed, and in that way this candidate wins out as expected. The other candidates show that further unparsing of function words with lower grammaticality

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degree (i.e. Fnc≤5) is improper for the excessive violations of SP-MAX-X^0 incurred.

(27) ALIGN-R(ω, Fnc≤5) ≫ SP-MAX-X^0

INPUT: (=24)

CAND 1: (ω Fnc=3) (ω Fnc=1) (ω Fnc=2) (ω Lex) (ω Fnc=5) (ω Lex) (ω Fnc=3)
(ω Lex) (ω Lex) (ω Fnc=4) (ω Fnc=3) (ω Fnc=3) (ω Fnc=6) (ω Fnc=6)

CAND 2: (ω Fnc=3) (ω Fnc=1) (ω Fnc=2) (ω Lex) (ω Fnc=5) (ω Lex) (ω Fnc=3)
(ω Lex) (ω Lex) (ω Fnc=4) (ω Fnc=3) (ω Fnc=3) Fnc=6 Fnc=6

CAND 3: (ω Fnc=3) (ω Fnc=1) (ω Fnc=2) (ω Lex) Fnc=5 (ω Lex) (ω Fnc=3)
(ω Lex) (ω Lex) (ω Fnc=4) (ω Fnc=3) (ω Fnc=3) Fnc=6 Fnc=6

CAND 4: (ω Fnc=3) (ω Fnc=1) (ω Fnc=2) (ω Lex) Fnc=5 (ω Lex) (ω Fnc=3)
(ω Lex) (ω Lex) Fnc=4 (ω Fnc=3) (ω Fnc=3) Fnc=6 Fnc=6

CAND 5: Fnc=3 (ω Fnc=1) (ω Fnc=2) (ω Lex) Fnc=5 (ω Lex) Fnc=3
(ω Lex) (ω Lex) Fnc=4 Fnc=3 Fnc=3 Fnc=6 Fnc=6

CAND 6: Fnc=3 (ω Fnc=1) Fnc=2 (ω Lex) Fnc=5 (ω Lex) Fnc=3
(ω Lex) (ω Lex) Fnc=4 Fnc=3 Fnc=3 Fnc=6 Fnc=6

CAND 7: Fnc=3 Fnc=1 Fnc=2 (ω Lex) Fnc=5 (ω Lex) Fnc=3
(ω Lex) (ω Lex) Fnc=4 Fnc=3 Fnc=3 Fnc=6 Fnc=6

/(=24)/	ALIGN-R (ω, Fnc≤5)	SP-MAX-X^0	ALIGN-R (ω, Fnc≤6)
CAND 1	*!*		
➡ CAND 2		**	
CAND 3		***!	
CAND 4		***!*	
CAND 5		***!*****	
CAND 6		***!******	
CAND 7		***!*******	

Note that, in this subsection, all sentence-final particles are treated alike with respect to tonal neutralization; that is, exceptions, if any, are sporadic and probably come from lexical idiosyncrasy. This is true for Cantonese but is not always the case cross-linguistically, which is made clear in the next subsection with the case of Miaoli

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Sixian Hakka.

3.1.3 Asymmetry between subclasses of sentence-final particles

We now turn to the tonal behavior of sentence-final particles in Miaoli Sixian Hakka, which is similar but not identical to what we have seen in Cantonese.

The details of sentence-final particles are not as clear for Miaoli Sixian Hakka as for Cantonese, given the fact that this topic is less studied for Sixian Hakka. According to a brief introduction of partial sentence-final particles in Luo's (1988) pioneering work, final particles in Miaoli Sixian Hakka appear to have inherent tones that can be recognized as one of the four lexical tones (see (11)), as shown below.

(28) Tonal realization of sentence-final particles in Miaoli Sixian Hakka (Luo: 206)

ge^{4}	Neutral assertion of relevance
le^{1}	Realization of state
lio^{1}	Realization of state
la^{3}	Smooth-alert
mo^{2}	Used in yes or no questions
mang^{2}	Used in yes or no questions about the realization of the state
a^{1}	Interrogative
no^{3}	Interrogative
na^{1}	Adhortative
o^{1}	Adhortative, smooth-alert
honn^{3}	Adhortative
hann^{3}	Adhortative

How should we treat these apparent tones? Are they authentic lexical tones or only of localized intonation as what we have argued for Cantonese? Here I observe a clear difference. That is, in Miaoli Sixian Hakka, a proper subset of the sentence-final particles is *tonic*, having authentic, unneutralized, lexical tones, while the rest (namely the

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complement of the tonic subset) are *atonic*, which carry a boundary tone/localized intonation, and are therefore toneless, or neutral-toned by definition. The tonic class is quite a small subset, including only a few members, such as *ge*^{4}, *le*^{1}, *lio*^{1}, *mo*^{2}, *mang*^{2}. In other words, most of the sentence-final particles are atonic. This difference can be justified in two ways.

First, based on J. Cheng (2007) and J. Wu's (2018) research, there are pairs/groups of atonic final particles in Miaoli Sixian Hakka that are described as sharing the same segments but differing in the pitch realization only, just like the case in Cantonese. This is shown by the examples in (29), which also shows that the difference in pitch contour simply contributes pragmatic nuances in general. Besides, the semantic/pragmatic contrast between *honn*^{3} and *honn*^{4} in (29b) and (30) is in line with the discussion about universal boundary tones (reviewed in §3.2.2) in the sense that some specific pitch contours correspond to certain meaning/function. Specifically, high register boundary tone (i.e. T4) expresses look forwarding toward the hearer, while low register boundary tone (i.e. T3 and T2) conveys speaker-oriented committedness. Therefore, by the same token, we may treat each pair/group of the final particles as variant forms of the same sentence-final particle. Note that this kind of variation is hardly reported for the members of tonic class.

(29) Pairs/groups of tonally contrastive sentence-final particles

a. Segmental form: *a*

a^{2}	Smooth-alert, conversational liveliness
a^{4}	Smooth-alert, conversational liveliness, more intensified than *a*^{2}
a^{3}	Smooth-alert, conversational liveliness, even more intensified than *a*^{2}

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b. Segmental form: *honn*

honn^{3}	Adhortative, interrogative, speaker-oriented, more assertive than *honn*^{4}
honn^{4}	Adhortative, interrogative, hearer-oriented, seeking for confirmation

(30) Nuance between *honn*^{3} and *honn*^{4}

a. *Tien*^{1}*gong*^{1}*ngid*^{3} *zang*^{4} *kon*^{4}=***honn***^{3}
Tomorrow not.until watch=**SFP**
'Let's not watch it until tomorrow. (more assertive, with stronger presupposition)'

b. *Tien*^{1}*gong*^{1}*ngid*^{3} *zang*^{4} *kon*^{4}=***honn***^{3}
Tomorrow not.until watch=**SFP**
'Let's not watch it until tomorrow, shall we?'

The other way to justify the tonic vs. atonic subclassification is to draw a comparison with Hailu Hakka, the second dominant Hakka dialect in Taiwan. As is well-known, cognate morphemes in Sixian Hakka and Hailu Hakka normally have reversed tonal melodies. That is, a given cognate morpheme with a high pitch in one of the dialects carries a low pitch in the other, and if a cognate morpheme has a rising contour in one of the dialect, it must have a falling contour in the other, as illustrated in table (31).

(31) Tonal reversion in two Hakka varieties

Cognate Morphemes		Sixian Hakka	Hailu Hakka
Tien	'sky'	24	53
Fung	'red'	11	55
Dang	'top, above'	31	24
Kon	'look'	55	11
Gued	'country'	2	5
Pag	'white'	5	2

In the domain of sentence-final particles, one may expect that reversion like this would occur in every type of sentence-final particles if all the particles were really associated

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with a distinct lexical tone. However, according to J. Cheng (2007:164), only members of the tonic class show the tonal reversion. Members of the atonic class, on the contrary, basically have the same tonal melodies in both dialects. This discrepancy, as shown in the following tables, falls out naturally with the assumption made here that the "tone" carried by an atonic final-particle is in fact acquired from an intonational effect, thus involving no genetically-related correspondence such as the reversion between the two varieties.

(32) Dialectal tonal reversion in sentence-final particles

a. Tonic class: reversion applicable

Final Particles	Miaoli Sixian Hakka	Hailu Hakka
Ge^{4}	55	11
Le^{1}	24	53
Lio^{1}	24	53
Mo^{2}	11	55
Mang^{2}	11	55

b. Atonic class: no reversion

Final Particles	Miaoli Sixian Hakka	Hailu Hakka
A^{2}	11	11
A^{4}	55	55
La^{2}	11	11
La^{3}	53	53
Honn^{3}	53	53
Honn^{4}	55	55
E^{2}	11	11

This subclassification is not a stipulation; one may find it reminiscent of the traditional division of sentence-final particles into three distributional classes, recast as a three-layered root CP by Paul (2014) — (i) low C, the lowest root complementizer, including sentential tense/aspect particles, such as *le*, *láizhe*, and *ne*$_{1}$ in Beijing Mandarin;

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(ii) force C, containing illocutionary force particles, such as *ma*, *ba*, *ne*$_2$, etc. in Beijing Mandarin; (iii) Attitude C, the highest root complementizer, including speaker's subjective attitude particles, such as *ou*, *(y)a*, *ne*$_3$, etc. in Beijing Mandarin. This split-CP architecture is shown below.

(33) Three classes of root complementizers (Paul 2014: 82)

C$_1$ (Low C)	<	**C$_2$ (Force)**	<	**C$_3$ (Attitude)**
le 'currently relevant state'		*ma* 'interrogative'		*ou* 'warning'
láizhe 'recent past'		*ba* 'imperative'		*(y)a* 'astonishment'
ne$_1$ 'continued state'		*ne*$_2$ 'follow-up question'		*ne*$_3$ 'exaggeration'
		…		…

Assuming the same architecture of root CP for Miaoli Sixian Hakka, we can see that a large majority of the tonic particles belong to the lowest two classes of root complementizer. Specifically, *le*^{1} and *lio*^{1}, both equivalent to the Mandarin *le*, are undoubtedly sentential tense/aspect particles and thus belong to low C, while *mo*^{2} and *mang*^{2}, as the standard interrogative particles used in yes/no questions, namely equivalent to Mandarin *ma*, belong to the class of Force C. The remaining tonic particle *ge*^{4}, though not in the lowest two classes of root complementizer, is not an Attitude C either. As an equivalent to the Mandarin *de* in the propositional assertion, *ge*^{4} should be in the non-root C position, according to Paul's (2014) analysis. To sum up, the tonic vs. atonic distinction can be translated as follows: only sentence-final particles that belong to the highest root complementizer (i.e. the class of Attitude C) are atonic, or neutral-toned.

The question that follows is why tonal neutralization targets sentence-final particles in Attitude C only. A possible account that I shall propose here is that attitude particles are more grammaticalized than final particles of the other classes, as shown in the

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extended scale (34), where attitude particles are labeled as degree 6.5, while the other sentence-final particles remain in the category of degree 6. This move is in line with the view of J. Cheng (2007) that, in Hailu Hakka, particles with tones, in reverse relation to the corresponding particles in Sixian Hakka (i.e. non-attitude particles), display more contentful properties.

(34) Extended grammaticality scale

NUM	PHA CL	DIR OP	ASP	MOD	SFP (NON-ATT)	SFP (ATT)
1	2	3	4	5	6	6.5

This idea is based on two assumptions. First, according to V. J. Pan (2015), attitude particles are the most subjective sentence-final particles. He argues that this is a logical deduction, given that attitude particles as such are always linked to subjective feeling, attitude and/or opinion of speakers rather than the utterance itself, and are therefore speaker-oriented. At the other end, particles in lower C, which convey tense, aspects, and/or modality, are tightly linked to the predication of the utterance itself. In other words, they are utterance-oriented, and are thus considered the least subjective complementizers. Particles in force C such as those expressing interrogative and imperative illocutionary force are, as V. J. Pan puts it, "situated between being subjective and being least subjective" (V. J. Pan, 2015: 821). Specifically, the force particles are more subjective than those particles in lower C because "they integrate the speaker's expectation from her/his co-speaker" (loc. cit). At the same time, they are also less subjective than attitude particles, since they are still linked to the interpretation of the sentence itself.

The recognition of the high degree of subjectivity for attitude particles leads to the

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second assumption made here: the more subjective, the more grammaticalized. This assumption concerns the tight connection between subjectification and grammaticalization, as Traugott, one of the pioneer explorer of subjectivity, repeatedly show in her analyses of semantic/pragmatic change. She considers subjectification in grammaticalization a historical process by which meanings become increasingly based on the speaker's subjective belief state, or attitude, toward what is said (Traugott 1989, 1995, 1997, 1999, *inter alia*). With a view to establishing general characteristics of grammaticalization, in one of her earlier influential works, Traugott (1982) has proposed unidirectional path of semantic change, characterized as 'propositional > (textual >) expressive, and views this shift as involving subjectification , that is, an increase in the expression of subjectivity or speakers' point of view. This shift is considered regular enough for Traugott to predict "paths of change, or constraints on the directionality of semantic change" (Traugott 1989:33), and the subjectification is suggested to be viewed as an intrinsically unidirectional phenomenon, that is to say, a trend towards a higher degree of encoding of the speaker's point of view, not vice versa. This nonsubjective > subjective tendency is considered an important role in semantic change and is supported by Traugott's subsequent works (Traugott 1995, 1997, 1999, 2003b), as well as other studies on subjectification and grammaticalization (e.g. König 1991, Smith 1993, Carey 1995, Company 1995, Brinton 1996, Suzuki 1998, Chor 2013).

Having settled the difference in degrees of grammaticality between attitude particles and final particles of the other types, the asymmetry in neutralization between these subclasses in Miaoli Sixian Hakka can be analyzed in the same way as we did for the case of Cantonese. That is, function words with the degree of grammaticalization

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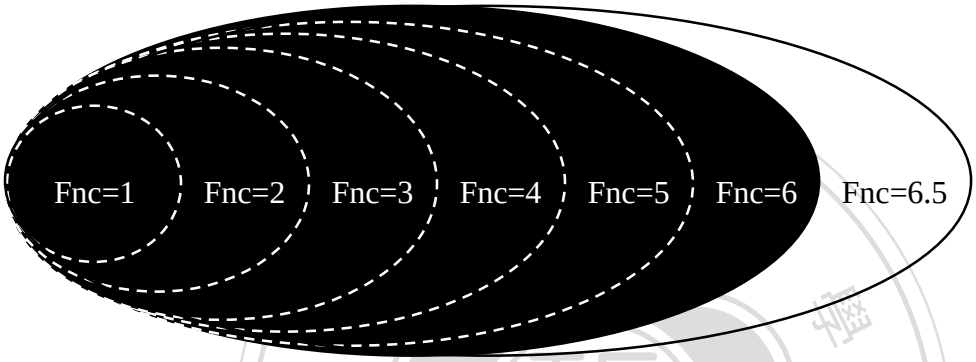
lower than 6.5 (i.e. Fnc≤6), including sentence-final particles outside Attitude C, are all prosodically prominent enough to prevent their lexical tones from being neutralized. Again, this means that the distinction between the categories with the degree lower than the highest grammaticalized category are all conflated.

(35) Conflation of Fnc≤6



In the same vein, the neutralization vs. non-neutralization distinction between grammaticality degrees 6 and 6.5 can be captured in the currently proposed framework by ranking ALIGN-R(ω, Fnc≤6) above SP-MAX-X^0. This is shown in the tableau (36). In CAND 1 every syntactic word is parsed in a prosodic word ω, including both the non-attitude particle *le*^{1} and the attitude particle *la*^{0}. The latter belongs to the degree 6.5 category on the grammaticality scale, and therefore the prosodic words built on the attitude particle incur one violations of ALIGN-R(ω, Fnc≤6). This problem gets fixed in CAND 2 by leaving the attitude particle unparsed, and in that way this candidate wins out as expected. The other candidates, again, though harmonically bounded by CAND 2, show that further unparsing of function words with lower grammaticality degree (i.e. Fnc≤6) is not allowed for the unnecessary violations of SP-MAX-X^0 incurred.

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(36) ALIGN-R(ω, Fnc≤6) ≫ SP-MAX-X

INPUT:

Lia^{3}=sam^{1}=bun^{3}	*ng^{2}*	*na^{1}-zon^{3}-loi^{2}=ge^{4}*	*su^{1}*	*ngai^{2}*	*kon^{4}-go^{4}=le^{1}-la^{0}*
This=two=CL	you	fetch-DIR-DIR=MOD	book	I	read-EXP=SFP=SFP.ATT

'As for the three books you brought here, I have read them already.

CAND 1: (ω Fnc=3) (ω Fnc=1) (ω Fnc=2) (ω Fnc=3) (ω Lex) (ω Fnc=3) (ω Fnc=3)
(ω Fnc=5) (ω Lex) (ω Fnc=3) (ω Lex) (ω Fnc=4) (ω Fnc=6) (ω Fnc=6.5)

CAND 2: (ω Fnc=3) (ω Fnc=1) (ω Fnc=2) (ω Fnc=3) (ω Lex) (ω Fnc=3) (ω Fnc=3)
(ω Fnc=5) (ω Lex) (ω Fnc=3) (ω Lex) (ω Fnc=4) (ω Fnc=6) Fnc=6.5

CAND 3: (ω Fnc=3) (ω Fnc=1) (ω Fnc=2) (ω Fnc=3) (ω Lex) (ω Fnc=3) (ω Fnc=3)
(ω Fnc=5) (ω Lex) (ω Fnc=3) (ω Lex) (ω Fnc=4) Fnc=6 Fnc=6.5

CAND 4: (ω Fnc=3) (ω Fnc=1) (ω Fnc=2) (ω Fnc=3) (ω Lex) (ω Fnc=3) (ω Fnc=3)
Fnc=5 (ω Lex) (ω Fnc=3) (ω Lex) (ω Fnc=4) Fnc=6 Fnc=6.5

CAND 5: (ω Fnc=3) (ω Fnc=1) (ω Fnc=2) (ω Fnc=3) (ω Lex) (ω Fnc=3) (ω Fnc=3)
Fnc=5 (ω Lex) (ω Fnc=3) (ω Lex) Fnc=4 Fnc=6 Fnc=6.5

CAND 6: Fnc=3 (ω Fnc=1) (ω Fnc=2) Fnc=3 (ω Lex) Fnc=3 Fnc=3
Fnc=5 (ω Lex) Fnc=3 (ω Lex) Fnc=4 Fnc=6 Fnc=6.5

CAND 7: Fnc=3 (ω Fnc=1) Fnc=2 Fnc=3 (ω Lex) Fnc=3 Fnc=3
Fnc=5 (ω Lex) Fnc=3 (ω Lex) Fnc=4 Fnc=6 Fnc=6.5

CAND 8: Fnc=3 Fnc=1 Fnc=2 Fnc=3 (ω Lex) Fnc=3 Fnc=3
Fnc=5 (ω Lex) Fnc=3 (ω Lex) Fnc=4 Fnc=6 Fnc=6.5

/INPUT/	ALIGN-R (ω, Fnc≤6)	SP-MAX-X^{0}	ALIGN-R (ω, Fnc≤6.5)
CAND 1	*!		
➡ CAND 2		*	
CAND 3		**!	
CAND 4		**!*	
CAND 5		**!**	
CAND 6		**!******	
CAND 7		**!********	
CAND 8		**!**********	

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3.1.4. The stresslessness

Tonal neutralization comes from stresslessness, and stresslessness is taken for granted in the previous chapters to be derived from the unparsing into ω, and yet we have said nothing about why unparsing into ω gives rise to stresslessness. We take care of this issue here before leaving this section.

To account for the fact that every syllable in Chinese bear a tone, and that only unstressed syllables are toneless, Yip (1980) assumes that syllables with tones are heavy, and every heavy syllable forms a metrical foot. Following this assumption, I claim that every syllable in Chinese (except Wu Chinese, to which I will turn in Chapter 5) form a metrical foot on condition that it is parsed into ω. This claim has several implications, including (i) monosyllabic feet is normally allowed in Chinese, (ii) feet must be properly contained in a ω. To capture this idea, some relevant constraints are proposed as follows:

(37) Constraints for foot formation

a. EQUSIS & Σ-WITH-ω (L) (= [EQUALSISTERS & ALIGN-L(Σ, ω)])

Assign one violation mark for every metrical foot (Σ) iff both of the following situation occurs:

(i) It is not left aligned with some prosodic word (ω)

(ii) It does not have the same prosodic constituent as its sister node in the prosodic structure.

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b. σ-WITH-Σ (E) (= [ALIGN-EDGE(σ, Σ)):

Assign one violation mark for every syllable (σ) iff it is not aligned with both edges of some metrical foot (Σ).

The Edge Alignment constraint in (37b), σ-WITH-Σ (E), is responsible for having every syllable build a metrical foot of its own and the conjunction of Alignment constraints with EQUSIS in (37a), [EQUSIS & Σ-WITH-ω (L)], requires that each metrical foot properly contained in some ω, and have the same prosodic status with its sister node. With these constraints, the stresslessness of syllables unparsed into ω falls out. This is illustrated in tableau (38). Given that the licensing constraint Align-R(ω, Fnc≤n) prohibits a non-prominent function word parsed in a ω, the conjunction is then crucial in ruling out CAND 3 in (38a), where a metrical foot is built independent of the formation of prosodic word. This is a desirable result: a metrical foot can be built only if it is contained in a prosodic word. The constraint ranking also explains why each syllable in a lexical word has a metrical foot and thus is stressed and tonic (38b), because leaving an internal syllable unparsed (CAND 2 in 38b) or forming polysyllabic feet (CAND 3 and CAND 4 in 38b) would incur fatal violation on σ-WITH-Σ (E).

(38) Align-R(ω, Fnc≤n), [EQUSIS & Σ-WITH-ω (L)] ≫ σ-WITH-Σ (E) ≫Σ-WITH-ω (L)

a. INPUT: [σ $_{Lex}$][σ $_{Fnc>n}$]

CAND 1: [(ˈ**σ** $_{Σ}$) $_{ω}$][(ˈ**σ** $_{Σ}$) $_{ω}$]
CAND 2: [(ˈ**σ** $_{Σ}$) $_{ω}$][σ $_{ω}$]
CAND 3: [(ˈ**σ** $_{Σ}$) $_{ω}$] (ˈ**σ** $_{Σ}$)
CAND 4: [(ˈ**σ** $_{Σ}$) $_{ω}$] σ

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/INPUT/	Align-R (ω, Fnc≤n)	[EQUSIS & Σ-WITH-ω (L)]	σ-WITH-Σ (E)	Σ-WITH-ω (L)
CAND 1	*!			
CAND 2	*!		*	
CAND 3		*!		*
➡ CAND 4			*	

b. INPUT: [σ σ σ Lex]

CAND 1: [('**σ** Σ) ('**σ** Σ) ('**σ** Σ) ω]
CAND 2: [('**σ** Σ) σ ('**σ** Σ) ω]
CAND 3: [('**σ** σ Σ) ('**σ** Σ) ω]
CAND 4: [('**σ** σ σ Σ) ω]

/INPUT/	Align-R (ω, Fnc≤n)	[EQUSIS & Σ-WITH-ω (L)]	σ-WITH-Σ (E)	Σ-WITH-ω (L)
➡ CAND 1				*
CAND 2		*!	*	*
CAND 3			*!*	*
CAND 4			*!**	

3.2 Invisible function words in Miaoli Sixian Hakka

Tonal neutralizaton involves word-level extrametricality, as we have seen in the last section. In Miaoli Sixian Hakka there is another phenomenon involving extrametricality, but on phrase-level this time. This phrase-level extrametricality makes certain types of function words invisible to some specific tonal process, and therefore it reflects the distinction between subclasses of function words. This section is dedicated to this invisibility, showing that the non-uniformity of phrase-level extrametricality also has a lot to do with a difference in degree of grammaticality. The following sections are organized as follows. §3.2.1 gives introduction to the tone sandhi in Miaoli Sixian Hakka, especially to the domain boundary the processing. §3.2.2 presents the data showing that certain types of function words may be invisible to that tone sandhi, and hence

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occurrence of underapplication. An analysis of this invisibility follows using the currently proposed model.

3.2.1 T1 sandhi in Miaoli Sixian Hakka

As introduced in §3.2.1, Miaoli Sixian Hakka has four lexically contrastive tones, with the assumption that the checked tones are allophonic variants of the non-checked counterparts on a closed syllable which ends in a voiceless stop. (Luo 1990, 2007; Gu 2005; among many others). The details of the four lexical tones are T1, a low rising; T2, a low level; T3, a low falling; T4, a high level, as repeated in (39).

(39) Lexical tones in Miaoli Sixian Hakka

Category	**T1**	**T2**	**T3**	**T4**
Non-checked	24	11	31	55
Checked			2	5

Among the four lexical tones, the rising tone (i.e. T1) is the only one involving the process of tonal change, termed as T1 Sandhi (also known as Yinping Tone Sandhi in the relevant literature). The rule of T1 Sandhi is stated in (40), which says that T1 changes to a low falling or low level that is very similar to the pitch pattern of T2 before an underlying high level (i.e. T4, be it checked or non-checked) or another T1. This rule is usually understood as motivated under the OCP effect (Y. E. Hsiao 2008). Words in (41) illustrate~~s~~ the application of the rule.

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(40) The rule of T1 sandhi

T1:/24/ → T2 [11] / __ {T4: [55]~[5], T1: [24]}

(41) Illustration of T1 sandhi

σ1/σ2	T1: [24]	T2: [11]	T3: [31]~[2]	T4: [55]~[5]
T1 [24]	*Tien-giung* [**11**-24] 'rainbow'	*Koi-cu* [24-11] 'to expel'	*Qiang-co* [24-31] 'verdant grass'	*Ziim-xian* [**11**-55] 'needlework'
			Vu-sed [24-2] 'black'	*Im-ngog* [**11**-5] 'music'

There is little research on the domain of T1 sandhi. Hsu's (1996) pioneer work is therefore a remarkable one for being relatively exhaustive and detailed. According to her analysis, the application of T1 sandhi is bounded by the right edge of intonational phrase (ι), a prosodic constituent at a considerably higher level in the prosodic hierarchy, second only to the highest constituent, namely Utterance. However, Hsu says little about how an intonational phrase is formed through the syntactic structure. She only gives a definition that "an intonational phrase is comprised of one or more phonological phrases" (Hsu 1996:63). This simple definition makes the formation of intonational phrase rather arbitrary in her analysis. The formed intonational phrase can sometimes be isomorphic to phonological phrases, and sometimes comprise some or all the phonological phrases. The only restriction is the length of ι, as described below. Example in (43) illustrates this restriction, where the phonological phrase is assumed to be flat here, and the lexically-governed AP is skipped in the formation of phonological phrase. As can be seen, the first formation of ι is ungrammatical for having series of too short ι and thus violating (42a), while the second formation of ι is ruled out because it violates (42) by having

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sequences ι of varied length. Therefore, only the third and fourth formation is acceptable; that is, either the whole sentence forms a single ι, and in that way all but the final syllable undergo tone sandhi (marked by S as having a sandhi tone), or the right end of the direct object *zem*^{1}*biong* 'chopping board' also demarcates the tone sandhi, thus allowing the second syllable of that word to preserve its base tone (marked by B).

(42) Length restriction (Hsu 1996:66)

a. Series of very short ι should be avoided.

b. Sequences of ι of varied length should be avoided.

(43) 'Brother fetched mom a chopping board first.'

[*A*^{1}*go*^{1} NP/DP]	[[*sien*^{1} AP]	*na*^{1}	[[*zem*^{1}*biong* NP/DP]	[*bun*^{1}	[*a*^{1}*me*^{1} NP/DP] PP] VP]
Elder.brother	first	fetch	chopping.board	give	mother
(ϕ)	(		ϕ)	(	ϕ)
*(S B ι)	(S	S	S B ι)	(S	S B ι)
*(S B ι)	(S	S	S S	S	S B ι)
(S S	S	S	S B ι)	(S	S B ι)
(S S	S	S	S S	S	S B ι)

This "ι-domain" analysis is in fact problematic. Here I argue instead that the domain demarcating T1 Sandhi is formed from two subtypes of phonological phrases, maximal phonological phrases and minimal phonological phrases. The minimal phonological phrase is usually non-isomorphic to syntactic phrase, probably due to prosodic markedness such as the size requirement. Note that T1 Sandhi does not apply to both subtypes, but choose to apply in either. Three reasons against the "ι-domain" analysis and in support of the current assumption are in order. First, in Match-theoretic approach, which is adopted here, intonational phrase is a correspondent prosodic constituent to

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clause, parenthetical expression, or dislocated phrases. The multiple intonational phrases formed in Hsu's analysis match none of these syntactic types. Second, maximal phonological phrase (i.e. phonological phrase that is not dominated by any other instance of phonological phrase) and non-minimal phonological phrase (i.e. phonological phrase dominating another instance of phonological phrase) are the only subtypes of prosodic constituents positioned between intonational phrase and minimal phonological phrase in the hierarchy. Given the fact that the domain for T1 Sandhi is usually larger than minimal phonological phrase, these intermediate subtypes are therefore good candidates. Third, since T1 Sandhi domains may in some cases match minimal phonological phrases, the subtype at a lower level must be considered a candidate too. Last but not least, the different domains for T1 Sandhi can be referred to yield different alternative readings. Therefore, optional strategies for the application of T1 Sandhi are necessary.

With this new assumption, we are now in the position to propose a mechanism to account for the domain for T1 sandhi in Miaoli Sixian Hakka by reanalyzing the sentence in (43). Here I argue that the domain formation in Miaoli Sixian Hakka is highly influenced by requirement of prosodic markedness, and that is why there is generally mismatch between the sandhi domains and syntactic phrases. The relevant markedness constraint is proposed below, which help restrict the size of a phonological phrase.

(44) Size constraints (Selkirk 2000, based on Ito & Mester 1992, 1995)

BINARITY^{min}: Assign one violation mark for every phonological phrase (ϕ) which contains only one prosodic word (ω).

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This markedness constraint interacts with prosodic faithfulness, SP-MAX-XP. It also has interactions with Alignment in either direction, i.e. syntax-to-prosody Alignment (45a) and prosody-to-syntax Alignment (45b-c). The ranking of the size constraint and prosody-to-syntax Alignment ought to be higher than SP-MAX-XP and Alignment in reverse direction, so that the surface prosodic structure can be non-isomorphic to syntactic structure. Employing this constraint ranking, the sentence in (43) can be analyzed in (46). The recursivity makes possible the phonological phrasing to be literally faithful to the syntactic phrases, as shown in in CAND 1, which thus incurs violations of the size constraint because three of the ϕ's contain fewer than one prosodic word (elements underlined together are syntactic/prosodic words). CAND 2 and CAND 3 have the same problems since they only made partial revision. CAND 4 satisfies the size constraint, but the adjustment violates Right Alignment, and thus is beaten by CAND 4, the optimal candidate. Finally, CAND 5 shows the possibility where the entire sentence is enclosed within a flat single ϕ, and thus only the sentence-final syllable keeps the base tone. This possibility is ruled out, however, by SP-MAX-XP as well as syntax-to-prosody Alignment. Note that the prosodic structure in the current analysis allows recursivity, contra Hsu's analysis, Hence, two subtypes of ϕ, the most embedded minimal phonological phrase φ and the outermost maximal phonological phrase Φ, are relevant here, both of which serve to confine T1 sandhi, and therefore the syllable in the final position of both φ and Φ preserves its base tone. This allows two alternative readings in the tone sandhi: one refers to φ, the other to Φ.

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(45) Alignment constraints

a. ALIGN-R(ϕ, XP): Assign one violation mark for every phonological phrase (ϕ) which is not right-aligned with some syntactic phrase (XP).

b. ALIGN-R(XP, ϕ): Assign one violation mark for every syntactic phrase (XP) which is not right-aligned with some phonological phrase (ϕ).

c. ALIGN-L(XP, ϕ): Assign one violation mark for every syntactic phrase (XP) which is not left-aligned with some phonological phrase (ϕ).

(46) Formation of phonological phrase

Constraint Ranking: {BINMIN(ϕ, ω), ALIGN-R(ϕ, XP)} ≫ SP-MAX-X
BINMIN(ϕ, ω) ≫ {ALIGN-R(XP, ϕ), ALIGN-L(XP, ϕ)}

INPUT:	[σσ NP/DP]	[σ σ	[σσ NP/DP]	[σ [σσ NP/DP]	PP]	VP]	TP/CP]	(=41)
CAND 1:	**((**SB **φ)**	(S S	(SB **φ)**	**(**S (SB **φ)**	ϕ)	ϕ)	**Φ)**	
CAND 2:	**((**SB **φ)**	(S **(** S	SB **φ)**	**((**S SB **φ)**	ϕ)	ϕ)	**Φ)**	
CAND 3:	**((**SB **φ)**	((S S	SB **φ)**	**((**S SB **φ)**	ϕ)	ϕ)	**Φ)**	
CAND 4:	**((**SS	B **φ)((** S	SB **φ)**	**((**S SB **φ)**	ϕ)	ϕ)	**Φ)**	
CAND 5:	**(((**SS	S S	SB **φ)**	**((**S SB **φ)**	ϕ)	ϕ)	**Φ)**	
CAND 6:	**(**SS	S S	SS	S SB			**φ/Φ)**	

/INPUT/	BINARITY^{min}	ALIGN-R (ϕ, XP)	ALIGN-R (XP, ϕ)	ALIGN-L (XP, ϕ)	SP-MAX-XP
CAND 1	*!**				
CAND 2	*!			**	
CAND 3	*!			**	
CAND 4		*!	*	***	
➡ CAND 5			*	***	*
CAND 6			**!***	****!	**!***

In this subsection I have revisited the issue on the domain of T1 sandhi, arguing that, with recursivity assumed, both of the subtypes of phonological phrase serve as the sandhi domains, and that the size of the domains are predominantly controlled by prosodic

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wellformedness rather than syntactic structure. With this analysis in mind, let us turn to what problem certain types of function words may cause to the tone sandhi.

3.2.2 Underapplication of T1 sandhi

As every utterance may contain a single phonological phrase, usually the a maximal one (Φ), one might predict that there is at least one reading for every utterance where T1 sandhi applies all the way to the penultimate syllable. However, this prediction turns out to fail when certain classes of function words are involved. That is, certain classes of function words, though having a full tone that serves as a proper trigger of T1 Sandhi, would always make T1 sandhi underapply to the preceding tone. Such underapplication occurs obligatorily when the trigger is sentence-final particles *le*^{1}/*lio*^{1} which denotes the tense/aspect of "current state realization," and *ge*^{4}, which expresses assertiveness and certainty. When the trigger is the modifier marker *ge*^{4}, on the other hand, the underapplication may occur optionally. Examples of each situation is given below, were B stands for a base tone of T1 and T for the trigger for T1 sandhi. These sentences show that the underapplication has nothing to do with the type or length of the phrase containing the target syllable.

(47) Obligatory underapplication

a.	*Tien*^{1}*gong*^{1} $_{\text{VP}}$**]** $_{\text{TP}}$]	***=le*^{1}*/lio*^{1}** $_{\text{LowCP}}$]
	To.dawn	SFP.PRF
	B	T
	'The day breaks.'	

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b. *Mo²* *dung¹xi¹* NP/DP] VP] TP] ***=le¹/lio¹*** LowCP]
Not.have things SFP.PRF
B T
'There is nothing left.'

c. *Ngai¹* *bun³loi²* *oi⁴* *lim¹* TP] ***=ge⁴*** CP[-root]] TP] CP[+root]]
I was.going.to want drink SFP
B T
'I'm telling you, I would have drunk it.'

(48) Optional underapplication

a. *A¹go¹* NP/DP] ***=ge⁴*** [*xin¹*sang¹ DP/NP] DP]
Elder.brother MOD teacher
B~S T
'My brother's teacher'

b. *A¹go¹* NP/DP] *mai¹* VP] CP^{-root}] ***=ge⁴*** [*fa¹* DP/NP] DP]
Elder.brother buy MOD flower
B~S T
'The flower that my brother bought'

c. *Mai¹* [*gie¹tong¹* NP/DP] VP] CP^{-root}] ***=ge⁴*** [*qien²* DP/NP] DP]
Buy chicken.soup MOD money
B~S T
'The money for chicken soup'

d. *Xin¹* AP] ***ge⁴*** [*hai²*e² DP/NP] DP]
New MOD shoes
B~S T
'New shoes'

e. *Jiang¹jiang¹* AP] ***ge⁴*** [*fa¹* DP/NP] DP]
Beautiful MOD flower
S **B~S** T
'Beautiful flowers'

A question that is raised here is about why only these two classes of function words are invisible to the sandhi processing and in what way underapplication occurs. The answer

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is quite clear if we take a look at the position of these classes in the grammaticality scale, which is repeated again in (49). As we can see from the scale, these classes are on the top end, belonging to the categories that are the most grammaticalized of all. This reveals that the degree of grammaticality also plays an important role in this phenomenon, with such an implication: the higher degree of grammaticality a function word is, the more likely it is prosodically invisible. As an evidence, function words grouped in categories with lower grammaticality degree never result in underapplication. This is evidenced by examples in (50), where we can see that the experiential perfect aspect marker *go*^{4} (with degree 4) and the directional complement *ha*^{1}*loi*^{2} (with degree 3), indeed serve as the trigger for T1 Sandhi expectedly.

(49) Extended grammaticality scale for Sixian Hakka (=34)

NUM	PHA CL	DIR OP	ASP	MOD	SFP (NON-ATT)	SFP (ATT)
1	2	3	4	5	6	6.5

(50) Function words lower grammaticalized: no underapplication

a. *Ng*^{2} *siid*^{3} *tang*^{1}-***go*^{4}**=*mo*^{2} VP] LowCP]
You ever hear-PRF=SFP.FOR
S T
'Have you ever heard this?'

b. *Tai*^{4}*ga*^{1} *kiung*^{4}*ha*^{4} *co*^{1}-***ha*^{1}**-*loi*^{2} VP] LowCP]
Everybody together sit-DIR-DIR
S T
'Everyone, let us sit down together.'

One might wonder whether and how the association of invisibility with grammaticality is motivated. In view of the analysis of sandhi domain we have seen in the last subsection, a

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reasonable inference or the invisibility is that those invisible function words (Fnc≥5) must immediately follow the right edge of a certain maximal phonological phrase, This ensures its preceding tone to be always in the final position of a maximal phrase (Φ), no matter whether the rule of T1 Sandhi is implemented in minimal phrase (φ) or maximal phrase (Φ). In other words, those indivisible function words are higher-level extrametrical for not being parsed in a (maximal) phonological phrase, a higher-level constituent compared to the one involved in the extrametricality in tonal neutralization. This idea can be schematically represented as follows, where B stands for base tone of T1. This configuration clearly shows that the trigger function word is outside any given domain for tone sandhi.

(51) Extrametrical to T1 sandhi

(… (…B $_{\varphi}$) $_{\Phi}$) Fnc≥5

We now proceed to produce this desirable configuration under the OT framework. Let us begin with the simpler case, the obligatory underapplication with sentence-final particles (i.e. Fnc>5). A prosodic licensing constraint is proposed in (52), in the formulation of Alignment, which dictates that the right edge of any instance of maximal phonological phrase be licensed by the right edge of some lower-grammaticalized (i.e. more contentful) words. In other words, the right edge of highly grammaticalized function words such as sentence-final particles is not an eligible licenser for the right end of Φ.

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(52) Licensing at the phrase-level

ALIGN-R(Φ, Fnc≤5):

Assign a violation mark for every maximal phonological phrase (Φ) which is not right-aligned with some prominent word, whose grammaticalization degree is lower than or equal to 5.

Since maximal phonological phrase is defined as immediately dominated by intonational phrase, there is also the need for a constraint demarcating intonational phrase. According to Selkirk (2011), the complement of the highest layer of complementizer phrase stands in correspondence with intonational phrase. This interface constraint is given in (53). This clausal interface constraint is ranked above SP:MAX-XP, since the clause itself is a syntactic phrase by definition, and the clausal mapping takes precedence.

(53) SP:MAX-CLAUSE:

Assign one violation mark for every clause in the input syntactic representation S that does not have some correspondent intonational phrase (ι) in the output phonological representation P, where the clause is defined as the complement of highest layer of root C.

With this constraints, we can deal with the underapplication involving sentence-final particles. We can see that in the case with the sentential tense/aspect particle *le*^{1}*/lio*^{1} (54a), the effect of the licensing constraint is obscured by the clausal interface constraint SP:MAX-CLAUSE because with high-ranking SP:MAX-CLAUSE these particles in root low

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C always follows the right edge of Φ based on their syntactic position. The crucial role of ALIGN-R(Φ, Fnc≤5) emerges in the case with non-root complementizer *ge*^{4}, as shown in (54b). In this case, *ge*^{4} as a non-root C having a complement TP parsed as minimal phrase, so without the help of the high ranking ALIGN-R(Φ, Fnc≤5), it would not follow the right edge of the maximal phrase. In other words, the extrametricality of *ge*^{4} is in line with other highly grammaticalized dnction words, but they may have different syntactic positions. If we had only the syntactically grounded interface constraints, we cannot obtain the correct output.

(54) Extrametrical sentence-final particles

Constraint ranking: ALIGN-R(Φ, Fnc≤5) ≫ ALIGN-R(XP, ϕ)

a. INPUT: [[*Tien*^{1}*gong*^{1} $_{VP}$] **=*le*^{1}/*lio*^{1}** $_{ForceCP}$] $_{AttCP}$] (=44a)

CAND 1: (([S **B**]$_{ω}$ Φ) [T]$_{ω}$ ι)
CAND 2: (([S **B~S**]$_{ω}$ ϕ) [T]$_{ω}$ Φ)

/INPUT/	ALIGN-R (Φ, Fnc≤5)	BINMIN (ϕ, ω)	SP:MAX-CLAUSE	ALIGN-R (XP, ϕ)	SP:MAX-XP
➡ CAND 1		*		*	**
CAND 2	*!	*	*!		*

b. INPUT: *Ngai*^{1} *bun*^{3}*loi*^{2} [*oi*^{4} *lim*^{1} $_{TP}$] **=*ge*^{4}** $_{CP[-root]}$] $_{TP}$] $_{CP[+root]}$] (=44d)

CAND 1: ([ ]$_{ω}$ [ ]$_{ω}$ ([ ]$_{ω}$ [**B**]$_{ω}$ Φ) [T]$_{ω}$ ι)
CAND 2: (([ ]$_{ω}$ [ ]$_{ω}$ ([ ]$_{ω}$ [**B~S**]$_{ω}$ ϕ) [T]$_{ω}$ Φ) ι)

/INPUT/	ALIGN-R (Φ, Fnc≤5)	BINMIN (ϕ, ω)	SP:MAX-CLAUSE	ALIGN-R (XP, ϕ)	SP:MAX-XP
➡ CAND 1				***	***
CAND 2	*!			**	**

While this prosodic licensing constraint is workable for sentence-final particles, it runs

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into problems applying to the case with the modifier marker *ge*^{4}. The rationale behind the licensing constraint is that maximal phonological phrase right aligned with highly grammaticalized words is prohibited, thus the pressure for the right edge to move away for licensing. However, in the case with the modifier marker *ge*^{4}, maximal phonological phrase is already well-licensed due to the syntactic configuration of the modifier construction. Therefore, I propose another licensing constrint to enforce the boundary to move, as defined in (55), which is in the form of cross Alignment.

(55) ALIGN(Fnc=5, L, Φ, R):

Assign a violation mark for every function word with grammaticality degree equal to 5 whose left edge is not aligned with the right edge of a maximal phonological phrase Φ.

Given the variable status of the invisibility of this marker, I suggest that the ranking between ALIGN(Fnc=5, L, Φ, R) and ALIGN-R(XP, ϕ) is unfixed for Miaoli Sixian Hakka, in the spirit of Antilla's (1997) multiple grammar approach. Some speakers have access to the ranking with the licensing constraint above ALIGN-R(XP, ϕ), as shown in (56a), others have access to the inversed ranking (56b), while still others may have access to either ranking, hence the occurrence of optionality and variation. Note that the S~B in CAND 1 does not represent dialectal or intra-speaker variation; it is rather like stylistic choice, also conditioned by prosodic factors such as speech rate (see Y. E. Hsiao 2008). Therefore, it is not on the par with the variation/optionality of underapplication that we are dealing with here; the latter, though remaining unclear yet, probably concerns dialectal or

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intra-speaker difference.

(56) Variation with the modifier marker

INPUT: [$A^{1}go^{1}$ NP/DP] mai^{1} VP] ***=ge⁴*** [fa^{1} DP/NP] DP] (=45b)

CAND 1: (([S S]$_{\omega}$ [**S~B**]$_{\omega}$ $_{\varphi}$) [T]$_{\omega}$ ([B]$_{\omega}$ $_{\varphi}$) $_{\Phi}$)
CAND 2: (([S S]$_{\omega}$ [**B**]$_{\omega}$ $_{\varphi}$) $_{\Phi}$) [T]$_{\omega}$ ([B]$_{\omega}$ $_{\Phi}$)

a. Constraint ranking: ALIGN(Fnc≥5, L, Φ, R) ≫ ALIGN-R(XP, ϕ)

/INPUT/	ALIGN (Fnc=5, L, Φ, R)	BINMIN (ϕ, ω)	ALIGN-R (XP, ϕ)	SP-MAX-XP
CAND 1	*!	*		
➡ CAND 2		*	*	

b. Constraint ranking: ALIGN-R(XP, ϕ) ≫ ALIGN(Fnc≥5, L, Φ, R)

/INPUT/	BINMIN (ϕ, ω)	ALIGN-R (XP, ϕ)	SP-MAX-XP	ALIGN (Fnc=5, L, Φ, R)
➡ CAND 1	*			*
CAND 2	*	*!		

3.3 Summary

Sixian Hakka and Cantonese have the least types of non-prominent function words — only those with the highest degree of grammaticalization, namely sentence-final particles, are subject to tonal neutralization and/or prosodic invisibility. This is analyzed employing the constraint ranking ALIGN-R(ω, Fnc≤5) ≫ SP-MAX-X^{0}. Besides, a further division of sentence-final particles is suggested, by which attitude particles are argued to be more grammaticalized and thus more vulnerable to prosodic attrition than the other subtypes, due to their highly subjectified status.

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4. Grammaticalized Function Words in Taiwanese and Standard Mandarin

4.0 Introduction

As is well-known, neutral tones in Min Chinese and Mandarin Chinese are among the richest of all the branches of Sinitic languages. In fact, the term "neutral tone" itself — known in Chinese as *qingsheng*, literally meaning 'light tone' — was originally introduced by Chao in the 1920s for the case of Beijing Mandarin, and was extended to describe the similar tonal phenomenon in Taiwanese Southern Min in as early as around 1970 (R. L. Cheng 1968, 1973). Besides, what is particular and relevant to this dissertation is that the occurrence of neutral tone in Min Chinese and Mandarin Chinese is more common and/or regular in grammatical words than in lexical words. It is this predominance of structural neutral tone that determines the grouping together of Min Chinese with Mandarin Chinese into the same chapter, excluding Wu Chinese, the picture of which is rather different in that lexical neutral tone is as prevalent as structural neutral tone (hence the arrangement of the case of Wu Chinese in the next chapter).

For the space limitation of the dissertation, only the representative of each family, that is, Taiwan Southern Min (which is very similar to the variety spoken in Amoy) and Standard Mandarin (including varieties in Taiwan and China), are addressed in this chapter. By surveying in those two languages the distribution of neutral tone across different types of function words, this chapter shows that most classes of function words are neutral-toned in the languages in question. Specifically, among all the classes of function words, only the relatively low grammaticalized classes, namely numerals,

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classifiers, and phasal complements, are immune to tonal neutralization. Such predominance of phonological attrition occurs in the application of tone sandhi in a parallel way. In the well-known positional paradigmatic tone sandhi in Taiwan Southern Min, all classes of function words but the relatively low grammaticalized ones are invisible, or extrametrical, to the processing. Clearly, both phenomena suggest the same tendency: function words with high or medium degree of grammaticality are more vulnerable to phonological attrition than those with low degree of grammaticality, and in this way, highly grammaticalized function words and medium grammaticalized ones are prosodically conflated, as far as certain processes of attrition are concerned.

(1) Predominant attrition of functional categories

NUM	PHA/CL	DIR/PRO	ASP	MOD	SFP
Visible		Invisible			
Unneutralized		Neutralized			

This chapter is arranged as follows. §4.1 is dedicated to the case of Taiwan Southern Min, where neutral tone and invisibility to tone sandhi are in order. §4.2 deals with the distribution of neutral tone in Standard Mandarin, with a focus on the medium grammaticalized class, namely directional complements and object pronouns, which shows discrepancy both language-internally and language-externally. §4.3 ends the chapter with a summary. The data in each section is primarily from my own observation, personal communication and consultation with informants. Part of data are adapted from online disctionaries and previous studies (e.g. U. Ang's 1996b, 1998f; E. Hsiao 1991, 1995 for Taiwanese; K. Huang 2018 for Taiwan Mandarin).

4.1 Tonal neutralization in Taiwan Southern Min

Taiwan Southern Min, more commonly referred to as Taiwanese (the language will be

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so called hereafter), is a known variant of the Southern Min Chinese spoken by approximately 70% of the population in Taiwan. Like Amoy, it is a koineized variety on the basis of the time-honored Southern Min dialects spoken in Zhangzhou and Quanzhou. Taiwanese is traditionally described to have seven categories of lexical tones, and each has two variants: one base tone and one sandhi tone. Roughly speaking, the former occurs in the final position of a certain domain, while the latter occurs non-finally (the details of the domain is addressed in §4.1.3). Table (2) gives a paradigm example of the tonal categories.

(2) The categories of lexical tone in Taiwanese (adapted from Myers & Tsay 2008)

Categories	**Base Tone**			**Sandhi Tone**		
T1	55	***si*^{1}**	'poetry'	33	***si*^{1}*bun*^{2}**	'poetry and prose'
T2	52	***si*^{2}**	'to die'	55	***si*^{2}*lang*^{5}**	'dead people'
T3	21	***si*^{3}**	'four'	52	***si*^{3}*tiam*^{2}**	'four o'clock'
T4	2	***si*^{4}**	'color'	5	***sik*^{4}*tshai*^{2}**	'color'
T5	13	***si*^{5}**	'time'	33	***si*^{5}*kan*^{1}**	'time span'
T7	33	***sik*^{7}**	'temple'	21	***si*^{7}*sing*^{1}**	'temple monk'
T8	5	***sik*^{8}**	'ripe'	2	***sik*^{8}*te*^{5}**	'baked tea'

While syllables in Taiwanese normally bear a lexical tone that belongs to one of those seven categories, be it in base form or sandhi form, certain types of grammatical words/morphemes may occur in the form of neutral tones, which are characteristic of loss of lexical contrast, domain-finality and invisibility to tone sandhi. These properties are undoubtedly symptoms of phonological attrition of grammaticalized elements, in the sense that they help destress the contentless elements, allowing emphasis to fall on the preceding syllable that remains with its full lexical tone. The remaining of this section addresses these properties of neutral tone with the focus on which types of grammatical words have the potential to be neutral-toned and how is that related to the degree of grammaticality.

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4.1.1 Predominant occurrence of tonal neutralization

Based on dictionaries and the attested surface form in citation or non-final positions, all types of grammatical words in Taiwanese are underlyingly associated with a lexical tone (although the predominant T4 in sentence-final particles is probably just a dummy which is derived from default low). Table (3) lays out the citation tone of the classes of function words that are usually attached to the right of its host/base and thus have potential to get neutral-toned.

(3) Citation tones of function words in Taiwanese

a. Sentence-final particles

ah^{4}	Realization of state
looh^{4}	Realization of state, noteworthiness
bo^{5}	Interrogative, unsed in yes or no questions
m^{7}	Used in (echo-)questions to emphasize the interrogativity
ah^{4}	Smooth-alert, adhortative
oh^{4}	Smooth-alert, adhortative
lah^{4}	Smooth-alert, adhortative
mah^{4}	Smooth-alert, adhortative
leh^{4}	Intensifier, to express contempt
neh^{4}	Intensifier, to express praise or satisfaction

b. Modifier marker

e^{5}	(Adjectival) modifier marker, possessive marker

c. Aspect markers

leh^{4}	Continuous marker
kue^{3}	Experiential perfect marker

d. Directional complements

lai^{5}	‘towards the speaker’
khi^{3}	‘away from the speaker’
loh^{8}	‘downward’
tshut^{4}	‘outward’
jip^{8}	‘inward’

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khi[2]	‘upward’
tng[2]	‘back to’

e. Object pronouns

gua[2]	‘me’
li[2]	‘you’
i[1]	‘him/her/it’

f. Phasal complements

uan[5]	‘finished, done for’
suah[4]	‘finished, done for’
liao[2]	‘finished, done for’
ho[2]	‘properly finished, completed’
tioh[8]	‘at, attached, acquired, ’
kau[3]	‘at, to’
diao[7]	‘finished, lost’

g. Classifiers

e[5]	generic classifier
pun[2]	for books
pang[1]	for a flight, train or bus at a particular time
tai[5]	for vehicle
te[3]	for a clump or blob of thing that usually has some weight
tiau[5]	for long, soft piece of thing; for songs
lui[2]	for flowers
nia[2]	for clothes

h. Numerals

tsit[8]	‘one’
nng[7]	‘two’
sann[1]	‘three’
si[3]	‘four’
go[7]	‘five’
lak[8]	‘six’
tshit[4]	‘seven’
peh[4]	‘eight’
kau[2]	‘nine’
tsap[8]	‘ten’
pah[4]	‘hundred’
tshing[1]	‘thousand’
ban[7]	‘ten thousand’

In the final position of a certain domain, most of these classes of grammatical words become neutral-toned. This neutralization, by definition, can be identified based on loss

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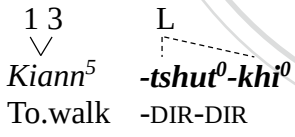
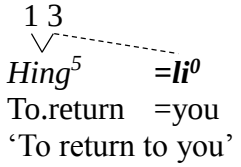
of tonal contrast. In derivational terms, a neutral-toned syllable first undergo tone loss and then are realized as either (i) a "constant low neutral tone," or (ii) a tonal variable as a function of the preceding lexical tone. The former is derived by an association with a default low, while the latter is derived by spreading rightward the offset of the full tone carried by the preceding syllable (Y. E. Hsiao 1995; S. Ou & Y. E. Hsiao 1997). The two strategies are schematized in (4), where neutral-toned syllables are marked with a superscripted 0. In (4a), the sequential directional complements *-tshut*^{4} 'out' and *-khi*^{3} 'away from the speaker' acquire a default low, whereas in (4b), the object pronoun *li*^{2} 'you' shares the end-pitch of the melody of the preceding syllable. In consequence, though the preceding full tone is identical, the neutral-toned function words in (4a) vs. (4b) are realized differently, that is, *-tshut*^{0}*-khi*^{0} surfacing as [21-11] while *li*^{0} as [33]. Nonetheless, in either case, the original tonal contrast of the function words is lost altogether.

(4) Realization of neutral tone

a. Default low docking



b. Rightward offset spreading



According to U. Ang's (1996b, 1998f) exhaustively descriptive works, members of the classes (3a-e) — namely, sentence-final particles, adjectival modifier marker (note

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particularly that *e*^{5} as possessive marker cannot be neutral-toned, which is addressed in the next subsection), aspect markers, directional complements, and object pronouns — undergo tonal neutralization and surface in the way of either (4a) or (4b), as long as they are situated domain-finally. The array of example utterances in (5-9) illustrates such positional neutralization in those classes of grammatical words.

(5) Neutralization of sentence-final particles

a. *Li*^{2} *u*^{7}*sin*^{1}=***ah***^{0} *si*^{7}=***m***^{0}
You pregnant=**SFP** right=**SFP**
'You are pregnant, right?'

b. *Tshia*^{1} *lai*^{5}=***ah***^{0}=***lah***^{0}
Vehicle come=**SFP**=**SFP**
'Look! Here comes the bus.'

c. *Si*^{7} *an*^{2} *tsuann*^{2}=***le***^{0}
COP how=SFP
'What is wrong?'

(6) Neutralization of the modifier marker

a. *Tse*^{1} *si*^{7} *tsin*^{1}=***e***^{0}
This COP real=**MOD**
'This is for real.'

b. *Gua*^{2} *tsu*^{2}=***e***^{0} *khah*^{4}=*ho*^{2}*tsiah*^{8}
I cook=**mod** comp=yummy
'My cooking is better.'

(7) Neutralization of aspect markers

a. *Tua*^{7}*mng*^{5} *kuainn*^{1}=***leh***^{0}
Door close= **CONT**
'The door is close.'

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b. *Gua*^{5} *u*^{7}*=khi*^{3}***-kue***^{0}
S/he PRF=go-**EXP**
'S/he is wearing a helmet.'

(8) Neutralization of directional complements

a. *Ping*^{1}*siunn*^{1} *hai*^{7}***-khi***^{0}*=ah*^{0}
Fridge be.broken-**DIR**=SFP
'The fridge is broken.'

b. *Li*^{2} *tang*^{7}*si*^{5} *beh*^{4}*=tng*^{2}***-lai***^{0}
You when be.going.to=get.back-**dir**
'When will you come back?'

c. *Tsit*^{4}*-kiann*^{7} *tai*^{7}*tsi*^{3} *khuann*^{3}***-khi***^{0}***-lai***^{0} *be*^{7}*=bai*^{2}
This-CL thing look-**dir-dir** NEG-bad
'This matter seems fine.'

d. *Li*^{2} *mai*^{3}*=koh*^{4} *kong*^{2}***-lok***^{0}***-khi***^{0}*=ah*^{0}
You NEG=still talk-**DIR-DIR**=SFP
'Don't say another word.'

(9) Neutralization of object pronouns

a. *Si*^{7} *siang*^{2} *beh*^{4}*=tshue*^{7}***=i***^{0}
COP who want=look.for=**him/her**
'Who wanted to see him?'

b. *Gua*^{2} *ai*^{3}***=li***^{0}
Very love=**you.ACC**
'I love you.'

c. *Tse*^{2}*=nng*^{7}*-e*^{5} *hoo*^{7}***=gua***^{0}
This-two-CL give=**me**
'Give me these two.'

On the other hand, the majority of members of the other classes (3f-h), namely, phasal complements, classifiers, and numerals preserve the full lexical tones even in the final position, as exemplified in (10-12). There exist a few exceptions that seem to undermine

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the validity of the classification based on grammaticality degree, however. For example, the phasal complement *tioh*^{8}, non-possesive attributive marker *e*^{5}, and the numerals denoting little degree or small quantity, rather than the concept of cardinal number, all of which being neutral-toned domain-finally, just like the non-prominent classes in (5-9), and therefore form exceptions. These are addressed in the next subsection.

(10) No neutralization for phasal complements

a. *Png*^{7} *tsiah*^{8}-***liau***^{2}=*ah*^{0}
Meal to.eat-**PHA**=SFP
'(They) have finished dinner.'

b. *Gong*^{1}-*kho*^{3} *sia*^{2}-***ho***^{2}=*ah*^{0}
Homework write-**PHA**=SFP
'I have done my homework.'

c. *Pun*^{3}-*so*^{3} *theh*^{8}-*khi*^{3} *hinn*^{3}-***tiau***^{7}
Garbage to.take-DIR throw-**PHA**
'Dump the garbage.'

d. *I*^{1} *ue*^{7} *gong*^{2}-***suah***^{4} *sui*^{5} *beh*^{4}=*tng*^{2}-*khi*^{0}
You words say-**PHA** immediately want.to=go.back =DIR
'She is leaving upon saying those words.'

(11) No neutralization for classifiers

a. *Gua*^{2} *beh*^{4}=*be*^{2} *tse*^{2}=*nng*^{7}-***e***^{5}
S/he want.to=buy this=two=**CL**
'I am buying these two.'

b. *Ge*^{1}*nng*^{7} *hoo*^{7}=*gua*^{2} *sann*^{1}-***liap***^{8}
Egg give=me three=**CL**
'Give me three eggs.'

c. *Hi*^{5} *i*^{2}*king*^{1} *u*^{7} *sann*^{1}=***bue***^{2}=*ah*^{0}
Fish already have three=**CL**=SFP
'We have three fish already.'

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d. *Sann*[1] *tsit*[8]***nia***[2] *gua*[7]*tse*[7]
Clothes one-**CL** how.much
'The dress, how much is it for one?'

(12) No neutralization for numerals

a. *li*[7]*-tsap*[8]*-**sann***[1]
two-ten-**three**
'Twenty-three'

b. *Sann*[1]*-tsap*[8]*-**kau***[2]
Three-ten-nine
'Thirty-nine'

With the discussion so far, we have attained the picture of tonal neutralization in Taiwanese. That is, among the grammatical categories that have potential to carry a neutral tone in the final positions, only numerals, classifiers, and phasal complements resist this type of reduction, thereby being as prominent as ordinary lexical words in this regards. Given the grammaticality scale established in Chapter 2 (as repeated in (13), where the number denotes the degree of grammaticalization, in the sense that the greater the number, the more grammaticalized the category), this asymmetry of prominence between sentence-final particles and the other classes of grammatical words in Taiwanese can be translated as follows: function words with the degree of grammaticalization higher than 4 (i.e. Fnc≥3) are all prosodically prominent enough to retain their lexical tones, showing no likelihood of tonal neutralization. The distinction between the highly grammaticalized categories, and the highly grammaticalized categories and the medium grammaticalized category are all conflated, as depicted in (14). Consequently, we may say that all categories other than low grammaticalized ones are prosodically on the par with each other, all being neutral-toned.

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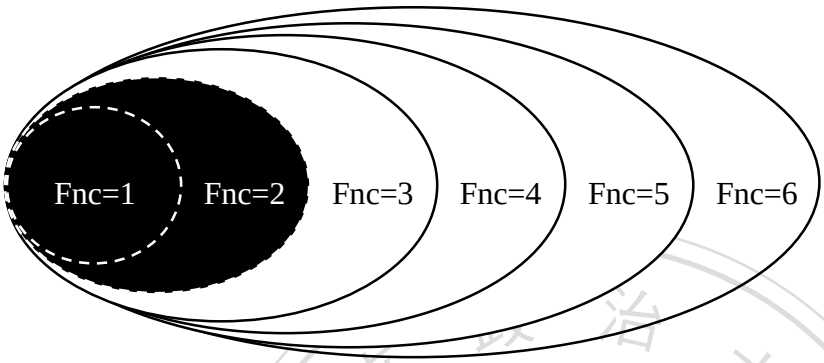
(13) Grammaticality scale

NUM	PHA CL	DIR OP	ASP	MOD	SFP
1	2	3	4	5	6

(14) Conflation of Fnc≥3



The neutralization vs. non-neutralization distinction between grammaticality degrees 2 and 3 can be captured in the currently proposed framework by ranking ALIGN-R(ω, Fnc≤2) above SP-MAX-X^0. This version of alignment constraint dictates that every prosodic word must be right-aligned with some function word in the categories with grammaticality degree equal to or lower than 2, so when it outranks SP-MAX-X^0, which requires that every syntactic word have a corresponding prosodic word, only function words with grammaticality degree higher than 2 fail to build their own prosodic word. Tableau (15) gives an illustration using the sentence in (24), where various prosodizations of function words in categories with different degrees of grammaticality are evaluated. In CAND 1 every syntactic word is parsed in a prosodic word ω, including the sentence-final particle *bo*, which belongs to the degree 6 category on the grammaticality scale, and the object pronoun *gua*, which belongs to the degree 6 category; therefore, the prosodic words built on those elements incur two violations of ALIGN-R(ω, Fnc≤2). This problem gets fixed completely in CAND 3 by leaving both the sentence-final particle and object pronoun unparsed, and in that way this candidate wins

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out as expected. CAND 4 and CAND 5 show that further unparsing of function words with lower grammaticality degree (i.e. Fnc≤2) is improper for the excessive violations of SP-MAX-X^0 incurred.

(15) ALIGN-R(ω, Fnc≤2) ≫ SP-MAX-X^0

INPUT:

Be^2	***go*^{7}*-tai*^{5}**	*hoo*^{7}***-gua*^{0}**	*tioh*^{8}=***bo*^{0}**
To.buy	**five.CL**	give-**me**	right=**SFP**
'He bought me five, right?'			

CAND 1: (ω Lex) (ω Fnc=1) (ω Fnc=2) (ω Lex) (ω Fnc=3) (ω Lex) (ω Fnc=6)
CAND 2: (ω Lex) (ω Fnc=1) (ω Fnc=2) (ω Lex) (ω Fnc=3) (ω Lex) Fnc=6
CAND 3: (ω Lex) (ω Fnc=1) (ω Fnc=2) (ω Lex) Fnc=3 (ω Lex) Fnc=6
CAND 4: (ω Lex) (ω Fnc=1) Fnc=2 (ω Lex) Fnc=3 (ω Lex) Fnc=6
CAND 5: (ω Lex) Fnc=1 Fnc=2 (ω Lex) Fnc=3 (ω Lex) Fnc=6

/INPUT/	ALIGN-R (ω, Fnc≤2)	SP-MAX-X^0	ALIGN-R (ω, Fnc≤3)
CAND 1	*!*		*
CAND 2	*!	*	
➡ CAND 3		**!	
CAND 4		**!*	
CAND 5		**!**	

4.1.2 Problematic grammatical words

We have mentioned in the last section that there are a few grammatical words appear to be exceptional to the generalization which is complied with by most other members within the same class on the grammaticality scale. These exceptions are problematic because they would undermine the assumption that tonal neutralization correlates with the degree of grammaticality, and therefore they need to be fixed. The exceptions can be distinguished between two types, neutralization in low grammaticalized classes, and non-neutralization in highly grammaticalized classes, which are examined in order.

Two cases of neutralization in low grammaticalized classes are spotted in

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Taiwanese. The first case is the frequently used phasal complement *tioh*^{8} 'attached, at, attained.' Phasal complement is argued to be a degree 2 grammatical word in this dissertation, and as such -*tioh*^{8} should have resisted neutralization, in line with the other members within this class (cf. -*ho*^{2}, -*uan*^{5}, -*liau2*, etc. in (10)). Yet, it is attested to be neutral-toned in the final position, as the following examples show.

(16) Neutral-toned *tioh*^{8}

a.	*Gua*^{2}	*u*^{7}	*khuann*^{3}-***tioh***^{0}
	I	PRF.MODAL	look-**PHA**
	'I have seen it.'		
b.	*I*^{1}	*khi*^{3}	*khap*^{4}-***tioh***^{0}
	S/he	go	clash.with-**PHA**
	'He came striking against it.'		

For expository purposes, I assume that the complement -*tioh*^{8} is more grammaticalized than the other phasal complements in Taiwanese, as can be justified in terms of two of Lehmann's (2015) parameters. The first parameter available is "the semantic integrity," which consists of the number and concreteness of semantic features of a word. Reductions in semantic integrity (often involving semantic generalization and semantic bleaching) correlates with higher degree of grammaticalization. In terms of this, -*tioh*^{8} can be understood as more grammaticalized than the complements -*ho*^{2} , -*kau*^{3} and -*tiau*^{7} because it has a relatively more bleached, abstract, meaning 'instant realization of some acquired state,' compared to the meanings 'well/properly done' of -*ho*^{2}, 'arrival/attainment' of -*kau*^{3}, and 'realization of loss' of -*tiau*^{7}. As for the remaining complements -*uan*^{5}, -*suah*^{4}, and -*liau*^{2}, they can be regarded as less grammaticalized than -*tioh*^{8} based on the other parameter "paradigmatic variability," which refers to the freedom with which a speaker can choose a word from a range of options." A reduction

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in paradigmatic variability, that is, having less competitors for conveying the same function, corresponds to a higher degree of grammaticalization. In this sense, *-uan*[5], *-suah*[4], and *-liau*[2] are paradigmatically more variable than *-tioh*[8], because they share the similar meaning 'finishing/completion' and thus competing with each other in the selection.

The discussion so far about *tioh*[8] is only part of the story, however. Things get more complicated when we take into consideration such factors as the presence/absence of the elements expressing negation and/or modality. As shown in the table in (17), we can see that the modal and/or negation elements (i.e. *-u*[7]/*-bo*[5] and *-e*[7]/*-be*[7]) may function as an infix blanked by the verb and the complement in question. What is particularly surprising is that, in this case, *-tioh*[8] remains with its full lexical tone. It can be generalized from these examples that only when the complement *-tioh*[8] is immediately preceded by the verb can it bear a neutral tone.

(17) Full-toned *tioh*[8] with negation and/or modality

a.	*Tshat*[8]*a*[2]	*liah*[8]*-beh*[7]***-tioh***[8]
	Thief	catch-NEG-**PHA**
	'(They) cannot catch the thief.'	
b.	*Gua*[2]	*khuann*[3]*-e*[7]***-tioh***[8]
	I	see-be.able.to-**PHA**
	'I can see.'	

To account for this discrepancy of tonal behavior of *-tioh*[8], I suggest treating the two constructions separately. Specifically, *-tioh*[8] as a complement immediately preceded by the verb has a higher degree of grammaticalization, while in the construction with infixation of modal/negation elements, the complement *-tioh*[8] is relatively lower-grammaticalized, presumably about the same degree of the other phasal complements

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that we have discussed, i.e. degree 2. This treatment is based on another one of Lehmann's parameters — "bondedness," which corresponds to the degree to which a word depends on, or attaches itself to, other words or phrases. Increase in bondedness means less autonomy and thus means a more grammaticalized element. A commonly used criterion for bondedness between elements is the possibility to insert something in between. Under this criterion, the bondedness between the complement *-tioh*^{8} and the main verb in the "V + modal/negation + *-tioh*^{8}" construction is relatively weaker than in the construction with no insertion, which gives rise to the difference in grammaticalization degree and the ensuing discrepancy in tonal neutralization. The partial scale in (18) summarizes the grammaticalization degree of *-tioh*^{8} accordingly.

(18) Grammaticalization degree of *-tioh*^{8}

NUM	**PHA CL** **V+ modal/negation + *-tioh*^{8}**	**DIR PRO** **V + *-tioh*^{8}**
Fnc=1	Fnc=2	Fnc=3
Unneutralized		**Neutralized**

The other case of neutralization in low grammaticalized classes involves the numerals *tsit*^{8} (one) and *nng*^{7} (two), together with the classifiers attached to the end of them in the construction V + *tsit*^{8}/*nng*^{7} + CL. In this case, the numerals do not denote real quantity, but a small amount, and the lexical tones carried by those numerals as well as the ensuing classifiers are neutralized altogether in the final position, as shown in the following examples. This occurrence of neutralization seems bizarre because numerals and classifiers are assumed as degree 1 and degree 2 grammatical words, respectively, which would have their lexical tones intact.

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(19) *tsit*^{8}/*nng*^{7} denoting small quantity

a. *Tsiah*^{8}-***tsit*^{0}-*uann*^{0}**
Eat-one-CL
'To eat few bowls of it'

b. *Lim*^{1}-***nng*^{0}-*pue*^{0}**
Drink-**two-CL**
'To drink a few glasses of it'

This problem can be solved by the same token. That is, the numerals together with the classifiers are deemed relatively more grammaticalized as the meaning has been bleached, no longer referring to the original descriptively specific quantity. On the other hand, the higher degree of grammaticalization is also manifested by the strong bondedness between the numerals in question and the preceding verb, given the fact that *tsit*^{8} and *nng*^{7} in this usage are always attached to the preceding verb. These arguments are cast in the revised scale (20), where numerals and classifiers in the construction V + *tsit*^{8}/*nng*^{7} + CL with unspecific reference are categorized in the degree 3 class.

(20) Grammaticalization degree of *tsit*^{8}/*nng*^{7}

NUM	**PHA** **CL**	**DIR** **PRO** **V + *tsit*^{8}/*nng*^{7} + CL**
Fnc=1	Fnc=2	Fnc=3
Unneutralized		**Neutralized**

Let us turn to the exceptional non-neutralization in highly grammaticalized classes. There is only one case of this type of exception: the possessive marker *e*^{5}. As a subtype of modifier marker, possessive marker generally shares the same phonological status as the marker generally suffixed to other types of modifiers. However, this is not the case for Taiwanese. Although indeed sharing the same segments and citation tone as the

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modifier marker in other usages, the possessive marker e^5 differs crucially in preserving its lexical tone even in the final position, as shown in (21). It is this preservation that strikes a discordant note in comparison with the general modifier marker, which as a degree 5 marker has its lexical tone neutralized.

(21) Adjectival modifier marker vs. possessive marker

a. *Tse¹ si⁷ tsin¹=**e⁰***
This COP real=**MOD**
'This is for real.'

b. *Tse¹ si⁷ gua²=**e⁵***
THIS COP I=**poss**
'This is mine.'

One may assume that this is also a case where seemingly identical grammatical word have different degrees of grammaticalization in different constructions/usages and thus can be settled in the same way that we have operated before. Indeed, the grammaticalization degree of possessive marker may be a little less grammaticalized than the general modifier marker. In terms of the parameter with respect to desemanticization, the general modifier marker denotes nothing, only serving as a plain grammatical connector in a modifying construction, while a possessive marker conveys possession/ownership in addition. Accordingly, we may distinguish between the two types of modifier marker on the scale of grammaticalization degree, with possessive marker at degree 5 and the general version at degree 5.5, as depicted in (22).

(22) Grammaticalization degree of modifier marker vs. possessive marker

DIR PRO	**ASP**	**POSS**	**MOD**	**SFP**
Fnc=3	Fnc=4	Fnc=5 Neutralized	Fnc=5.5	Fnc=6

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This move alone, however, fails to solve the paradox that we are confronted with. This is because the threshold of neutralization is attested to be at degree 3 in Taiwanese, and therefore the assumed degree 5 possessive marker would still be in the range where tonal neutralization occurs.

To get rid of this dilemma, I venture to propose that the non-neutralization of tone in possessive marker is driven by the avoidance of having categories with different degrees of grammaticalization surface as homophonous. This proposal extends the notion of "contrast preservation" in Lubowicz (2003) that it is imperative to preserve the distinction between contrastive elements, to the domain of grammaticalization. That is, with what was originally one category being reanalyzed as two in the course of grammaticalization, distinction would be drawn or maximized between the new, more grammaticalized, category on the one hand, and the old, less grammaticalized, category on the other. Such a distinction can be made by syntactic means, for example, the structural difference between auxiliaries (such as *do*, *have*, etc.) and their lexical source verbs (Hopper & Traugott 2003), or by morphophonological means, for instance, the different lexical tones assigned to the moving verb do^4 and the phasal complement do^3 that is grammaticalized from the verb (M. Chiang 2018). This conception can be cast in OT by adopting the anti-merger constraint family, the systemic faithfulness constraint in Padgett (1997, 2003) and Ito & Mester (2003), which are in turn based on Dispersion Theory developed in Flemming (1995, 2002). The definition of an anti-merger constraint that is relevant to the current problem is given in (23), which is manipulated to refer to specific words or categories, in this case, the two types of modifier markers. The reason why we do not use a more general formulation here is because it is unclear and beyond the scope of this dissertation whether there are other grammatical words/categories characteristic of anti-merger of this sort.

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(23) NOMERGE(MOD/POSS):

Assign one violation mark for every instance of homophonous modifier marker and possessive marker.

With this constraint, we can account for the non-neutralization of possessive marker by ranking the anti-merger constraint above ALIGN-R(ω, Fnc≤2), as illustrated in (24).

(24) NOMERGE(MOD/POSS) ≫ ALIGN-R(ω, Fnc≤2) ≫ SP-MAX-X^0

INPUT:

a. *tsin*^{1}=***e*^{0}**
real=**MOD**
Real

b. *Kau*^{2}=***e*^{5}**
dog=**poss**
'(The) dog's'

CAND 1: a. (ω Lex) (ω Fnc=5.5) b. (ω Lex) (ω Fnc=5)
CAND 2: a. (ω Lex) Fnc=5.5 b. (ω Lex) (ω Fnc=5)
CAND 3: a. (ω Lex) (ω Fnc=5.5) b. (ω Lex) Fnc=5
CAND 4: a. (ω Lex) Fnc=5.5 b. (ω Lex) Fnc=5

/INPUT/	NOMERGE (MOD/POSS)	ALIGN-R (ω, Fnc≤2)	SP-MAX-X^0	ALIGN-R (ω, F≤5)	ALIGN-R (ω, Fnc≤5.5)
CAND 1	*!	**		*	
➡ CAND 2		*	*		
CAND 3		*	*	*!	
CAND 4	*!		**		

4.1.3 The extrametricality of neutral tones

As stated in the outset of this section, besides loss of tonal contrast — which we have discussed in the last subsections — neutral tones in Taiwanese are also characteristic of domain-finality and invisibility to tone sandhi. Both properties are clearly the

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fundamental principles of the universal phenomenon known as *extrametricality*, or alternatively *extraprosodicity* in Hsiao's (1995) terms. In this section I deal with these properties respectively. §4.1.3.1 addresses invisibility, and §4.1.3.2 copes with domain-finality.

4.1.3.1 Invisibility to tone sandhi

As we have introduced in the outset, each of the seven categories of lexical tones in Taiwanese has two variants in tonal alternation: one base tone and one sandhi tone (the paradigm being repeated here). The selection between base forms and sandhi forms is purely positionally-conditioned. Specifically, base tones can only in the final position of some certain domain, while sandhi tones occurs elsewhere. Assuming that base form is underlying, the paradigmatic alternation can be translated into the tone sandhi rule in (26), which has the effect of converting all but the final tone within a tone sandhi domain into their corresponding sandhi tones.

(25) The categories of lexical tone in Taiwanese (=2)

Categories	**Base Tone**			**Sandhi Tone**		
T1	55	***si*^{1}**	'poetry'	33	***si*^{1}*bun*^{2}**	'poetry and prose'
T2	52	***si*^{2}**	'to die'	55	***si*^{2}*lang*^{5}**	'dead people'
T3	21	***si*^{3}**	'four'	52	***si*^{3}*tiam*^{2}**	'four o'clock'
T4	2	***si*^{4}**	'color'	5	***sik*^{4}*tshai*^{2}**	'color'
T5	13	***si*^{5}**	'time'	33	***si*^{5}*kan*^{1}**	'time span'
T7	33	***sik*^{7}**	'temple'	21	***si*^{7}*sing*^{1}**	'temple monk'
T8	5	***sik*^{8}**	'ripe'	2	***sik*^{8}*te*^{5}**	'baked tea'

(26) Tone sandhi rule in Taiwanese (adapted from Chen 1987: 113)

B → S / _ B within a sandhi domain, where B is base tone and S is sandhi tone.

A sandhi domain, in consequence, may consist of a string of sandhi tones followed by

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a single base tone, as illustrated in the following sentence, where tones within the same domain are enclosed in parentheses.

(27) Illustration of tone sandhi rule in (26)

Lau^{7}tsim^{2}po^{5}	*m^{2}=siong^{1}sin^{3}*	*ing^{1}ko^{1}*	*e^{7}=kong^{2}ue^{7}*
Old.woman	NEG=believe	parrot	can=talk
(S S B)	(S S S	S B)	(S S B)

'The old lady does not believe that the parrot can talk.'

As for the way of defining sandhi domains, Chen (1987) in his pioneer work on Amoy demonstrates that the tone sandhi domains are syntactically determined phrase-level constituents. The proposed account is listed in (28).

(28) Sandhi domain formation (adapted from Chen 1987, 1992)

Mark the right edge of every XP with a sandhi domain boundary, except where XP is an adjunct c-commanding ots lexical head.

The second half of the rule addresses the distinct differences in tone sandhi behavior between arguments and adjuncts, which does not concern us here, while the maximal projection condition (i.e. XP) in the first half of the formation rule covers a large range of categories, indicating that the formation rule is not sensitive to categorical distinction, but rather makes reference to categorical hierarchy. This phrase-level constituency corresponds to phonological phrase (ϕ) in the Match theory. Accordingly, tone sandhi in Taiwanese can be translated as the following: all but the final tone within a phonological phrase change into their corresponding sandhi forms. Such a correspondence is shown below, with the very same sentence as in (27). Note in particular that the prosodic structure here allows embedded phrases, as opposed to that

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proposed in Chen, meaning that Nonrecursivity is crucially dominated by SP-MAX-XP.

(29) Embedded phonological phrase matched with syntactic structure

[[*Lau^{7}tsim^{2}po^{5}* NP/DP]	[*m^{2}=siong^{1}sin^{3}*	[[*ing^{1}ko^{1}* NP/DP]	*e^{7}=kong^{2}ue^{7}* VP] CP] CP]
Old.woman	NEG=believe	parrot	can=talk
((S S B ϕ)	(S S S	((S B ϕ)(	S S B ϕ) ϕ)

'The old lady does not believe that the parrot can talk.'

The presence of neutral tones pose a threat, however, to the given formation of tone sandhi domain. The problem comes from the fact that neutral tones, being carried by a grammatical word with degree of grammaticalization lower than or equal to 2, are required to occur at phrase-final positions (we will turn to this finality in the next subsection). Since neutral tones must surface with some pitch through the strategies introduced in §4.1.1, they become exceptional — the only non-based tone in the final position. What is further peculiar is that in this case, the location for the realization of base form shifts to the syllable immediately followed by the neutral-toned syllable. This is illustrated in (30), where N stands for neutral tone.

(30) Invisibility of neutral tone

[*u^{7}*	*khuann^{3}-tioh^{0}* VP]
PRF	see-PHA
(S	B N ϕ)

'(I) have seen it.'

This is clearly a case of extrametricality too[1]. Therefore, following the same rationale

[1] Hsiao (1995) analyse this invisibility of neutral tone in the same vein, terming it extraprosodicity and propounding three fundamental principles: (a) Invisibility: an extraprosodic element is outside of a prosodic system and invisible to phonological rules in the system. (b) Peripherality: an extraprosoddic element must be assigned to a designeted edge, either left or right. (c) Nonuniformity: all the elements

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for the extrametricality in Sixian Hakka (see §3.2.2), we can assume that those invisible function words (Fnc≥2) must be immediately preceded by some right edge of a phonological phrase and they themselves are not included in any instance of phonological phrase. In other words, those indivisible function words are phrase-level extrametrical for not being parsed in a phonological phrase. This idea can be schematized in (31), where " ι) " represents the boundary of intonational phrase. This configuration clearly shows that the function words is outside the domain for tone sandhi and the tone carried by the preceding syllable would be always phrase-finally and thus take on its base form.

(31) Extrametrical to the paradigmatic tone sandhi in Taiwanese

(… σ σ ϕ) Fnc≥2 ι)
S B N

This can also be captured by the alignment constraint we proposed for Sixian Hakka, but this time, it is specific to grammatical words with degree of grammaticalization lower than or equal to 2, and in that way it dictates that the right edge of a given phonological phrase be licensed by the right edge of a word in that degree, (i.e. Fnc≤2), which includes numerals, classifiers, phasal complements as well as lexical words.

immediately dominated by the node α on a prosodic tree must be of uniform level, except an extraprosodic element may be of a lower level. These principles, expecially principle (c), are inspiring to the present analysis.

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(32) ALIGN-R(ϕ, Fnc≤2)

Assign one violation mark for every phonological phrase (ϕ) which is not right-aligned with some word with degree of grammaticalization lower than or equal to 2 (Fnc≤2).

With this alignment constraint ranked above ALIGN-R(ϕ, XP), function words that would carry neutral tone are forced to be located outside any phonological phrase. The following tableau illustrates this desirable results.

(33) ALIGN-R(ϕ, Fnc≤2) ≫ ALIGN-R(ϕ, XP)

INPUT: (=30)

[*u*^{7}	*khuann*^{3}*-tioh*^{0} VP]
PRF	see-PHA
(S	B N ϕ)
'(I) have seen it.'	

CAND 1: a. (S S B ϕ)
CAND 2: a. (S B ϕ) N

/INPUT/	ALIGN-R(ϕ, Fnc≤2)	ALIGN-R(ϕ, XP)
CAND 1	*!	
➡ CAND 2		*

4.1.3.2 Domain-finality

Another crucial property of the neutral tones in Taiwanese that is exceptional in Sinitic languages is that they are confined to the domain-final positions. Consider the examples below, where we can see that only in the final position can a non-prominent function word be neutral-toned.

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(34) Finality of neutral tone

a.

[*khioh*^{8}*-tioh*^{8}	[*tsinn*^{5} $_{NP/DP}$] $_{VP}$]	'To have found money'
Pick-Fnc=3	money	
(S S	B $_{\phi}$)	

b.

[*khioh*^{8}*-tioh*^{8} $_{VP}$]	'To have found'
Pick-Fnc=3	
(B $_{\phi}$) N	

This confinement to final positions is in line with two of the universal restrictions on extrametricality proposed by Hayse (1982). The first, *peripherality*, restricts extrametrical constituents to the edges of a domain; and the other, *edge markedness*, prefers that they occur at the right edge. Under the framework of OT, these restrictions are incorporated into a constraint family, NON-FINALITY, which is presented as a replacement for extrametricality, as formulated in (35).

(35) NON-FINALITY:

Assign one violation mark for every phrase-final syllable that is parsed in a prosodic word.

One may conjecture that this constraint can be responsible for the finality of neutral tone. However, NON-FINALITY is not suitable for this case by nature, because it only aims at the final syllable/word. Empirically, this would make wrong prediction in the case with a sequence of function words phrase-finally, all having potential to be neutral-toned. In the case with sequential function words piled up at the final position are with degree higher than the threshold of neutralization, and they are attested to be neutral-

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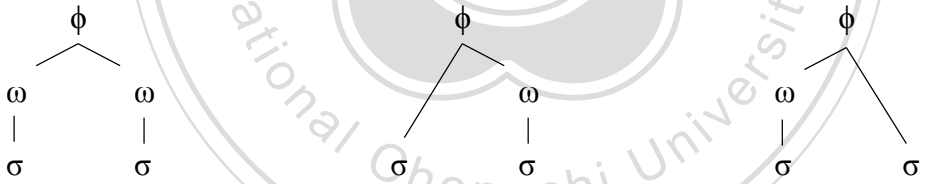
toned altogether. Yet, NON-FINALITY can only ensure neutralization of the last syllable.

Logically, the point we should take into consideration is how to prevent non-prominent function words from losing their lexical tones at non-final positions, rather than trying to produce neutralization at final positions, because given the alignment constraint ALIGN-R(ω, Fnc≤2) in the current proposal, those words are destined for neutralization. In view of this, I propound that a non-prominent function word preserves its tonal contrast in non-final positions for improving on "prosodic coordination," a notion put forward by Myrberg (2010, 2013). That is, phonology prefers sister nodes in the prosodic structure to be the same prosodic category, as shown in (36a); adjunction (unequal sister nodes), for example, adjoining a syllable to the left of a prosodic word (36b) or to the right of a prosodic word (36c), is less preferred.

(36) Prosodic coordination and adjunction

a. Coordination b. Adjunction to the left c. Adjunction to the right



Myrberg propose an anti-adjunction constraint, known as EQUALSISTERS, to capture this structural preference, as defined below.

(37) EQUALSISTERS (or EQUSIS for short):

Assign a violation mark for every pair of sister nodes in the prosodic structure that are not instantiations of the same prosodic category.

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This constraint helps differentiate neutral tones in phrase-internal positions from neutral tones in phrase-final positions. As shown in (38a), with phrase-internal neutral tone, which is derived from function words in the form of free clitics, the neutral-toned syllable is adjoined both to the left (i.e. to the phrase-initial ω) and to the right (to the phrase-final ϕ). In other words, it violates EQUALSISTERS twice. However, if the phrase-internal function words is promoted to the status of an independent ω, in which case it bears a full tone, like (38b), it is only adjoined to the right, while attaining coordination with the sister node to its left, and the violation on EQUALSISTERS is improved: only one violation. On might wonder why the function word does not promotes itself all the way to the status of ϕ so that it can remove all the violations on EQUALSISTERS. I suggest it is because the effect of the licensing constraint introduced in the last subsection, ALIGN-R(ϕ, Fnc≤2), which demands that a phonological phrase be licensed by right-alignment with a prominent function word. Promotion to ϕ would violate this constraint by having the promoted ϕ right-aligned with this non-prominent function word. Therefore, by ranking ALIGN-R(ϕ, Fnc≤2) above EQUALSISTERS, we attain a partial improvement. Last, consider the case where the function word is at phrase-final positions. In this case, according to the discussion in the last subsection, the right edge of ϕ will be moved to the left of the function word by the licensing constraint ALIGN-R(ϕ, Fnc≤2). Consequently, the function word is a free clitic dominated immediately by the intonational phrase and it is left adjoined to a ϕ. There is no pressure for it to promote to the status of ω because promotion by one level does not fix the adjunction. It cannot promote to ϕ either, given the high-ranking ALIGN-L(ϕ, XP).

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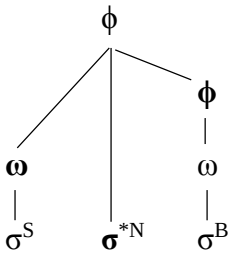
(38) Prosodization of non-prominent function words in final vs. non-final positions

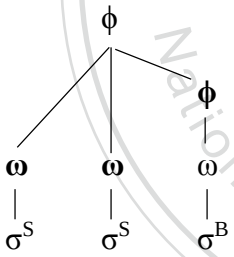
a. Non-final free clitics: unattested phrase-internal neutral tone

[*khioh*^{8}-*tioh*^{8}	[*tsinn*^{5} $_{NP/DP}$] $_{VP}$]	'To have found money'
Pick-Fnc=3	money	
(S *N	(B $_{\phi}$) $_{\phi}$)	



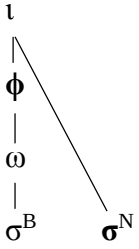
b. Non-final promotion: attested phrase-internal full tone (in the sandhi form)

[*khioh*^{8}-*tioh*^{8}	[*tsinn*^{5} $_{NP/DP}$] $_{VP}$]	'To have found money'
Pick-Fnc=3	money	
(S S	(B $_{\phi}$) $_{\phi}$)	



c. Final free clitic: attested phrase-final neutral tone

[*khioh*^{8}-*tioh*^{8} $_{VP}$]	'To have found'
Pick-Fnc=3	
(B $_{\phi}$) N	



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Accordingly, with the ranking ALIGN-R(ϕ, Fnc≤2) ≫ EQUALSISTERS ≫ ALIGN-R(ω, Fnc≤2), the phrase-internal promotion to ω is attained as the optimal candidate, which is shown in tableau (39).

(39) ALIGN-R(ϕ, Fnc≤2) ≫ EQUALSISTERS ≫ ALIGN-R(ω, Fnc≤2)

a. Non-final promotion: attested phrase-internal full tone (in the sandhi form)

INPUT: (=38a, b)

[*khioh*^{8}-*tioh*^{8} [*tsinn*^{5} $_{NP/DP}$] $_{VP}$] 'To have found money'
Pick-Fnc=3 money
(S S (B $_{\phi}$) $_{\phi}$)

CAND 1: {(S $_{\omega}$) N {(B $_{\omega}$) $_{\phi}$} $_{\phi}$}
CAND 2: {(S $_{\omega}$) (B $_{\omega}$) {(B $_{\omega}$) $_{\phi}$} $_{\phi}$}
CAND 3: {(S $_{\omega}$) {(B $_{\omega}$) $_{\phi}$} {(B $_{\omega}$) $_{\phi}$} $_{\phi}$}

/INPUT/	ALIGN-R (ϕ, Fnc≤2)	EQUSIS	ALIGN-R (ω, Fnc≤2)	ALIGN-R (ϕ, XP)
CAND 1		**!		
➡ CAND 2		*	*	
CAND 3	*!		*	*

a. Final free clitics: attested phrase-final neutral tone

INPUT: (=38c)

[*khioh*^{8}-*tioh*^{8} $_{VP}$] 'To have found'
Pick-Fnc=3
(B $_{\phi}$) N

CAND 1: {(S $_{\omega}$) N $_{\phi}$}
CAND 2: {(S $_{\omega}$) (B $_{\omega}$) $_{\phi}$}
CAND 3: {(S $_{\omega}$) $_{\phi}$} N
CAND 4: {(S $_{\omega}$) $_{\phi}$} (B $_{\omega}$)
CAND 5: {(S $_{\omega}$) $_{\phi}$} {(B $_{\omega}$) $_{\phi}$}

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/INPUT/	ALIGN-R (ϕ, Fnc≤2)	EQUSIS	ALIGN-R (ω, Fnc≤2)	ALIGN-R (ϕ, XP)
CAND 1	*!	*		
CAND 2	*!		*	
➡ CAND 3		*		*
CAND 4		*	*!	*
CAND 5	*!		*	

This analysis is better than the previous ones because it also treats the finality of neutral tone as relevant to invisibility while maintaining the positional restrictions of base tone: it can only appear in final positions of a phrase.

4.2 Tonal neutralization in Standard Mandarin

Standard Mandarin is probably the best studied language in the literature of neutral tones. The threshold of relevant research can be traced back to Y. R. Chao's studies. Two types of neutral tones are distinguished in the literature — inherent neutral tone on the one hand, and non-inherent neutral tone on the other. Inherent neutral tones assume a lexicalized status of neutral tone, while non-inherent neutral tones can be argued as a postlexical process. This section address these two types of neutral tone, as well as their distinction both theoretically and empirically. Introduction and distribution of these two types of neutral tone are given in the first section (§ 4.2.1). §4.2.2 offers an analysis of the asymmetry between the two types of neutral tones, under the framework of stratal OT.

4.2.1 Distribution of the two types of neutral tones

Standard Mandarin has the famous four-toned system, including T1, a high level, T2, a rising, T3, a dipping or low falling, and T4, a falling, as detailed in (40).

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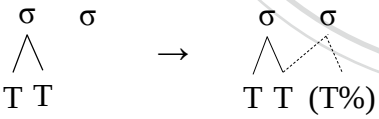
(40) Distinct lexical tones in Standard Mandarin

Category	**T1**	**T2**	**T3**	**T4**
Value	55	35	21~214	51

As is well-known, there are a large number of grammatical words characteristic of carrying none of those four lexical tones, even in citation. Instead, these words have a so-called *inherent* neutral tone, which is firmly established and usually deemed the base form or citation form. That is, syllables carrying an inherent neutral tone have already lexicalized the status of being neutral-toned, and therefore this type of neutral tones is usually prescriptively marked in the dictionaries.

Inherent neutral tones can be analyzed as underlyingly toneless. They are fleshed out in the surface form with the pitch contour either spreading from the preceding full tone, derived from the interpolation between the preceding lexical tone and a boundary tone, or acquired from an unmarked target, which is a mid-low in Standard Mandarin. This can be schematized in (41).

(41) Inherent Neutral tone: underlying toneless



Function words bearing an inherent neutral tone normally belong to the following categories; (42) gives some example sentences where inherent neutral tones occur. The superscripted 0 denotes the realization of neutral tone.

(43) Function words with inherent neutral tone in Standard Mandarin

a. Sentence-final particles

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le^{0}	Realization of state, currently relevant state
de^{0}	Assertion
a^{0}	Smooth-alert, adhortative
ma^{0}	Interrogative, used in yes or no questions
ba^{0}	Imperative, used for confirmation
ne^{0}	Continued state
ne^{0}	Follow-up question
ne^{0}	Exaggeration
la^{0}	Smooth-alert, adhortative
ya^{0}	Smooth-alert, adhortative
ma^{0}	Smooth-alert, adhortative

b. Modifier marker

de^{0}	(Adjectival) modifier marker, possessive marker

c. Aspect markers

le^{0}	Perfective marker
zhe^{0}	Continuous marker
guo^{0}	Experiential perfect marker

(44) Inherent neutral tones carried by sentence-final particles in connected speech

a. *Ni*^{3} *jin*^{1}*tian*^{1} *hao*^{3}=***ma***^{0}
You today fine=SFP
'How's today?'

b. *Tai*^{4}=*duo*^{1} *ren*^{2}=***le***^{0}=***a***^{0}
Too=many person=**SFP=SFP**
'There are too many people, you know?'

c. *Shui*^{4}*zhao*^{2}=***le***^{0}=***ne***^{0}
fall.asleep=**SFP=SFP**
'Look, he has fell asleep'

(45) Inherent neutral tones carried by modifier markers in connected speech

a. *Wu*^{3}-***de***^{0} *shu*^{1} *bu*^{4}*jian*^{4}=*le*
I-**MOD** book lost=SFP
'My books are lost.'

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b. *Shi*^{2} *sin*^{1}=***de***^{0}=*o*^{0}
COP new-**MOD**=SFP
'It is new, you know that?'

c. *Na*^{5} *zo*^{2}*tian*^{1} *mai*^{3}*-lai*^{2}=***de***^{0} *na*^{4}=*jian*^{4}
Take yesterday buy-DIR=**MOD** that=CL
'Go get the one I bought yesterday.'

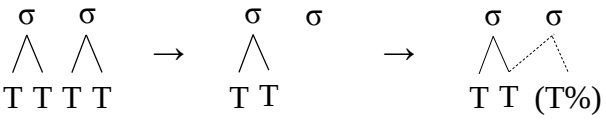
(46)Inherent neutral tones carried by aspect markers in connected speech

a. *Zeng*^{4} *chi*^{1}*-****zhe***^{0} *fan*^{4}=*ne*^{0}
Right.away eat-**ASP** meal-SFP
'He's in the middle of dinner.'

b. *Zuo*^{4}*-****le***^{0} *yi*^{1}=*dao*^{4} *cai*^{4}
Make-ASP one-CL dish
'I have cooked a dish.'

Neutral tones can also be non-inherent in Standard Mandarin, espexically in mainland Standard Mandarin, the variety spoken in mainland China[2]. A non-inherent tone, by definition, refers to derived tonelessness. That is, words surfacing with a non-inherent neutral tone in the connected speech have a distinct lexical tone in citation. This can be depicted in (47).

(47) Non-inherent neutral tone: derived tonelessness



Function words bearing a non-inherent neutral tone normally belong to two categories:

[2] Non-inherent neutral tone is not prevailing or even does not exist in Taiwan Mandarin, the variety of Standard Mandarin spoken in Taiwan.

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directional complements and object pronoun. (48) illustrates their original lexical tones with the citation form. These contrastive full tones are lost altogether in the connected speech, as shown in (49-50). Again, the superscripted 0 denotes the realization of neutral tone.

(48) Some types of function words

a. Directional complements

lai^{2}	'towards the speaker'
qu^{4}	'away from the speaker'
xia^{4}	'downward'
chu^{1}	'outward'
jin^{4}	'inward'
qi^{3}	'upward'
hui^{2}	'back to'

b. Object pronouns

wo^{3}	'me'
ni^{3}	'you'
ta^{1}	'him/her/it'

(49) Neutralization of directional complements

a. *Ta*^{1} *gang*^{1}*gang*^{1} *cong*^{2} *tai*^{2}*bei*^{3} *guo*^{4}-***lai*^{0}**
S/he just.now from Taipei pass-**DIR**
'S/he has just come over from Taipei.'

b. *Ta*^{1} *bei*^{4} *jing*^{3}*cha*^{2} *zhua*^{1}-***qu*^{0}**-*le*^{0}
S/he PASS the.police arrest-**DIR**-SFP
'S/he was arrested by the police.'

c. *Ba*^{3}=*hua*^{4} *shuo*^{1}-***xia*^{0}**-***qu*^{0}**
OM=words say-**DIR-DIR**
'Go on (saying it).'

d. *Kan*^{4}-***qi*^{0}**-***lai*^{0}** *hen*^{3}=*bu*^{2}*cuo*^{4}
Look-**DIR-DIR** very.nice
'It looks so nice.'

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(50) Neutralization of object pronouns

a. *Bu²yao⁴ da³=**ta⁰***
Do.not beat=him
'Don't beat him.'

b. *hen³ kai¹xin¹ ren⁴-shi⁴=**ni⁰***
Very happy know=**you.ACC**
'Nice to meet you.'

The remaining categories of grammatical words (i.e. classifiers, phasal complements, and numerals) are prominent function words, meaning that in no circumstance do they bear either a inherent neutral tone or non-inherent neutral tone. This is shown by the forms in citation (51) and the forms in connected speech (52-54).

(51) Some types of function words in citation forms

a. Phasal complements

wan²	'finished, done for'
hao³	'properly done, well set'
dao⁴	'at, to, attached, acquired, '
diao⁴	realization of lost

b. Classifiers

ben³	for books
ban¹	for a flight, train or bus at a particular time
liang⁴	for vehicle
kuai⁴	for a clump or blob of thing that usually has some weight
tiao²	for long, soft piece of thing; for songs
duo³	for flowers
jian⁴	for clothes

c. Numerals

yi¹	'one'
er⁴/liang³	'two'
san¹	'three'
si⁴	'four'
wu³	'five'
liu⁴	'six'

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qi^{1}	'seven'
ba^{1}	'eight'
jiu^{3}	'nine'
shi^{2}	'ten'
bai^{3}	'hundred'
qian^{1}	'thousand'
wan^{4}	'ten thousand'

(52) No neutralization for phasal complements

a. *Chi*^{1}***-wan***^{2} *fan*^{6} *zai*^{4} *shuo*^{1}*=ba*^{0}
Eat-**PHA** meal not.until to.discuss=SFP
'(I will) have dinner first and then sort it out.'

b. *Ni*^{3} *xia*^{4}***-dao***^{4}*-le*^{0}*=ta*^{0}
You scare-**PHA**-ASP=him/her
'You scared him/her.'

c. *Ta*^{1} *mai*^{3}***-hao***^{3}*-le*^{0} *dong*^{1}*xi*^{0}
S/he buy-**PHA**-ASP thing
'He's done the shopping.'

(53) No neutralization for classifiers

a. *Zhao*^{3} *na*^{4}***=wui***^{3} *xiao*^{3}*jie*^{3}
Look.for that=**CL** young.lady
'I want to see that young lady.'

b. *Ta*^{1} *nong*^{4}*diu*^{1}*-le*^{0} *liang*^{3}***=ba***^{3} *san*^{3}
S/he get.lost-ASP two=**CL** umbrella
'S/he has lost two umbrellas.'

c. *Mai*^{3}*-le*^{0} *hao*^{3}*ji*^{3}***=tiao***^{2} *yu*^{2}
Buy-ASP several=**CL** fish
'I bought several fish.'

(54) No neutralization for numerals

a. ***Yi***^{1}*=dui*^{4} *zu*^{2}*qiu*^{2}*dui*^{4} *you*^{3}***=shi***^{2}***-yi***^{1}*=wui*^{4} *dui*^{4}*yuan*^{2}
One-massifier football.team there.be=**ten**-**one**=CL member
'A football team consisits of eleven members.'

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b. *Zhuo[1]shang[4]* *zhi[3]you[3]=**san**[1]=ping[2]* *jiu[3]*
Table.on there.be.only=**three**=CL beer
'There are only three bottles of beer on the table.'

Put aside the underlying vs. derived distinction between inherent and non-inherent neutral tones, it seems that standard Mandarin is a parallel case to that of Taiwanese — the threshold of tonal neutralization is set at the category with degree of grammaticalization equal to 3, as shown in (55).

(55) General distribution of tonal neutralization

NUM	PHA CL	DIR PRO	ASP	MOD	SFP
Fnc=1	Fnc=2	Fnc=3	Fnc=4	Fnc=5	Fnc=6
Unneutralized		**Neutralized**			

One may jump into conclusion that such a scenario suggests ranking ALIGN-R(ω, Fnc≤2) above SP-MAX-X^0. This analysis, however, does not capture the picture of Standard Mandarin. As I shall argue next, the analysis of the grammatical words in Standard Mandarin would not be complete if we do not take into consideration the distinction between the two types of neutral tones.

4.2.2 Neutralization at lexical vs. postlexical levels

The fact that inherent can be distinguished from non-inherent neutral tones by the notion of underlying tonelessness in mainland Standard Mandarin is reminiscent of the lexical vs. postlexical distinction. This distinction plays an important role in generative phonology, where (morpho)phonological rules are postulated to apply at multiple stages — lexical phonological rules are confined to lexicon and are thus confined to morphemes and single words, sensitive to sublexical structure, while postlexical rules, referred to as phrasal rules as well, operate across word boundaries and have access to

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phrasal or syntactic structure. The difference in their domains of application implies that lexical rules must apply prior to postlexical rules and that there are distinct characteristics attributed to these two types of phonological rules, as shown in the following table (Kiparsky 1985).

(56) Properties of lexical vs. postlexical rules

	Lexical Rules	Postlexical Rules
a.	Word-bounded	Not word-bounded
b.	Access to word-internal structure assigned at the same level	Access to phrase structures only
c.	Cyclic	Non-cyclic
d.	Apply in derived environments	Apply across the board
e.	Structure-preserving	Not (necessarily) structure-preserving
f.	Apply to lexical categories only	Apply to all categories
g.	may have exceptions	Automatic
h.	Semi-productive	Fully productive
i.	Categorical output	May have gradient output
j.	Obligatory	Optional and may be sensitive to rhythmic factors such as rate, register and pause

While the reliability of these properties has been challenged by many attested applications that share characteristics of both lexical and postlexical types of rules, as a diagnostics they can still help us accounts for the two types of tonal neutralization in question, especially the properties (56g), (56i) and (56j). Based on Chao's (1968) description, as well as my own observation, the occurrence of inherent neutral tones are obligatory, produce categorical outputs, and have exceptions — all being properties of lexical rules. By contrast, in mainland Standard Mandarin neutralization of the non-inherent type is optional, has gradient output, and automatically applies — all characteristic of postlexical rules. Note that the obligatoriness vs. optionality distinction is applicable only in some varieties, such as Taiwan Mandarin, a prevalent variety of Standard Mandarin spoken in Taiwan. According to authoritative teaching materials

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and reference books published in Taiwan, degree 3 grammatical words (i.e. directional complements and object pronouns) are described to be optionally neutral-toned, and even if they are neutralized, the extent of the neutralization is also reported to be incomplete and/or variable.

We can also address the lexical vs. postlexical distinction with the aid of the famous T3 Sandhi. Details aside, this rule can be simply stated as follows: T3 changes into T2 before another T3, as formulated in (57).

(57) T3 Sandhi in Standard Mandarin

T3 → T2 / _ T3

It is widely argued that this rule is both lexical and postlexical, since it applies and is sensitive to both word-internal/morphological and phrasal/syntactic structure (Shih 1986). As illustrated in (58),in the compounding word *shui*^{3}*guo*^{3} 'fruit,' the first member of the compound *shui*^{3} becomes T2 for being followed by the second member, *guo*^{3}, which is also a T3 morpheme, and this morpheme itself in turn changes into T2 due to the following T3 adjective *hao*^{3} 'good,' which is another word serving as the predicate/comment of the compound. This case shows not only that T3 Sandhi applies both within and across words, but that the application in lexical domain is prior to the application in postlexical domain.

(59) Lexical/Postlexical application of T3 Sandhi

	[*Shui*^{3}*guo*^{3} $_{N}$]	[hao^{3} $_{A}$]	'Fruit is good.'
	Fruit	good	
Lexical domain	(**T2** T3)		
Postlexical domain	(**T2** T3)		

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Let us turn back to the neutral tones. There is an asymmetry between inherent and non-inherent neutral tones with regards to the tone sandhi rule: T3 sandhi applies before a non-inherent neutral tone that is originally T3, but fails to do so before an inherent neutral tone grammaticalized from a T3 verb, namely *liao*^{3} 'to end.'

(60) Interaction between T3 Sandhi and neutral tones

a. Inherent neutral tones:

[*Da*^{3}=*le*^{0} $_{VP}$]	[ta^{1} $_{D}$]	'have hit him/her'
To.hit=PFV	him/her	
(T3 T0)		

b. Non-inherent neutral tones

[*Da*^{3}=*wo*^{3} $_{VP}$]	'to hit me'
To.hit=ME	
(**T2** T0)	

The non-application of T3 Sandhi before inherent neutral tones suggests that T3 Sandhi applies after the neutralization, meaning that inherent neutral tones come into being at the stage earlier than lexical T3 Sandhi. Here I assume that the occurrence of inherent neutral tone is in the domain of stem level, while the lexical T3 Sandhi is a word-level application. Accordingly, the processing of non-inherent neutral tone must be postlexical. This is illustrated in (61).

(61) Rule application in different morphosyntactic domains

	Inherent Neutral tone	T3 Sandhi	Non-inherent neutral tone
Stem-level	✓		
Word-level		✓	
Phrase-level		✓	✓

To summarize, inherent neutral tones, a stem-level application which is obligatory, and

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categorical, occurs in highly grammaticalized words (i.e. sentence-final particles, modifier markers and aspect markers), while non-inherent neutral tones, a phrase-level application which may be optional and/or gradient, occurs in medium grammaticalized words (i.e. object pronouns and directional complements). This is schematized in (62).

(62)

NUM	**PHA/CL**	**DIR/PRO**	**ASP**	**MOD**	**SFP**
Fnc=1	Fnc=2	Fnc=3	Fnc=4	Fnc=5	Fnc=6
Unneutralized		**Non-inherent Neutral Tones** *(Phrase-level)*	**Inherent Neutral tones** *(Stem-level)*		

This derivational analysis can be recast under the framework of stratal OT that assumes a classical modular feedforward architecture of grammar (Bermúdez-Otero 2012, 2015). The model consists of multiple grammars referring to stem-, word- and phrase-level, each may involve different constraint ranking that evaluates in a parallel way as the classic version of OT, yet the grammars are feedforward: the output of stem-level grammar serves as the input of word-level grammar, and the output of word-level grammar feeds the input of phrase-level grammar. Adopting this model, I assume different rankings wih respect to ALIGN-R(ω, Fnc≤2) and SP-MAX-X^0 for stem- and word-level grammar. Specifically, in stem-level grammar, ALIGN-R(ω, Fnc≤2) ranks below SP-MAX-X^0, hence no inherent neutralization for degree 3 grammatical words. In phrase level, on the other hand, the ranking of ALIGN-R(ω, Fnc≤2) with respect to SP-MAX-X^0 is variable, and thus there is postlexical, optional, non-inherent neutralization for degree 3 grammatical words. By contrast, ALIGN-R(ω, Fnc≤3) outranks SP-MAX-X^0 at every stage of grammar, which leads to inherent neutralization for highly grammaticalized function words. This analysis is shown in (63) and (64).

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(63) Stem-level grammar

Constraint ranking: ALIGN-R(ω, Fnc≤3) ≫ SP-MAX-X^0 ≫ ALIGN-R(ω, Fnc≤2)

Input: (=60a)

[*Da*^{3}=*le*^{0} VP]	[ta^1 D]
To.hit=PFV	him/her
'Have hit him/her'	

CAND 1: ($_\omega$ Lex) ($_\omega$ Fnc=4) ($_\omega$ Fnc=3)
CAND 2: ($_\omega$ Lex) Fnc=4 ($_\omega$ Fnc=3)
CAND 3: ($_\omega$ Lex) Fnc=4 Fnc=3

/INPUT/	ALIGN-R (ω, Fnc≤3)	SP-MAX-X^0	ALIGN-R (ω, Fnc≤2)
CAND 1	*!		*
➡ CAND 2		*	*
CAND 3		**!	

(64) (One possible) Phrase-level grammar

Constraint ranking: ALIGN-R(ω, Fnc≤3) ≫ SP-MAX-X^0 ≫ ALIGN-R(ω, Fnc≤2)

INPUT: (=60a)

[*Da*^{3}=*le*^{0} VP]	[ta^1 D]
To.hit=PFV	him/her
'Have hit him/her'	

CAND 1: ($_\omega$ Lex) ($_\omega$ Fnc=4) ($_\omega$ Fnc=3)
CAND 2: ($_\omega$ Lex) Fnc=4 ($_\omega$ Fnc=3)
CAND 3: ($_\omega$ Lex) Fnc=4 Fnc=3

/INPUT/	ALIGN-R (ω, Fnc≤3)	ALIGN-R (ω, Fnc≤2)	SP-MAX-X^0
CAND 1	*!	*	
CAND 2		*!	*
➡ CAND 3			**!

4.3 Summary

This chapter addresses grammaticalized function words in Taiwanese and Standard Mandarin. Both languages contain a large range of non-prominent function words in

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tonal neutralization, with the threshold set on categories with degree of grammaticalization equal to 3, hence the constraint ranking ALIGN-R(ω, Fnc≤2) ≫ SP-MAX-X^0. In Taiwanese, non-prominent words undergo tonal neutralization and prosodic invisibility only at phrase-final positions. This is because of the interaction between EQUALSISTERS, ALIGN-R(ω, Fnc≤2) and ALIGN-R(ϕ, Fnc≤2). In Standard Mandarin, non-prominent function words can be further divided into two groups according to the presence/absence of optionality for tonal neutralization — relatively lower grammaticalized function words optionally bears neutral tone, while higher grammaticalized ones always appear with neutral tone. This division is parallel to the point in tone they are grammaticalized.

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5. Grammaticalized Function Words in Shanghainese

5.0 Introduction

Wu Chinese is probably the richest in neutral tones of all the major families of Sinitic languages. In a large majority of languages in Wu Chinese, especially in the Northern branch, underlying tonal contrast is *maximally* neutralized in the sense that the application is across categories. On the one hand, tonal neutralization applying in the functional categories tend to be irrespective of the distinction between classes with different degrees of grammaticalization. Even low grammaticalized function words that are prosodically prominent in other Sinitic families are normally neutralized in Wu Chinese. On the other hand, neutralization of tonal contrast occurs in lexical categories as normal as in functional categories. A vast majority of Northern Wu languages have general rules of tone sandhi that replace the full lexical tones carried by non-initial syllables in a lexical word with the pitch contour either by spreading from the initial syllable or by epenthesis of some unmarked pitch target. In consequence, tonal neutralization in Wu Chinese involves conflation between not only distinct classes on the grammaticalization scale, but also the functional categories and lexical categories. A representative example of this dual conflation that I address in this chapter is Shanghainese, where only numerals denoting specific quantity preserve their distinct lexical tones, and the preservation is confined to the initial syllable as it is in the lexical words.

Besides tonal neutralization, Shanghainese also instantiates the invisibility of the

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high grammaticalized function words. Only modifier markers and sentence-final particles are invisible to the normal application of spreading from the preceding tone. This phenomenon of extrametricality, as it were, serves to distinguish between classes with high degree of grammaticalization and classes with non-high degree of grammaticalization. Table (1) summarize the two types of tonal attrition in Shanghainese.

(1) Tonal attrition of functional categories in Shanghainese

NUM	PHA/CL	DIR/PRO	ASP	MOD	SFP
Unneutralized	Neutralized				
Visible				Invisible	

Discussions of the remaining sections mainly concerns the two types of tonal attrition in Shanghainese, including tonal neutralization (§5.1) and the prosodic invisibility to melody redistribution (§5.2). The conclusion follows in §5.3. The data in each section is primarily from my own observation, personal communication and consultation with informants. Part of data are adapted from online disctionaries and previous studies (e.g. Qian 1997, T.-C Huang 2015).

5.1 Tonal attrition in Shanghainese

Shanghainese is perhaps the most recognized dialect of Northern Wu Chinese. As stated in the outset, grammatical words in this language are characteristic of both maximal neutralization and invisibility. This section examines the first one, with a general introduction to tonal neutralization of grammatical words first (§5.1.1), followed by the discussion of the distinction between neutralization in lexical and functional categories (§5.1.2).

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5.1.1 Tonal neutralization of grammatical words

Shanghainese has five citation tones, three of which being long while the other two being short, or checked. Like many other Sinitic languages, long tones and short tones are in complementary distribution conditioned by the type of syllables that bear the tone, and therefore they can be treated as allophonic variants. However, as our discussion in the following subsections focuses on the long tones, the distinction between long tones and short tones would be maintained for the sake of clarity. Table (2) shows the five lexical tones in Shanghainese, including T1, a fall, T2, a small rise, T3, a big rise, T4, a short high, and T5, a short low rising. Note particularly that the long tones are all contour tones.

(2) Citation tones in Shanghainese

Categories	**T1**	**T2**	**T3**	**T4**	**T5**
Long	52	34	13		
Checked				5	12

The marking of citation tone for grammatical words in Shanghainese is an issue of mess. Some treat part of the grammatical words as having a fixed citation tone as lexical words do, while others leaving unspecified the function words in most of the classes. My conjecture is that most of the function words in Shanghainese underlyingly carry a pitch contour lexicalized from a variety of sources that we have addressed in the cases of Cantonese and Hakka, such as default unmarked form (i.e. a checked tone), boundary tones, and intonation. Later on, this lexicalized pitch contour is attributed by the speakers to one of the five tonal categories with which it shares the most perceptual similarities, and yet this categorization is far from stable. Accordingly, I assume that most of the function words in Shanghainese do carry one of the five full tones in citation, as illustrated in (3b-g). However, sentence-final particles, especially those that Paul

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(2014) argues are situated in Attitude C, could be underlying toneless, given their more variable pitch realization than that of the other grammatical words. This status is shown in (3a) by marking these particles as T0 in citation.

(3) Prescriptively marked tones of function words in Shanghainese

a. Sentence-final particles in Attitude C

a^{0}	Smooth-alert, adhortative
ya^{0}	Smooth-alert, adhortative
o^{0}	Smooth-alert, adhortative
le^{0}	Smooth-alert, assertion
la^{0}	Follow-up question, with adhortative touch
noa^{0}	Smooth-alert, warning

b. Sentence-final particles outside Attitude C

leh^{5}	Realization of state
geh^{5}	Neutral assertion of relevance
va^{3}	Used in yes or no questions

c. Modifier marker

geh^{5}	(Adjectival) modifier marker, possessive marker

d. Aspect markers

leh^{5}*he*^{0}	Continuous marker
leh^{5}	Perfective marker
ku^{2}	Experiential perfect marker

c. Directional complements

le^{3}	‘towards the speaker’
qi^{2}	‘away from the speaker’
zang^{3}	‘upward’
gho^{3}	‘downward’
loh^{5}	‘downward’
ceh^{1}	‘outward’
jing^{2}	‘inward’
qi^{2}	‘upward’
ghue^{3}	‘back to’

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d. Object pronouns

ngu[3]	'me'
nong[3]	'you'
ghi[3]	'him/her/it'

e. Phase Markers

kuang[1]	'finished, done for'
hoa[2]	'properly done, well set'
theh[4]	'realization of lost or eroded'
toa[2]	'at, to, arrived'

f. Classifiers

geh[5]	generic classifier
po[2]	for something long and has a hilt or handle
pe[1]	for a flight, train or bus at a particular time; for a group of people
bu[3]	for vehicle
khue[2]	for a clump or blob of thing that usually has some weight
dioa[3]	for long piece of thing

g. Numerals

yieh[4]	'one'
nyi[3]*/liang*[3]	'two'
se[1]	'three'
sy[2]	'four'
ng[3]	'five'
loh[5]	'six'
qieh[4]	'seven'
pah[4]	'eight'
jieu[2]	'nine'
zeh[5]	'ten'
pah[4]	'hundred'
qi[1]	'thousand'
ve[3]	'ten thousand'

In connected speech, all classes of grammatical words — with numerals as the only exception — surface with no tonal contrast. This is shown in the examples (4-11), where the neutral-toned syllable is marked with a superscripted 0. Details of the phonetic manifestation of the neutral tones are addressed in the next subsection.

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(4) Neutralization in sentence-final particles

a. *Geh^{5}=tsah^{0}* *ng^{3}* *ghe^{3}=zy^{0}* *sang^{1}=**geh^{0}***
This=CL fish still=COP raw=**MOD**
'The fish remains undercooked.'

b. *Mo^{3}ve^{0}=nong^{3}* *nyang^{3}nyang^{0}-**a^{0}***
Bother=you.ACC make.way-**SFP**
'Excuse me, please make way.'

c. *Nong^{3}* *jing^{1}tsoa^{0}* *hoa^{2}=**va^{0}***
You today fine=**SFP**
'How is your day?'

(5) Neutralization in modifier markers

a. *Ngu^{3}* *yoa^{2}* *ghong^{3}nge^{0}seh^{0}=**geh^{0}***
I want red.color=**MOD**
'I would like the red one.'

b. *Zhia^{3}zhia^{0}* *nong^{3}=**geh^{0}*** *kue^{1}-xing^{0}*
Thank you=**MOD** concern
'Thanks for asking.'

c. *Geh^{5}geh^{0}* *zy^{3}* *ghi^{3}* *ting^{2}* *huoe^{1}xi^{0}=**geh^{0}*** *yi^{1}zang^{0}*
This COP s/he most like=**MOD** dress
'That is his/her favorite dress.'

(6) Neutralization in aspect markers

a. *geh^{5}=dji^{0}* *yi^{1}zang^{0}* *tsah^{4}-**lah^{0}he^{0}***, *tse^{2}* *veh^{5}=we^{0}* *sang^{1}fong^{0}*
This=CL clothes put.on-**CONT**, just NEG=will to.catch.a.cold
'Put the clothes on, so you will not catch a cold.'

b. *Qieh^{4}-**tsy^{0}*** *ve^{3}*, *nong^{3}* *zhieu^{3}* *qi^{2}* *doh^{5}sy^{0}*
Eat=**PFV** meal, you then to.proceed studying
'You should study once you finish your dinner.'

c. *Geh^{5}=peng^{0}* *sy^{1}* *ngu^{3}* *koe^{2}-**ku^{0}*** *hoa^{2}ji^{0}-thang^{0}*
This=**CL** book I read-**EXP** several-times
'I have read the book several times.'

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(7) Neutralization in directional complements

a. *Geh^{5}=tsang^{0}* *de^{3}tsy^{0}* *poe^{1}-**jing^{0}**-**qi^{0}***
This=CL table carry-**DIR-DIR**
'Carry this table inside.'

b. *Phioa^{1}tsy^{0}* *ma^{3}-**qi^{0}**-**le^{0}**=o^{0}*
S/he-couple beat-**DIR-DIR**=SFP
'Please pay for the ticket.'

(8) Neutralization in object pronouns

a. *Ngu^{3}* *tseng^{1}.gha^{0}* *veh^{5}=yoa^{0}* *ce^{2}=**ghi^{0}**=geh^{0}*
I just NEG=want take.notice.of=**him/her**=SFP
'I'm just not going to take any notice of him/her.'

b. *Ngu^{3}* *tseng^{1}.geh^{0}* *loa^{3}* *xiang^{2}=**nong^{0}**=geh^{0}*
I really very miss=**you.ACC**=SFP
'I really miss you.'

(9) Neutralization in phasal complements

a. *Nong^{3}* *khua^{2}ti^{0}* *ne^{1}=ghi^{0}* *tsu^{2}-**theh^{0}***
You hurry.up OM-him kill-**PHA**
'Kill him right away.'

b. *Khua^{2}ti^{0}* *ne^{1}=nong=geh^{0}* *gong^{1}khu^{0}* *xia^{2}-**hoa^{0}**=le^{0}*
hurry.up OM=you=MOD homework write-**PHA**-SFP
'Finish your homework right away.'

c. *Coa^{2}ku^{2}* *ze^{3}-**zah^{0}**=ti^{0}* *xioa^{2}ce^{0}-dong^{3}di^{0}*
Speculate.in.stocks earn-**PHA**=little appetizer.money
'He made a little money in the stock market.'

(10) Neutralization in classifiers

a. *Geh^{5}=**bu^{0}*** *qi^{1}co^{0}=geh^{0}* *ying^{1}djing^{0}* *zy^{3}=jing^{2}kheu^{0}=ge^{4}*
This=**CL** car=MOD engine COP=imported=SFP
'The engine of this car was imported.'

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b. *Yieh^{4}=**khue**^{0}* *de^{3}koa^{0}* *yoa^{2}* *tu^{1}soa^{0}* *dong^{3}di^{0}=ne^{0}*
One=**CL** cake need how.much money=SFP
'How much does a cake cost?'

(11) No neutralization for Neumerals

a. *Qieh^{4}-tsy^{0}* ***ng^{3}**=pe^{0}* *jieu^{2}* *tse^{2}* *qi^{2}* *zang^{3}pe^{0}*
Have-ASP **five**=CL beer not.until go to.work
'(I) had five glasses of beer before going to work.'

b. *Geh^{5}=tsah^{0}* *ghah^{5}deu^{0}-li^{3}xiang^{0}* *yeu^{3}teh^{0}* ***se^{1}**=tsah^{0}* *keu^{2}*
This=CL box.inside have **three**=CL dog
'There are three dogs in the box.'

To sum up, in Shanghainese function words in the vast majority of grammatical categories have their distinct tones neutralized, except numerals, the only type of function words that is prosodically prominent enough to preserve the contrast. Given the grammaticalization scale established in Chapter 2 (as repeated in (12), where the number denotes the degree of grammaticalization, in the sense that the greater the number, the more grammaticalized the category), the prominence asymmetry between numerals and the other classes of grammatical words in Shanghainese can be translated as the distinction between the least grammaticalized function words (i.e. Fnc≤1) and the function words that are relatively higher grammaticalized (i.e. Fnc>1). In other words, the distinction between the categories with grammaticalization degree higher than 1 are all conflated. That is, with respect to tonal neutralization, there is no distinction between degree 2 and degree 3, or between degree 3 and degree 4, and the like, as depicted in (13). The picture forms a mirror image of the case in Cantonese and Miaoli Sixian Hakka.

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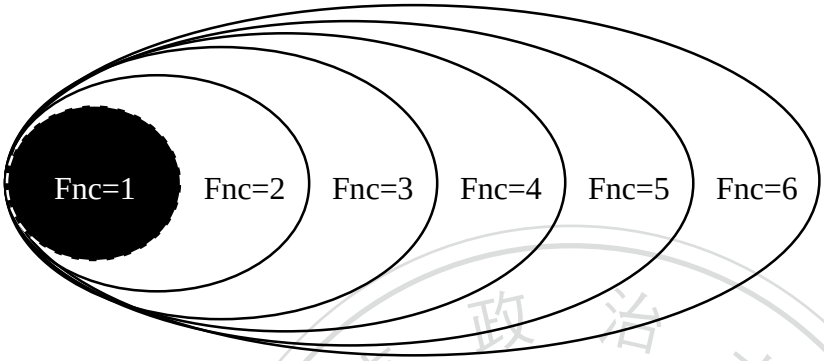
(12) Grammaticalization scale

NUM	PHACL	DIROP	ASP	MOD	SFP
1	2	3	4	5	6

(13) Conflation of Fnc>1



The neutralization vs. non-neutralization distinction between grammaticalization degrees 1 and 2 can be captured in the currently proposed framework by ranking ALIGN-R(ω, Fnc≤1) above SP-MAX-X^0, definition of these constraints being given below.

(14) ALIGN-R(ω, Fnc≤1):

Assign one violation mark for every prosodic word (ω) that is not right-aligned with a syntactic word with grammaticalization degree lower than or equal to 1 (i.e. numerals and lexical words).

(15) SP-MAX-X^0

Assign one violation mark for every syntactic word (X^0) in the input syntactic representation S that does not have a corresponding prosodic word (ω) in the output phonological representation.

This version of alignment constraint in (14) is highly stringent in that it allows an

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extremely small subset of word types (i.e. numerals and lexical words only) to license prosodic words at its right edge. When this constraint outranks SP-MAX-X^0, which requires that every syntactic word have a corresponding prosodic word, a wide range of types of function words fails to fall under the scope of the prosodic word status. The tableau in (16) gives an illustration, where various prosodizations of function words in categories with different degrees of grammaticalization are evaluated. Prosodizations from CAND 1 through CAND 5 contain a variant amount of instantiation of Fnc>1 right-aligned with ω, and thus they fatally violate the high-ranked ALIGN-R(ω, Fnc≤1) at least once. The violation(s) on ALIGN-R(ω, Fnc≤1) is removed in the remaining two candidates: CAND 6 parses lexical words and numerals in ω, and CAND 7 parses lexical words only. The latter loses to the former as desired because leaving numerals unparsed would incur excess violation on SP-MAX-X^0. This constraint ranking successfully ensures that only numerals, the lowest grammaticalized type of function words, are eligible for the status of ω, where they can be accented at syllabic level and thus are as qualified as lexical words in the capability of preserving the tonal contrast.

(16) ALIGN-R(ω, Fnc≤1) ≫ SP-MAX-X^0

INPUT:

Meng^3=nong^0	*jia^2=geh^0*	*se^1-peng^0*	*sy^1*	*khoe^2-ku^0=leh^0=ya^0*
Ask=you	borrow=MOD	three-CL	book	read-EXP-SFP-SFP
'I have read the three books I borrowed from you.				

CAND 1: (ω Lex) (ω Fnc=3) (ω Lex) (ω Fnc=5) (ω Fnc=1) (ω Fnc=2) (ω Lex)
(ω Lex) (ω Fnc=4) (ω Fnc=6) (ω Fnc=6)

CAND 2: (ω Lex) (ω Fnc=3) (ω Lex) (ω Fnc=5) (ω Fnc=1) (ω Fnc=2) (ω Lex)
(ω Lex) (ω Fnc=4) Fnc=6 Fnc=6

CAND 3: (ω Lex) (ω Fnc=3) (ω Lex) Fnc=5 (ω Fnc=1) (ω Fnc=2) (ω Lex)
(ω Lex) (ω Fnc=4) Fnc=6 Fnc=6

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CAND 4: (ω Lex) (ω Fnc=3) (ω Lex) Fnc=5 (ω Fnc=1) (ω Fnc=2) (ω Lex)
(ω Lex) Fnc=4 Fnc=6 Fnc=6

CAND 5: (ω Lex) Fnc=3 (ω Lex) Fnc=5 (ω Fnc=1) (ω Fnc=2) (ω Lex)
(ω Lex) Fnc=4 Fnc=6 Fnc=6

CAND 6: (ω Lex) Fnc=3 (ω Lex) Fnc=5 (ω Fnc=1) Fnc=2 (ω Lex)
(ω Lex) Fnc=4 Fnc=6 Fnc=6

CAND 7: (ω Lex) Fnc=3 (ω Lex) Fnc=5 Fnc=1 Fnc=2 (ω Lex)
(ω Lex) Fnc=4 Fnc=6 Fnc=6

/INPUT/	ALIGN-R (ω, Fnc≤1)	SP-MAX-X^0	ALIGN-R (ω, Fnc≤3)
CAND 1	*!*****		****
CAND 2	*!***	**	**
CAND 3	*!**	***	*
CAND 4	*!*	****	
CAND 5	*!	*****	
➡ CAND 6		******	
CAND 7		*******!	

Note that this analysis follows the idea that this dissertation attempts to propose — as far as tonal neutralization is concerned, there is a parsed-in-ω vs. unparsed-in-ω distinction between prominent function words along with lexical words on the one hand and non-prominent function words on the other. However, as I will show, neutralization of non-initial syllables of prominent function words and lexical words are attested in Shanghainese too, and the pitch realization is derived in the same way as non-prominent function words. Therefore, an alternative analysis seems possible that non-prominent function words as a prosodic clitic are incorporated in the prosodic word built on some prominent host that precedes them (be it a lexical word or prominent function word). In the next subsection, I will show that feasible as this incorporation account is, it falls short of cross-linguistic uniformity, and that the present analysis alone suffices for taking care of neutralization in both prominent and non-prominent classes.

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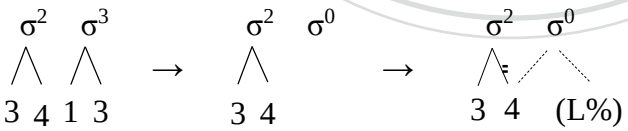
5.1.2 Neutralization in lexical vs. functional domains

In derivational terms, the pitch realization of neutral tone in Shanghainese is derived in the similar fashion to the non-inherent case in Standard Mandarin and the spreading case in Taiwanese. That is, neutral-toned syllables undergo tone loss first, and then acquire pitch through assimilation to the offset of the tone carried by the preceding syllable. Yet, the assimilation in Shanghainese is different from that in Standard Mandarin and Taiwanese, where the offset of the preceding tone only spreads or extends and hence the entire melody does not change after the spreading. In Shanghainese, by contrast, the end-pitch of the preceding tone shifts or is redistributed, rather than spreads, to the neutral-toned syllable, and thereby the entire melody has changed from a contour tone into a level tone. This redistribution of tone segments is depicted in (17), instantiated by a T2 syllable (i.e. a small rise /34/) followed by a T3 syllable (a big rise /13/) that undergoes neutralization, where the superscripted numbers indicates tonal categories (0 denoting neutral tone) and L% represents a boundary low tone.

(17) Derivation of neutral tone in Shanghainese



What concerns us here is that this neutralization routine is not exclusively for non-prominent function words. Rather, all but the initial syllables in a prominent function word or even an ordinary lexical word undergo the same derivation. As a result, it is very likely that a polysyllabic lexical word shares the same overall contour shape with syllable strings that consists of a lexical word/prominent function word followed by a

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non-prominent function word, as long as the first syllables in each case lexically carry the same tone. This is illustrated in (18) with the parallels between three pairs of syllables in different configurations — lexical roots that are compounded into a lexical word (18a), a lexical word and a non-prominent function word (18b), a prominent function word and a non-prominent function word (18c). The symbol "o" denotes tonelessness during the derivation. As we can see, despite the difference in configuration, they all surface with an overall rising derived from redistribution of the initial T2.

(18) Neutralization in different configurations

a. [σσ $_{Lex}$]:

	[*sy*^{2}	*co*^{1} $_{Lex}$]	'waterwheel'
	water	vehicle	
Base tone	34	52	
Tone loss	34	o	
Redistribution	3	4	

b. [σ $_{Lex}$][σ $_{Fnc>1}$]:

	[*sy*^{2} $_{Lex}$]	[*nong*^{3} $_{Fnc>1}$]	'to make you (do)'
	to.make	you	
Base tone	34	13	
Tone loss	34	o	
Redistribution	3	4	

c. [σ $_{Fnc=1}$][σ $_{Fnc>1}$]:

	[*sy*^{2} $_{Fnc=1}$]	[*uoe*^{2} $_{Fnc>1}$]	'four bowls of'
	four	CL	
Base tone	34	34	
Tone loss	34	o	
Redistribution	3	4	

The consistency in the surface contour across different configurations reveals that the redistribution involved in neutralization is indifferent to the end of prominent words

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(either lexical words or prominent function words) or the start of non-prominent words, so non-prominent function words like the object pronoun *nong*^{3} in (18b) and the classifier *uoe*^{3} in (18c) are not distinct from non-initial syllables of a lexical word, such as the second member *co*^{1} 'vehicle'of the compound in (18a). This lack of distinction results in indeterminacy in the prosodic status of non-prominent function words: they can either be left unparsed at the word-level (19c), as the present analysis assumes (see §5.1.1), or get incorporated in the prosodic word built on some prominent host that precedes them (19b), by which they share exactly the same status in prosodization as the non-initial syllables of a lexical word (cf. 19a), given the uncontroversial ω status assumed for lexical words. In Selkirk's (1996) terms, we are confronted with the choice between *internal* clitics and *free* clitics.

(19) Prosodization for constructions in (18)

a. Lexical words: assuming the status of ω

[σ σ $_{Lex}$]
(T o $_{\omega}$)

b. Non-prominent function words: internal clitic analysis

[σ $_{Lex}$][σ $_{Fnc>1}$] [σ $_{Fnc=1}$][σ $_{Fnc>1}$]
(T o $_{\omega}$) (T o $_{\omega}$)

c. Non-prominent function words: free clitics analysis

[σ $_{Lex}$][σ $_{Fnc>1}$] [σ $_{Fnc=1}$][σ $_{Fnc>1}$]
(T $_{\omega}$) o (T $_{\omega}$) o

To decide between the prosodizations, one might consider the internal clitic analysis (19b) better than the free clitic analysis (19c) in terms of theoretical economy, since the former keeps in line with the case involving only lexical words (19a). However, here I

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advocate the free clitic analysis and thus hold on to assuming the constraint ranking proposed in the last section. The argument is based on the fact that the application of the whole set of processes is indeed sensitive to where a prominent word ends as the entire string of syllables get longer, more precisely, consisting of more than three syllables. For example, consider the quadrisyllabic strings from (20) through (22) — a lexical compound word embedding two disyllabic lexical words (20), a lexical simplex word which is a quadrisyllabic transliteration of foreign names (21), and a disyllabic lexical word suffixed by a disyllabic non-prominent function word (22).

(20) [[σσ $_{Lex}$][σσ $_{Lex}$] $_{Lex}$]

a. Attested reading 1: disyllabic domains

	[[*tseng*^{2}	*de*^{3} $_{Lex}$]	[*da*^{3}	*ghoh*^{5} $_{Lex}$] $_{Lex}$]	'Aurora University'
	Aurora		university		
Base tone	(34	13)	(13	12)	
Tone loss	(34	o)	(13	o)	
Redistribution	(3	4)	(1	3)	

b. Attested reading 2: a quadrisyllabic domain

	[[*tseng*^{2}	*de*^{3} $_{Lex}$]	[*da*^{3}	*ghoh*^{5} $_{Lex}$] $_{Lex}$]	'Aurora University'
	Aurora		univesity		
Base tone	(34	13	13	12)	
Tone loss	(34	o	o	o)	
Redistribution	(3	4	o	o)	
L% association	(3	4	2	1)	

(21) [σσσσ $_{Lex}$]

a. Attested reading 1: disyllabic domains

	[*oa*^{2}	*da*^{3}		li^{3}	*a*^{2}	$_{Lex}$]	'Australia'
Base tone	(34	13	)(	13	34	)	
Tone loss	(34	o	)(	13	o	)	
Redistribution	(3	4	)(	1	3	)	

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b. Attested reading 2: a quadrisyllabic domain

	[*oa*^{2}	*da*^{3}	li^{3}	*a*^{2} $_{\text{Lex}}$]	'Australia'
Base tone	(34	13	13	34)	
Tone loss	(34	o	o	o)	
Redistribution	(3	4	o	o)	
L% association	(3	4	2	1)	

(22) [σσ $_{\text{Lex}}$][σσ $_{\text{Fnc>1}}$]

a. Unattested reading: disyllabic domains

	[*poa*^{3} reserve	*lieu*^{3} $_{\text{Lex}}$]	[*lah*^{5} CONT	*he*^{2} $_{\text{Fnc>1}}$]	'to be held on to'
Base tone	(34	13)	(12	34)	
Tone loss	(34	o)	(12	o)	
Redistribution	*(3	4)	(1	2)	

b. Attested reading: a quadrisyllabic domain

	[*poa*^{3} reserve	*lieu*^{3} $_{\text{Lex}}$]	[*lah*^{5} CONT	*he*^{2} $_{\text{Fnc>1}}$]	'to be held on to'
Base tone	(34	13	12	34)	
Tone loss	(34	o	o	o)	
Redistribution	(3	4	o	o)	
L% association	(3	4	2	1)	

The first two cases (20) and (21) — both containing a four-syllable-long lexical word — have two alternative readings differing in the demarcation of the domain of neutralization: reading 1 with a division into two disyllabic domains, and reading 2 with the entire string enclosed in a single domain. In contrast, the last case (22), with the last two syllables out of the lexical word, only has the single-domain reading; the division into disyllabic domains is not available in this case. The generalization from the contrast is that only inside a prominent word can a quadrisyllabic string be divided into disyllabic domains, even in the absence of word-internal morphosyntactic structure (as evidenced by the "flat" structure of the transliteration in (21)). This confinement of domain division to the inside of prominent words validates the distinction between non-

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initial syllables of a prominent word and non-prominent function words preceded by a prominent word, and therefore warrants some prosodic boundary exclusively on where a prominent word ends — which I assume is the right edge of a prosodic word $_{\omega}$] — so that the application of domain division can be correctly demarcated. Such a prosodization can be carried out only by adopting the free clitic analysis in (19c), as shown in (23a). The internal clitic analysis is not even an option because it would predict the unattested second domain for non-prominent function words preceded by a prominent word, as represented in (23b). To sum up, non-prominent function words in Shanghainese assume the very same prosodic status as in the other languages that we have addressed in the previous chapters — outside any instance of ω.

(23) Confinement of domain division to the inside of prominent words

a. Free clitic analysis: correct prediction

[	σ	σ			σ	σ	Lex/Fnc=1]		[	σ	σ	Lex/Fnc=1][	σ	σ	Fnc>1]
[(	T	o	)(		T	o	) $_{\omega}$]		[(	T	o	) $_{\omega}$]	o	o	

b. Internal clitic analysis: wrong prediction

[	σ	σ			σ	σ	Lex/Fnc=1]		[	σ	σ	Lex/Fnc=1][	σ	σ	Fnc>1]
[(	T	o	)(		T	o	) $_{\omega}$]		*[(	T	o	)(	T	o	) $_{\omega}$]

Given the analysis thus far, while the prosodization at the word level is held consistent across the languages addressed in this dissertation, the condition for tone loss/preservation in Shanghainese is clearly different from that in the other languages. Specifically, preservation of tonal contrast is strictly prosodic-word bound in all the languages in question, except Shanghainese, which only retains the initial tone of some domain that is smaller than the prosodic word. The case of Shanghainese clearly needs another account since the analysis proposed for tone loss in Chapter 3 would be not

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available for Shanghainese, and this is the issue we are going to tackle in the rest of this subsection.

The analysis begins with two assumptions. First, the domain of tone loss/preservation is defined as a metrical foot (Σ). This is line with the case in the other languages, given the widely accepted view that tonelessness is related with unstressed/unaccented status. Second, metrical foot is restricted in size to more than one syllable, with a preferable maximum of exactly two. This differs crucially from the other languages where degenerate feet (i.e. monosyllabic feet) are prevailing and thus each syllable has its own stress by which it can license the tonal contrast. Finally, the head of each metrical foot falls on the initial syllable.

To recast these assumptions in OT I propose the following constraints, as defined in (24), including the size constraint, FTBIN, which sets disyllabic minimum and maximum for a foot, and an alignment constraint that requires the head of a foot be initial. These constraints interact with those proposed for the footing in the other languages, repeated in (25).

(24) Newly proposed constraints for footing

a. FOOTBINARITY (or FTBIN):

Assign one violation mark for every metrical foot that does not contains exactly two syllables.

b. ALIGN-L(Head(Σ), Σ) (or TROCHEE):

Assign one violation mark for every metrical foot whose head is not initial.

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(25) Previously proposed constraints for footing

a. EQUSIS & Σ-WITH-ω (L) (= [EQUALSISTERS & ALIGN-L(Σ, ω)])

Assign one violation mark for every metrical foot (Σ) iff both of the following situation occurs:

(i) It is not left aligned with some prosodic word (ω)

(ii) It does not have the same prosodic constituent as its sister node in the prosodic structure.

b. σ-WITH-Σ (E) (= [ALIGN-EDGE(σ, Σ)):

Assign one violation mark for every syllable (σ) iff it is not aligned with both edges of some metrical foot (Σ).

Recall that the previously proposed constraints (25) are ranked as follows: Align-R(ω, Fnc≤n), [EQUSIS & Σ-WITH-ω (L)] ≫ σ-WITH-Σ (E) ≫ Σ-WITH-ω (L), where σ-WITH-Σ (E) crucially outranks Σ-WITH-ω (L) to motivate the prevailing degenerate feet in the other languages. Therefore, to put the emphasis on the syllabic binarity of feet for the case of Shanghainese, the size constraints, namely FTBIN, should outrank σ-WITH-Σ (E). This ranking is implemented in the tableaux (26), where the desirable outputs follow the prosodization that prefers domain division, as shown in (23a). That is, for quadrisyllabic prominent words, there are two disyllabic feet enclosed in a prosodic word (21a); for disyllabic prominent words followed by disyllabic non-prominent words, the preceding prominent word is parsed in a single disyllabic foot, which is in turn parsed in a prosodic word, leaving the non-prominent word unparsed (22b). As we can see from the tableaux, the ranking FTBIN ≫ σ-WITH-Σ (E), together with some other constraints, correctly picks out the desirable outputs, namely, CAND 2 for (26a) and CAND 5 for (26b).

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(26) FTBIN ≫ σ-WITH-Σ (E)

a. Quadrisyllabic prominent words

INPUT: [σ σ σ σ $_{Lex}$] (=21)

CAND 1: [(ˈ**σ** $_{Σ}$) (ˈ**σ** $_{Σ}$) (ˈ**σ** $_{Σ}$) (ˈ**σ** $_{Σ}$) $_{ω}$]
CAND 2: [(ˈ**σ** σ $_{Σ}$) (ˈ**σ** σ $_{Σ}$) $_{ω}$] (=21a)
CAND 3: [(σ ˈ**σ** $_{Σ}$) (σ ˈ**σ** $_{Σ}$) $_{ω}$]
CAND 4: [(ˈ**σ** $_{Σ}$) (ˈ**σ** σ σ $_{Σ}$) $_{ω}$]
CAND 5: [(ˈ**σ** σ σ σ $_{Σ}$) $_{ω}$] (=21b)

/INPUT/	FTBIN	σ-WITH-Σ (E)	ALIGN-R (ω, Fnc≤1)	EQUSIS & Σ-WITH-ω (L)	TROCHEE
CAND 1	*!***				
➡ CAND 2		****			
CAND 3		****			*!*
CAND 4	*!*	***			
CAND 5	*!	****			

b. Disyllabic prominent words followed by disyllabic non-prominent words

INPUT: [σ σ $_{Lex}$][σ $_{Σ}$) (ˈσ $_{Fnc>1}$] (=22)

CAND 1: [(ˈ**σ** $_{Σ}$) (ˈ**σ** $_{Σ}$) $_{ω}$][(ˈ**σ** $_{Σ}$) (ˈ**σ** $_{Σ}$) $_{ω}$]
CAND 2: [(ˈ**σ** σ $_{Σ}$) $_{ω}$][(ˈ**σ** σ $_{Σ}$) $_{ω}$] (=22a)
CAND 3: [(ˈ**σ** $_{Σ}$) (ˈ**σ** $_{Σ}$) $_{ω}$] (ˈ**σ** $_{Σ}$) (ˈ**σ** $_{Σ}$)
CAND 4 [(ˈ**σ** σ $_{Σ}$) $_{ω}$] (ˈ**σ** σ $_{Σ}$)
CAND 5 [(ˈ**σ** σ $_{Σ}$) $_{ω}$] σ σ (=22b)

/INPUT/	FTBIN	σ-WITH-Σ (E)	ALIGN-R (ω, Fnc≤1)	EQUSIS & Σ-WITH-ω (L)	TROCHEE
CAND 1	*!***		*		
CAND 2		****	*!		
CAND 3	*!***			*	
CAND 4		****		*!	
➡ CAND 5		****			

This analysis is in line with the widely-adopted view that, while tonal neutralization in Shanghainese has long been described as a general tone sandhi process, its nature is in fact of no difference from the neutral tone in Beijing Mandarin (e.g. Hirayama 1992, among many others). That is, they all involve tone loss which is motivated by

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stresslessness/unaccentedness. The only difference between them is the parameters of foot formation and the ensuing stress assignment, which has been settled in this subsection.

5.2 Prosodic invisibility in Shanghainese

We have shown that tonal neutralization involves tone loss and melody redistribution, and that it not only occurs in functional elements but applies as a general tone sandhi process in lexical elements. While this process has generally been reported to be obligatory either in lexical or functional categories (e.g. Selkirk & Shen 1990, Qian 1997), according to my own survey (T.-C. Huang 2015), its application can be blocked before syllables of certain types of function words, which is undoubtedly another instantiation of prosodic invisibility. This section concerns this phenomenon: §5.2.1 focuses on the mechanism of melody redistribution. §5.2.2 deals with the blocking of redistribution in functional categories by reviewing my previous analysis. §5.2.3 gives a reanalysis of the blocking in sentence-final particles using the currently proposed prosodic licensing constraints.

5.2.1 The nature of melody redistribution

As introduced in §5.1.1, Shanghainese has five categories of citation tones, including three long tones and two short/checked tones. This section chooses to focus only on the long tones since they are surely subject to melody redistribution. In contrast, whether tone sandhi processes involving short tones can be accounted for by redistribution in the same fashion remains under controversy. Table (27) abstracts the long tones in Shanghainese, including T1, a fall, T2, a small rise, and T3, a big rise. Besides the

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phonetic transcription in Chao's five-scale notation system, these tones are further transcribed this time through the phonological notation which may be dubbed as an "impressionistic" description using H for a high-pitch segment, M for a mid-pitch segment and L for a low-pitch segment. These phonological notations are used hereafter for the sake of clarity as they make the operation of redistribution more transparent.

(27) The long tones in Shanghainese

Categories	**T1**	**T2**	**T3**
Phonetic transcription	52	34	13
Phonological transcription	HL	MH	LH
Contour description	fall	small rise	big rise

As we have seen in §5.1.2, combination of the long tones in Shanghainese features a left-dominant system. That is, in a polysyllabic string, only the first tone is retained, while the remaining tones are neutralized by losing their tonal contrast. The retained initial tone is subsequently redistributed in a left-to-right, one-to-one fashion, and the redistribution is characteristic of locality; that is, it is confined to the first two syllables, with the second syllable always being the recipient of the offset of the preceding melody. The whole picture is illustrated in table (28), where syllable boundary is marked by a dot, and o denotes a toneless syllable. This initial prominence is already analyzed as motivated by trochaic rhythm in the last section.

(28) Tone patterns in polysyllabic combinations

σ_1	**$\sigma_1\sigma$**	**$\sigma_1\sigma\sigma$**	**$\sigma_1\sigma\sigma\sigma$**
HL	H.L	H.L.o	H.L.o.o
MH	M.H	M.H.o	M.H.o.o
LH	L.H	L.H.o	L.H.o.o

Note that after redistribution, the initial contour tone is "flattened" by delinking the

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second tone feature of that contour from the sponsor syllable. In my previous work (T.-C. Huang 2015), I suggested that this can be understood as motivated by reduction of tonal complexity. Given the marked status of contour tones (Yip 2002), the redistribution of melodies happens for flattening non-final contours due to the notion proposed by J. Zhang (2002, 2007) that final position enjoys the length privilege in licensing such a marked type of tones. This can be expressed by what Zoll (1998) calls "negative positional markedness" — formulated as *CONTOUR-NONFINAL — which punishes every instance of non-final contours. For example, T1 /HL/ being non-final in a certain domain, as in (HL.o), is assessed with one violation by *CONTOUR-NONFINAL; it needs spreading in the redistribution fashion, ending up as (H.L). If the fall is licensed at the right edge of some constituent, as in ((HL).o), there is no pressure for it to be redistributed. The latter case is how the blocking/invisibility phenomenon is analyzed in my previous study: it is considered the lack of any pressure to get flattened by redistribution, which I will review in details in the next subsection.

5.2.2 Blocking of redistribution

While melody redistribution generally applies after tone loss in the derivation of tonal neutralization. The application of redistribution can in fact be independent of tone loss. There are occasions where melody redistribution is blocked from applying. That is, the initial contour tone stays *in situ*, surfacing with no flattening, as represented in (29), in which case the second syllable, though toneless, serves as a non-recipient for the redistributed melodies; it acquires some pitch through the association of L% at the later point in the derivation.

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(29) Melody redistribution

a. Normal application: /HL.T/ → [H.L]

b. Application blocked: /HL.T/ → [HL.o)

In my previous survey, this blocking is found to occur when the second syllable belongs to certain types of function words, and the occurrence itself is variable, aside from inter-speaker variation. (30) shows the results of the survey, which are adapted from T.-C. Huang (2015: 170). The occurrence of blocking is shown in the shaded area. As we can see from the table, the main condition for blocking concerns the type of Function words. Sentence-final particles and modifier marker are non-recipients, the former being major non-recipients (annotated as Fnc^{MA}) and the latter a minor non-recipient (annotated as Fnc^{MI}) in terms of the proportion of blocking. By contrast, the remaining types of function words are always recipients (annotated as Fnc^{R}) of the redistributed melodies. Tonal types also play an important role here. Of the three long tones in Shanghainese, only the fall /HL/ and the small rise /MH/ are vulnerable to blocking, more of the former being blocked than the latter, which is attested by two facts—(i) /HL/ can be blocked before the modifier marker while /MH/ cannot, and (ii) before sentence-final particles, /HL/ has the preference for blocking over spreading while /MH/ has a reversed preference. Note that the types of function words under the scope of the survey roughly matches those types discussed in the current dissertation, except numerals, classifiers, and phasal complements. Yet, based on my personal observation and communication, the behavior of these types is the same as object pronouns and directional complements; namely, they are normal recipients and never block redistribution.

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(30) Variable blocking of redistribution in Shanghainese

Tone types \ Fnc types		Fnc^{MA}	Fnc^{MI}	Fnc^{R}		
		SFP	MOD	ASP	DIR	PRO
HL	Blocked	22	5	--	--	--
	Redistributed	2	12	12	3	6
	% Blocked	92	29	--	--	--
MH	Blocked	3	--	--	--	--
	Redistributed	12	15	6	6	6
	% Blocked	20	--	--	--	--
LH	Blocked	--	--	--	--	--
	Redistributed	39	15	6	3	3
	% Blocked	--	--	--	--	--

To explain the variable blocked vs. non-blocked distinction between the three categories of function words, namely, Fnc^{MA}, Fnc^{MI}, and Fnc^{R}, my previous analysis assumes different prosodizations according to their distinct syntactic distribution, as schematized in (31). We can see all three categories of function words fail to construct a prosodic word of their own (putting numerals aside for the time being), and thus they are enclitics varying only in the prosodic host they are adjoined to. Fnc^{R} are adjoined to ω, as in (31c), while the other two are adjoined to the subtypes of ϕ—the major non-recipient, Fnc^{MA}, being Φ-adjoined, as in (31a), and the minor non-recipient, Fnc^{MI}, φ-adjoined, as in (31b). This difference in prosodization lies in their different syntactic configuration. The crucial difference between Fnc^{MA} and Fnc^{MI} is that the former is right aligned with "CmmP" (i.e. Comma Phrase) while the latter is not. The notion CmmP is Potts' (2003, 2005) proposal, referring to a syntactic constituent as "logically and compositionally independent of ... the at-issue entailments" (Potts 2003: 119) of the proposition expressed by the surrounding sentence. Instances of CmmP, as Potts proposes, include supplementary expressions, such as non-restrictive relatives and parentheticals, etc. Selkirk (2005) further suggests an inclusion of root clause and dislocated constituent such as topic expressions, both being the very projection of Fnc^{MA}. By contrast, restrictive relatives, as what Fnc^{MI} normal heads, do not have the

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status of being a CmmP. This projection, CmmP, is argued to be the syntactic constituent corresponding to intonational phrase according to Selkirk (2005); that is why Fnc^{MA} is immediately dominated by intonational phrase, while Fnc^{MA} is not. As for Fnc^{R}, on the other hand, is usually the sister node of the preceding lexical host in the syntactic structure, and therefore distinct from the cases of Fnc^{MA} and Fnc^{MA}.

(31) Prosodizations of the different types of Fnc (adapted from T.-C. Huang 2015: 175-176)

a. Φ-adjunction for Fnc^{MA}

[[... Lex]$_{lexP}$ **Fnc^{MA}**]$_{CmmP}$
( )$_{ι}$ Intonational phrase
( )$_{Φ}$ (Maximal) phonological phrase
( )$_{ω}$ Prosodic word

b. φ-adjunction for Fnc^{MI}

[[[... Lex]$_{lexP}$ **Fnc^{MI}**]$_{NonCmmP}$ …]$_{NP}$
( )$_{Φ}$ (Maximal) phonological phrase
( )$_{φ}$ (Minimal) phonological phrase
( )$_{ω}$ Prosodic word

c. ω-adjunction for Fnc^{R}

[... Lex **Fnc^{R}**]$_{lexP}$
( )$_{Φ}$ (Maximal) phonological phrase
( )$_{ω}$ Prosodic word

Given the different prosodizations, the previous analysis contends that all else being equal, only the prosodic domains that are higher than ω on the hierarchy can tolerate the final contour tone, the tolerance being proportional to the domain level on the hierarchy. For example, intonational phrase has the highest tolerance, maximal phonological phrase the next highest, and so on.

On the other hand, to what extent a contour tone can be tolerated also differs even

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in the same position of the same prosodic domain—/LH/ being the least tolerable at non-final positions and /HL/ the most tolerable. The previous analysis holds that this difference is linked to the relative markedness of these contour tones in relation to one another. The more marked a contour tone is, the higher-level the prosodic domain it requires for licensing in the final position, given the duration-based account put forward by J. Zhang (2007). Therefore, given the markedness scale of the three long tones: LH > MH > HL (where > represents "more marked than), the previous analysis proposes that the threshold of being tolerable in the final position is φ for /HL/, Φ for /MH/ and ι for /LH/.In other words, in φ-final only /HL/ can have no pressure to be redistribute, in Φ-final both /HL/ and /MH/ can, and in ι-final all stay unchanged.

This line of reasoning is crucially captured in the previous analysis by proposing the negative positional markedness as formulated in (32a), which enforces flattening of different non-final contour tones by redistribution of the tone segments within or across varied prosodic domains. This contour tone licensing constraints interacts with faithfulness to contour tones, as given in (32b).

(32) Contour-licensing constraints (T.-C Huang 2015: 178)

a. $*\tau\_)_{\pi}$

Assign a violation mark for every non-final contour tone of type τ within a prosodic domain of type π, where $\tau \supset$ {big rise, small rise, fall} and $\pi \supset$ {ι, ϕ, ω}.

b. PRESERVECONTOUR (or PRESC for short)

Assign a violation mark for every contour tone in the input that does not have a correspondent in the output.

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The previous analysis shows that the presence/absence of blocking can be accounted for by manipulating the ranking of the faithfulness, PRESC, with respect to the set of positional markedness against non-final contours: PRESC outranks *τ_i_)$_{\pi x}$ if τ_i is redistributed across)$_{\pi x}$, and conversely, PRESC is outranked by *τ_j_)$_{\pi y}$ if τ_j is blocked by the boundary)$_{\pi y}$ from applying redistribution. Accordingly, the proposed constraint ranking is as shown in (33). All the subtypes of *BIGRISE_)$_\pi$ are ranked higher than PRESC, given the attested fact that T3 as a big rise /LH/ is never tolerable non-finally in a prosodic constituent of any level (33a). As for T2, the small rise /MH/, since it can be licensed at the final position of a maximal projection (Φ), hence the crucial ranking: *SMALLRISE_)$_\Phi$ » PRESC » *SMALLRISE_)$_\iota$ (33b). Last, T1, the only falling tone /HL/, can be licensed at the final position of a minimal phonological phrase (φ), an even lower constituent, therefore PRESC is ranked between *FALL_)$_\varphi$ and *FALL_)$_\Phi$ (33c).

(33) Ranking of the blocking

a. T3: no blocking

{*BIGRISE_)$_\varphi$, *BIGRISE_)$_\Phi$, *BIGRISE_)$_\iota$} » PRESC

b. T2: blocking by)$_\Phi$

{*SMALLRISE_)$_\varphi$, *SMALLRISE_)$_\Phi$} » PRESC » *SMALLRISE_)$_\iota$

c. T1: blocking by)$_\varphi$

*FALL_)$_\varphi$ » PRESC » {*FALL_)$_\Phi$, *FALL_)$_\iota$}

While the previous analysis is workable and the proposed constraints are well-motivated, it is deficient in the knowledge of CP-periphery and therefore is flawed by the problematic formation of intonational phrase. This warrants a reanalysis of Fnc^{MA}, the sentence-final particles.

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5.2.3 Prosodic licensing of the non-root C particle

My previous analysis of the blocking of redistribution in tonal neutralization offers an account that is characteristic of (i) syntactically driven difference in prosodization, and (ii) positional licensing of marked structure. Compared to the latter property, which is insightful and is thus held on to in the present analysis, the former can be relatively deficient because it presupposes a perfect match between some kind of syntactic configuration and a certain way of prosodization. In fact, there could be two cases where such perfect match does not exist.

The first case is where the function words in similar types of syntactic configurations have different behaviors with regard to the blocking. Cases like this occur in sentence-final particles. While the previous analysis assumes that sentence-final particles are situated in similar syntactic positions and accordingly should have identical prosodizations, which then grants them the same prosodic status to decide whether the contour tone can be licensed *in situ*. That is, all the sentence-final particles should be equally likely to block/apply the redistribution. However, this is not the case. As illustrated in (34), there are subtypes of sentence-final particles. One particular subtype, including those that Paul (2014) assumes are situated in Attitude C, namely, the head of the highest complementizer layer (e.g. a^0, ya^0, le^0, etc.), are highly likely to block redistribution of the preceding T2 /MH/, whereas the other types, the Force C and Low C for the most part (e.g. leh^5, va^3, etc.), are not as typical non-recipient of redistributed tones as the Attitude C. They barely or sporadically block the redistribution. Asymmetry between these subtypes is surprising because based on the previous analysis, all the subtypes of sentence-final particles are complementizer and are sandwiched between the right edge of a phonological phrase and the right edge of an intonational phrase, which should have made the small rise /MH/ preceding them

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equally well-licensed.

(34) Subtypes of sentence-final particles in root C: no difference in prosodization

a. Sentence-final particles in Attitude C: normal blocking

[[*Ngu*^{3}	*soa*^{1}=*geh*^{5}	*ce*^{2} $_{TP}$]	=a^{0} $_{AttCP}$]	'This dish was cooked by me.'
I	cook=MOD	dish	=SFP	
		M $_{\Phi}$)	H $_{\iota}$)	

b. Sentence-final particles in Force C/Low C: sporadic or no blocking

[[*qieh*^{4}	*coa*^{2}*ve*^{3}	*hoa*^{2} $_{TP}$]	=va^{3} $_{ForceCP}$]	'How about fried rice?'
I	fried.rice	dish	=SFP	
		M $_{\Phi}$)	H $_{\iota}$)	
		*?MH $_{\Phi}$)	o $_{\iota}$)	

This asymmetry might urge one to distinguish between the Attitude C and the other lower subtypes by means of, for example, assuming that only the highest root C corresponds to intonational phrase. This is exactly what Selkirk (2011) proposed to define syntax-phonology correspondence at clausal level. She suggests that, assuming multiple layers of complementizer in CP-periphery in the spirit of Rizzi (1997), the clause in correspondence with intonational phrase should be defined as the *complement* of the highest layer, ForceP in the framework she adopts. This is illustrated in (35b).

(35) Clausal correspondence

a. MATCH-CLAUSE:

A clause in syntactic constituent structure must be matched by a constituent of a corresponding prosodic type in phonological representation, call it ι.

b. [ForceP Force^{0} [illocutionary clause]]
Force^{0} (illocutionary clause ι)

Given that the highest layer assumed in this dissertation is Attitude C, we may propose

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that only the complement of Attitude C forms an intonational phrase, following Selkirk's proposal. This move makes the sentence-final particles in Attitude C outside the intonational phrase, because it is not a part of its own complement. The implementation is given in (36). As we can see, by doing so, sentence-final particles in Attitude C is successfully distinguished from the other subtypes of its like. The small rise /MH/ followed by an attitude final particle is now at the final position of an intonational phrase (ι), whereas the same contour tone followed by the other types of final particles remains at the final position of a maximal phonological phrase (Φ). The blocking asymmetry now can be explained by assuming that a small rise is well-licensed only in ι-final.

(36) Subtypes of sentence-final particles in root C: different prosodization

a. Sentence-final particles in Attitude C: normal blocking

[[*Ngu*^{3}	*soa*^{1}=*geh*^{5}	*ce*^{2} TP]	ForceCP]	=*a*^{0}	AttCP] 'This dish was cooked by me.'
I	cook=MOD	dish		=SFP	
		M Φ)	ι)	H	

b. Sentence-final particles in Force C/Low C: sporadic or no blocking (=34b)

[[*qieh*^{4}	*coa*^{2}*ve*^{3}	*hoa*^{2}	TP]	=*va*^{3}	ForceCP]	'How about fried rice?'
Eat	fried.rice	okey		=SFP		
		M	Φ)	H	ι)	
		*?MH	Φ)	o	ι)	

This revision, however, runs into the other problem that the previous analysis may pause, that is, the case where function words share the same tonal behavior and yet they are in distinct syntactic positions which would give rise to different prosodization for them. An example of such a case is the sentence-final particle *geh*^{5}. This final particle is an equivalent to Mandarin *de*^{0} in the propositional assertion construction, which is analyzed in Paul (2014) as a non-root C, in contrast with the abovementioned subtypes

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of root final particles. “Non-root” means that this particle is affiliated with an embedded clause, a position that cannot correspond to intonational phrase according to Selkirk (2011). In other words, *geh*^{5} as a non-root C final particle, its syntactic and prosodic statuses are similar to those of Low C/Force C particles, and yet it tonal behavior is not the like of them. Rather, its behavior with respect to blocking is more like Attitude C particles. This is illustrated in (37), the situation of Attitude C particles and Force C/Low C particles are repeated here for comparison.

(37)

a. Sentence-final particles in root Attitude C: normal blocking (=36a)

[[*Ngu*^{3}	*soa*^{1}=*geh*^{5}	*ce*^{2} TP] ForceCP]	=*a*^{0} AttCP]	‘This dish was cooked by me.’
I	cook=MOD	dish	=SFP	
		M Φ) ι)	H	

b. Sentence-final particles in root Force C/Low C: sporadic or no blocking (=36b)

[[*Qieh*^{4}	*coa*^{2}*ve*^{3}	*hoa*^{2} TP]	=*va*^{3} ForceCP]	‘How about fried rice?’	
Eat	fried.rice	okey	=SFP		
		M Φ)	H ι)		
		*$^{/?}$MH Φ)	o ι)		

c. Sentence-final particles in non-root C: optional blocking

[[*Nong*^{3}	*me*^{1}	*we*^{3}*teh*^{4}	*ti*^{2}*ce*^{2} TP]	=*geh*^{3} CP(-root)] TP]	‘You’re such a foodie.’	
You	quite	capable	to.order.dish	=SFP		
			M ϕ)	H Φ)		
			MH ϕ)	o Φ)		

This problem reveals that it is impracticable to define the prosodic invisibility by purely syntactic structure. Rather, we need a mechanism specific to the types of function words. The prosodic licensing constraints serve as such a mechanism. The idea is that suppose the grammaticalization degree of the non-root C particle *geh*^{5} is higher than 6, by which it is a more grammaticalized element than Low C/Force C perhaps slightly lower than

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Attitude C particles, whose degree of grammaticalization is given as 6.5. This Assumption that non-root C particle is highly grammaticalized is not a stipulation. Pragmatically, it does not denote sentential aspect/tense/modality, so nothing like low C particles. It mainly conveys two kinds of meaning: one denotes the assertive declarative sentence type, and in this sense is close to Force C particles, while the other expresses subjective soft certainty and thus is more like Attitude C. In view of the correlation between subjectification and grammaticalization, the grammaticalization degree of the non-root C particle *geh*^{5} may be somewhere in between. Therefore, it is assumed to be categorized as Fnc>6 here.

With this higher grammaticalized status, we can follow the same rationale for the extrametricality in Sixian Hakka (see §3.2.2) and Taiwanese (§4.1.3.1), assuming that the invisible non-root C particle *geh*^{5} (Fnc≥6) must be immediately preceded by some right edge of a intonational phrase and it is not included in any instance of intonational phrase. In other words, the non-root C particle are clause-level extrametrical for not being parsed in a intonational phrase. This idea can be schematized in (38). This configuration clearly shows that the preceding small rise /MH/ is ensured to be properly licensed at the final position of a prosodically high-level domain, and thus there is no pressure for this contour tone to be redistributed.

(38) Extrametrical to the paradigmatic tone sandhi in Taiwanese

(… σ MH $_{\iota}$) Fnc≥6

This can also be captured by the alignment constraint we proposed for Sixian Hakka and Taiwanese, but this time, it is specific to grammatical words with degree of grammaticalization lower than or equal to 6, and in that way it dictates that the right

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edge of a given intonational phrase be licensed by the right edge of a word in that degree, (i.e. Fnc≤6), which includes Low C particles/Force C particles, as well as the other types of function words that have even lower degree of grammaticalization.

(39) ALIGN-R(ι, Fnc≤6):

Assign one violation mark for every intonational phrase (ι) which is not right-aligned with some word with degree of grammaticalization lower than or equal to 6 (Fnc≤6).

With this alignment constraint ranked above ALIGN-R(ι, CLAUSE), the non-root C particle is manipulated to be located outside an instance of intonational phrase, by which the preceding MH can stay *in situ*. The following tableau illustrates this desirable results.

(40) ALIGN-R(ι, Fnc≤6) ≫ ALIGN-R(ι, CLAUSE)

INPUT: (=37c)

[[*Nong*^{3}	*me*^{1}	*we*^{3}*teh*^{4}	*ti*^{2}*ce*^{2} $_{\text{TP}}$]	=*geh*^{3} $_{\text{CP(-root)}}$] $_{\text{TP}}$]	'You're a foodie.'
You	quite	capable	to.order.dish	=SFP$^{\text{Fnc>6}}$	
CAND 1:			M $_{\phi}$)	H $_{\Phi}$) ι)	
CAND 2:			MH $_{\phi}$) $_{\Phi}$) ι)	o	

/INPUT/	ALIGN-R(ι, Fnc≤6)	ALIGN-R(ι, ForceP(Comp))
CAND 1	*!	
➡ CAND 2		*

5.3 Summary

This chapter addresses grammaticalized function words in Shanghainese. Shanghainese can be said to be phonologically highly attrited language in that the vast majority of

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function words are non-prominent in terms of tonal neutralization, and that the distinction between lexical and functional categories is obscured by the neutralization of non-initial tones of lexical words. Both can be analyzed as a result of stress assignment and prosodic licensing, captured by two sets of constraints ranking: ALIGN-R(ω, Fnc≤1).≫ SP-MAX-X^0 and FTBIN ≫ σ-WITH-Σ (E). Besides, Shanghainese also exhibit prosodic invisibility in highly grammaticalized word, namely, sentence-final particles. This is attained through the constraint ranking ALIGN-R(ι, Fnc≤6) ≫ ALIGN-R(ι, CLAUSE).

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6. Theoretical Remarks on Typology

Having settled the scenarios in each language, this chapter attempts to give a typological overview of those languages and draw some theoretical implications. The first two sections summarize the constraint rankings of neutral tone and prosodic invisibility. § 6.3 gives remarks on the prosodic well-formedness.

6.1 Neutral tone

Neutral tone has been assumed as derived from syllables unparsed into prosodic word. This is captured by the conception of prosodic licensing, formulated as ALIGN-R(ω, Fnc≤n) ≫ SP-MAX-X^0 ≫ ALIGN-R(ω, Fnc≤n-1). The number, which denotes degree of grammaticalization, is divergent across languages. This divergence is summarized below:

(1) Neutral tone typology

Languages	High-ranked licensing constraint	Neutral-toned types
Sixian Hakka	ALIGN-R(ω, Fnc≤6) ≫ SP-MAX-X^0 ≫ ALIGN-R(ω, Fnc≤5)	SFP^{AttC}
Cantonese	ALIGN-R(ω, Fnc≤5) ≫ SP-MAX-X^0 ≫ ALIGN-R(ω, Fnc≤4)	SFP
Standard Mandarin	ALIGN-R(ω, Fnc≤3) ≫ SP-MAX-X^0 ≫ ALIGN-R(ω, Fnc≤2)	SFP, MOD, ASP
	ALIGN-R(ω, Fnc≤2) ≫ SP-MAX-X^0 ≫ ALIGN-R(ω, Fnc≤1)	SFP, MOD, ASP, PRO, DIR
Taiwanese	ALIGN-R(ω, Fnc≤2) ≫ SP-MAX-X^0 ≫ ALIGN-R(ω, Fnc≤1)	SFP, MOD, ASP, PRO, DIR
Shanghainese	ALIGN-R(ω, Fnc≤1) ≫ SP-MAX-X^0 ≫ ALIGN-R(ω, Lex)	SFP, MOD, ASP, PRO, DIR, PHA, CL

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This constraint ranking typology corresponds to the grammars of the five languages investigated in this dissertation, as shown in table (2), where the check mark "✓" means that this class of function words is neutral toned. The proposed constraint system thus embodies in a formalized way the general impression that Wu Chinese (as represented by Shanghainese), Min Chinese (as represented by Taiwanese) and Mandarin Chinese (as represented by Standard Mandarin) are particularly rich in stress-related phenomena such as neutral tones, while Hakka Chinese (as represented by Sixian Hakka) and Yue Chinese (as represented by Cantonese) are famous for scarce manifestation of stress and neutral tone phenomena.

(2) Overview of neutral toned classes of function words across languages

subclasses / Languages	=1	=2		=3		=4	=5	≥6
	NUM	PHA	CL	PRO	DIR	ASP	MOD	SFP
Sixian Hakka								✓
Cantonese								✓
Standard Mandarin				(✓)	(✓)	✓	✓	✓
Taiwanese				✓	✓	✓	✓	✓
Shanghainese		✓	✓	✓	✓	✓	✓	✓

Furthermore, with the edge alignment constraints formulated in stringency form, the currently proposed system captures both the universal and language-specific nature of the relation between grammaticalization and neutral tone. On the universal side, the system captures the fact that all else being equal, tonal neutralization never seeks out a less grammaticalized function word in preference to a more grammaticalized one. On the language-specific side, the system allows conflation. Various conflations of grammaticalization degrees across Chinese dialects arise from the interaction between the stringent edge alignment ALIGN-R(ω, Fnc≤n) and SP-faithfulness. When SP:MAX is crucially outranked by edge alignment referring to a range with maximum degree x, all the types of function words with grammaticalization degree ≤ x are conflated into

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the unneutralized class, and the rest types are the neutral-toned class.

Note that the conflation, despite being language-specific, is not unrestricted. The stringency formulation has the predictive power that the conflation into (un-)neutralized class must be adjacent. The system cannot wrongly predict a grammar where high grammaticalized function words and low grammaticalized function words are conflated into a class, be it neutral-toned or unneutralized, leaving medium grammaticalized function words outside the conflation. This is illustrated in tableau (3). The neutralization of Fnc=2 requires the ranking ALIGN-R(ω, Fnc≤1) ≫ SP-MAX-X0 ≫ ALIGN-R(ω, Lex), and the neutralization of Fnc=5 and Fnc=6 needs the ranking ALIGN-R(ω, Fnc≤4).≫ SP-MAX-X0 ≫ ALIGN-R(ω, Fnc≤3). However, with both of these constraint rankings, we cannot obtain a discontinuant conflation where one might expect Fnc=2, Fnc=5, and Fnc=6 are neutral-toned while Fnc=3 and Fnc=4 are not, as shown by the elimination of CAND 1. This is because the high-ranking ALIGN-R(ω, Fnc≤1) is a highly stringent version, and therefore if we are to allow Fnc=2 to be neutral-toned, it means that Fnc>2 must be treated alike, which is proved by the optimal candidate, CAND 3.

(3) Discontinuant conflation: eliminated

INPUT: (ω Fnc=2) (ω Fnc=3) (ω Fnc=4) (ω Fnc=5) (ω Lex=6)

CAND 1: (ω Fnc=2) (ω Fnc=3) (ω Fnc=4) (ω Fnc=5) (ω Lex=6)
CAND 2: (ω Fnc=2) (ω Fnc=3) (ω Fnc=4) (ω Fnc=5) (ω Lex=6)
CAND 3: (ω Fnc=2) (ω Fnc=3) (ω Fnc=4) (ω Fnc=5) (ω Lex=6)

/INPUT/	ALIGN-R (ω, Fnc≤1)	ALIGN-R (ω, Fnc≤4)	SP:MAX-X^0	ALIGN-R (ω, Fnc≤3)	ALIGN-R (ω, Lex)
➡ CAND 1	**		***	*	**
➡ CAND 2	***		**	*	***
➡ CAND 3			*****		

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Nevertheless, the proposed system does overpredict three types of grammar that are not attested in the current investigation: (i) all function words are neutral-toned (ii) No function words are neutral-toned, and (iii) only sentence-final particles and modifiers are neutral-toned. The ranking of these unattested grammars are shown in (4).

(4) Unattested grammars:

Grammar:	Neutral-toned types
SP-MAX-X^0 ≫ ALIGN-R(ω, Fnc≤6)	All function words neutralized
ALIGN-R(ω, Lex) ≫ SP-MAX-X^0 (Unrankable ALIGN-R(ω, Fnc≤n))	No function words neutralized
ALIGN-R(ω, Fnc≤4) ≫ SP-MAX-X^0	SFP, MOD

The first two types are unattested because numerals seem to never carry a neutral tone across languages, and attitude sentence-final particles seem to always be neutral-toned cross-linguistically. Here I assume that these facts should be taken as universal, which can be captured by the fixed rankings in (5).

(5) Fixed ranking

a. ALIGN-R(ω, Fnc≤1).≫ SP-MAX-X^0 ≫ ALIGN-R(ω, Lex)

b. ALIGN-R(ω, Fnc≤6) ≫ SP-MAX-X^0

As for the third type of grammar, where only sentence-final particles and modifiers are neutral-toned, it is yet uncertain whether this type exists or not, and I shall leave it for future investigation.

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6.2 Prosodic Invisibility

Invisibility to normal tonal process is captured by various constraints and their interaction. Among them, phrase-level licensing constraints are remarkable ones that concern this study. The application of this constraint family in languages addressed in this dissertation is summarized below.

(3) Typology of prosodic invisibility

Languages	High-ranked licensing constraint	Invisible types
Sixian Hakka	ALIGN-R(Φ, Fnc≤5) ≫ ALIGN-R(XP, ϕ)	SFP
Taiwanese	ALIGN-R(ϕ, Fnc≤2) ≫ ALIGN-R(XP, ϕ)	SFP, MOD, ASP, PRO, DIR
Shanghainese	ALIGN-R(ι, Fnc≤6) ≫ ALIGN-R(ι, CLAUSE)	SFP^{AttC}, (SFP, MOD)

What we can draw from this typology is that invisibility to tonal process at phrasal level usually involves highly grammaticalized function words, which is obvious in Sixian Hakka and Shanghainese. It implies that there is correlation between sentence-final positions, high degree of grammaticalization, and invisibility.

6.3 Prosodic well-formedness

As an opposing force to the licensing constraints addressed above, prosodic well-formedness also plays an important role in the current analysis. And their significance and influence differs from one language to another. Take two of them for example — well-formedness of structural configuration and constituent size, as summarized in (4).

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(4) Structural preference: EQUALSISTERS

Languages	Ranking	Position of neutral tone
Taiwanese	EQUSIS ≫ ALIGN-R(ω, Fnc≤2)	Phrase-final only
All else	ALIGN-R(ω, Fnc≤n) ≫ EQUSIS	Phrase-final or internal

(5) Size preference: σ-WITH-Σ (E) and FOOTBINARITY

Languages	Ranking	Target of neutralization
Shanghainese	FTBIN ≫ σ-WITH-Σ (E)	Not foot-initial, Lex or Fnc
All else	σ-WITH-Σ (E) ≫ FTBIN	Fnc, outside ω

Taiwanese put more emphasis on prosodic coordination than the other languages, so neutral tones in Taiwanese are confined to phrase-final positions. On the other hand, Shanghainese prefers binary feet and therefore the application of neutral tone extends to non-initial positions in lexical categories.

The different application of neutral tones and relevant prosodizations across Chinese dialects may converge on promoted status under certain universal prosodic well-formedness, as illustrated in (6). This happens to, for example, the progressive markers (i.e. Mandarin *zai*^{4}, Taiwanese *teh*^{4}/*leh*^{4}, Shanghainese *lah*^{5}*he*^{2}), which as an aspect marker (degree 4) are supposed to be neutral-toned. Yet, this type of function words is always full-toned due to its occurrence in initial positions.

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(6) Promotion of non-prominent function words

Languages	Phrase-initial	Elsewhere
Standard Mandarin	{**(Fnc ω)** (Lex ω) ϕ}	{(Lex ω) **Fnc** … ϕ}, {(Lex ω) **Fnc** ϕ}
Taiwanese	{**(Fnc ω)** (Lex ω) ϕ}	{(Lex ω) **(Fnc ω)** … ϕ}, {(Lex ω) **Fnc** ϕ}
Shanghainese	{**(Fnc ω)** (Lex ω) ϕ}	{(Lex ω) **Fnc** … ϕ}, {(Lex ω) **Fnc** ϕ}

The promotion can be treated as forced by STRONGSTART, a prosodic markedness constraints, which disprefers prosodic constituents that begin with a sequence of two prosodic elements where the first is lower in the prosodic hierarchy than the immediately following prosodic element. Definition is as follows.

(7) STRONGSTART (after Selkirk 2011)

Assign one violation mark for every prosodic constituent whose leftmost daughter constituent is lower in the prosodic hierarchy than a sister constituent immediately to its right.

By dominating ALIGN-R(ϕ, Fnc≤1), this constraint STRONGSTART comes in effect when the function word is at initial positions of a prosodic phrase. This is shown in the following tableau. The prosodic markedness STRSTAR requires that *lah*^{5}*he*^{2} as a preverbal progressive marker be promoted to the status of ω if it is phrase-initial. By contrast, *lah*^{5}*he*^{2} as a postverbal continuant marker is prohibited from parsing into ω due to the prosodic licensing constraint ALIGN-R(ϕ, Fnc≤1), in which case STRONGSTART is irrelevant because the marker is not phrase-initial.

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(8) STRONGSTART ≫ ALIGN-R(ϕ, Fnc≤1)

a. INPUT:

[*Di*^{3}*di*^{3} NP/DP] [*lah*^{5}*he*^{2} *doh*^{5}*sy*^{1} VP/AspP]
Younger.brother PROG= study
'My brother is studying.'

CAND 1: {(σ^{Lex}σ^{Lex} ω) ϕ} {**(σ$^{Fnc>1}$σ$^{Fnc>1}$ ω)** (σ^{Lex}σ^{Lex} ω) ϕ}
CAND 2: {(σ^{Lex}σ^{Lex} ω) ϕ} { **σ$^{Fnc>1}$σ$^{Fnc>1}$** (σ^{Lex}σ^{Lex} ω) ϕ}

/INPUT/	STRSTAR	ALIGN-R (ϕ, Fnc≤1)	SP:MAX-X^{0}
➡ CAND 1		*	
CAND 2	*!		*

b. INPUT:

[*Phioa*^{2} NP/DP] [*poa*^{2}*lieu*^{3} *lah*^{5}*he*^{2} VP/AspP]
Ticket reserve =CONT
'As for the ticket, I kave kept it.'

CAND 1: {(σ^{Lex}σ^{Lex} ω) ϕ} {(σ^{Lex}σ^{Lex} ω) **(σ$^{Fnc>1}$σ$^{Fnc>1}$ ω)** ϕ}
CAND 2: {(σ^{Lex}σ^{Lex} ω) ϕ} {(σ^{Lex}σ^{Lex} ω) **σ$^{Fnc>1}$σ$^{Fnc>1}$** ϕ}

/INPUT/	STRSTAR	ALIGN-R (ϕ, Fnc≤1)	SP:MAX-X^{0}
CAND 1		*!	
➡ CAND 2			*

The same rationale is applied to pronouns, and perhaps extends to the types of function words that are always at preverbal positions, such as object markers, modals, and so on.

6.4 Summary

This chapter summarizes the typology of the constraint ranking and offers some theoretical remarks. The factorial typology predicts grammars without non-prominent function words in terms of tonal neutralization and grammars where all the types of function words are neutralized, and yet did not find them attested under the scope of

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current inquiry. Also, it predicts a correlation between high grammaticalization degree, sentence-final positions, and the status of prosodic invisibility. As for typology of prosodic structure, these languages are found to have divergent response to some of the universal prosodic well-formedness requirements, such as the preference for structural coordination and binarity in size, but tend to conform to other principles, such as the domain initial prominence implemented by the constraint STRONGSTART, which seems to be high-ranked across the languages and thus brings about a promotion asymmetry: while non-prominent words can be promoted to ω at phrase-initial positions, they fail to do so elsewhere.

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7. Conclusions

This dissertation explores the grammaticalized function words in Chinese dialects in terms of neutral tone and prosodic invisibility. It has attained two major aims, one more empirical and the other more theoretical. First, it gave a broader scope of inquiry into the types of function words that are potential to be involved in the phenomena in question, and thereby provided a unified account for not only the operation of these phenomena *per se* but also the cross-linguistic patterns of distinct classes of function words. Second, it proposed a formalized model under the framework of Optimality Theory for different prosodizations across distinct (sub)classes of function words. The major claims are presented in (1). This summary provides an overview of the content in each chapter of the dissertation and reviews the main claims one by one.

(1) a. Function words do not form a monolithic and homogeneous group in prosody. They should be divided along the scale of grammaticalization degree into at least two prosodic classes: the prominent class, which is eligible for licensing the edge of prosodic constituents at either word level or phrase level, and the non-prominent class, which does not enjoy that licensing privilege and is therefore extraprosodic at either level, being vulnerable to tonal neutralization and/or prosodic invisibility. This distinction is formalized by the schemata of constraint ranking ALIGN-R(ω, Fnc≤n) ≫ SP-MAX-X^0 and ALIGN-R(Pcat, Fnc≤n) ≫ ALIGN-R(XP, Pcat). (Chapter 2)

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b. Sixian Hakka and Cantonese have the least types of non-prominent function words — only those with the highest degree of grammaticalization, namely sentence-final particles, are subject to tonal neutralization and/or prosodic invisibility. This is analyzed employing the constraint ranking ALIGN-R(ω, Fnc≤5) ≫ SP-MAX-X^0. Besides, a further division of sentence-final particles is suggested, by which attitude particles are argued to be more grammaticalized and thus more vulnerable to prosodic attrition than the other subtypes, due to their highly subjectified status. (Chapter 3)

c. Taiwanese and Standard Mandarin each contain a large range of non-prominent function words in tonal neutralization, with the threshold set on categories with degree of grammaticalization equal to 3, hence the constraint ranking ALIGN-R(ω, Fnc≤2) ≫ SP-MAX-X^0. In Taiwanese, non-prominent words undergo tonal neutralization and prosodic invisibility only at phrase-final positions. This is because of the interaction between EQUALSISTERS, ALIGN-R(ω, Fnc≤2) and ALIGN-R(ϕ, Fnc≤2). In Standard Mandarin, non-prominent function words can be further divided into two groups according to the presence/absence of optionality for tonal neutralization — relatively lower grammaticalized function words optionally bears neutral tone, while higher grammaticalized ones always appear with neutral tone. This division is parallel to the point in tone they are grammaticalized. (Chapter 4)

d. Shanghainese can be said to be phonologically highly attrited language in that the vast majority of function words are non-prominent in terms of tonal neutralization, and that the distinction between lexical and functional categories is obscured by the neutralization of non-initial tones of lexical

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words. Both can be analyzed as a result of stress assignment and prosodic licensing, captured by two sets of constraints ranking: ALIGN-R(ω, Fnc≤1) ≫ SP-MAX-X^0 and FTBIN ≫ σ-WITH-Σ (E). Besides, Shanghainese also exhibit prosodic invisibility in highly grammaticalized word, namely, sentence-final particles. This is attained through the constraint ranking ALIGN-R(ι, Fnc≤6) ≫ ALIGN-R(ι, CLAUSE). (Chapter 5)

e. The factorial typology predicts grammars without non-prominent function words in terms of tonal neutralization and grammars where all the types of function words are neutralized, and yet did not find them attested under the scope of current inquiry. Also, it predicts a correlation between high grammaticalization degree, sentence-final positions, and the status of prosodic invisibility. As for typology of prosodic structure, these languages are found to have divergent response to some of the universal prosodic well-formedness requirements, such as the preference for structural coordination and binarity in size, but tend to conform to other principles, such as the domain initial prominence implemented by the constraint STRONGSTART, which seems to be high-ranked across the languages and thus brings about a promotion asymmetry: while non-prominent words can be promoted to ω at phrase-initial positions, they fail to do so elsewhere. (Chapter 6)

Theoretically, this dissertation contributes to the syntax-phonology interface in two respects. First, it provides a principled way for ranked interface constraints to refer to specific types or even tokens of function words. Second, it instantiates that interface between syntax and semantics/pragmatics can shed light on interface between syntax and phonology. Given the limitation of this dissertation, the impact of this two-way

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interaction remains unclear and thus deserves further research to look whether it is applicable to other languages and other types of function words.

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