

18 Prosody and Syntax

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1 Introduction

Over the course of the past 25 years, there has been a growing body of work investigating the ways in which prosody and syntax interact with each other and how aspects of phonology may match up with, reveal, and even potentially constrain aspects of syntactic structure, both synchronically, and also possibly over time; leading to syntactic change (for example, Inkelas and Zec 1988; Kawaguchi *et al.* 2006; Selkirk 1984; Zubizarreta 1988, among many others). In Chinese, there are also many interesting phenomena bearing on the connections established between syntax and prosodic structure and how and to what degree syntax-prosody mappings may be direct or indirect, and also how and why mismatches between syntax and prosody seem to occur. A considerable part of this chapter focuses on the special prosodic information provided by tone sandhi patterns in Chinese, and what aspects of syntactic structure may or may not determine and be revealed by tone sandhi outputs and domains, examining three rather different systems found in Wu, Hokkien, and Mandarin varieties of Chinese. It will be seen that, in various instances, prosodic patterns may actually lead to certain interesting conclusions about hypothetical underlying syntactic structures. In later sections, the chapter will also consider the issue of nuclear stress in Chinese and its potential interaction with focus structures, as well as prosodic constraints relating to disyllabicity which have been argued to impose filters on syntactic and lexical structures and longitudinally direct the course of certain syntactic changes in Chinese.

2 Chinese tone sandhi and its relation to syntactic structure

A particularly rich and distinctive area of the linguistics of Chinese is the occurrence of tone sandhi systems present in many varieties of Chinese (see Chapter 17). A consideration of the different ways that tonal modifications are implemented in sequences of syllables in different forms of Chinese can provide important insights into general issues of syntax-phonology connectivity and the degree to which syntax may intrude into and be mirrored in phonological processes, as well as arguments for the existence and dominance of independent prosodic structures. In Section 2.1, we first begin with a look at tone sandhi patterns in a Wu dialect, as described and analyzed in some depth by Selkirk and Shen (1990) in a left-edge-based account of Shanghai Chinese that distinguishes two significant prosodic levels. Then in Section 2.2 we consider a range of complex sandhi phenomena in Hokkien and what kind of right-edge-based model may best be able to capture the attested patterns. Following this, Section 2.3 offers an overview of the challenging patterns of third tone sandhi in Mandarin, which are less syntactically transparent than sandhi patterns in either Hokkien or Wu.

2.1 *Wu dialect: Shanghai Chinese*

Selkirk and Shen (1990) show how the underlying lexical tones of syllables in words in Shanghai Chinese undergo modification and change to a sandhi tone in various environments. First they report how tone sandhi occurs within the syllables of compound words, then they describe how sandhi affects sequences of words. It is argued that an end-based approach is most suited to capture the tone sandhi (TS) phenomenon in Shanghai Chinese, and that TS modifications are sensitive to two levels of prosodic structure: (i) Prosodic Words/PWs, and (ii) Major Phrases/MaPs. Quite generally, there are many instances in which a sequence of elements clustering together in a single sandhi-defined unit does not seem to correspond to a syntactic constituent. However, syntactic structure does play some role in the way that MaPs are defined, and so syntax is held to *indirectly* constrain the application of TS.

In Shanghai Chinese all syllables have some lexical “underlying” tone. Sometimes this tonal value will surface and be the overt pronunciation of the syllable. Other times, a syllable’s tone may be subject to modification and tone sandhi. There are three underlying tones in Shanghai Chinese, all of which are rising or falling contour tones: Low-to-High/LH, Mid-level-to-High/MH, and High-to-Low/HL. In nominal compounds composed of two syllables, it is found that the second syllable loses its underlying tone, undergoing Obligatory Tone Deletion/OTD, and the tone of the first syllable is spread to the second syllable, as illustrated in (1):

- | | | | | |
|-----|-----|------|---|----------|
| (1) | HL | MH | → | H L |
| | thi | tshi | | thi-tshi |
| | sky | air | | weather |

Where there are three syllables in a compound, the second and third syllables undergo OTD, the tone of the first syllable spreads to the second syllable, and a default L tone is inserted onto the third syllable:

- (2) a. MH HL LH b. M H L
 sou foN dziN → sou foN dziN
 hand wind organ hand wind organ
 "accordion"

Parallel tone sandhi phenomena also occur in sequences of words that involve a lexical word – a noun, adjective, or verb – and any number of immediately following grammatical words/morphemes. The N/Adj/V spreads its tone to the grammatical morpheme which immediately follows it, and a default L tone is inserted on all other following functional words until a new lexical word N/Adj/V occurs:

- (3) a. V Asp Pronoun Q-Prt b. V Asp Pron Q-Prt
 LH MH LH LH → L H L L
 mo ku noN va mo ku noN va
 "(Has someone) scolded you?"

Such sequences of words/morphemes are created "in the syntax," by syntactic combinations, and so tone sandhi here is most certainly a post-lexical operation, applying to the output of syntactic operations. Selkirk and Shen suggest that the sequences of lexical element + grammatical words that form a tone sandhi domain in clusters such as (3) constitute "Prosodic Words" (PWs). Sometimes, it appears that the PW which comprises a sandhi domain does not correspond to any obvious syntactic constituent. In (4) below, the object noun and the sentence-final aspectual-particle create a tone sandhi domain/PW, as indicated via the bracketing, but do not constitute a single syntactic constituent – the aspectual particle takes scope over the whole VP and does not just combine with the object NP. Note that the tones represented above the syllables are the surface output tones, following sandhi modification (as in (4) and other examples in which a single line of tonal values occur).

- (4) (V) (N Prt)
 MH L H
 taN mo leq
 "has hit the horse"

Similarly in (5), the PW phrasing of the possessor of the object together with the preceding verb does not correspond to any regular syntactic constituency, yet sandhi patterns indicate that the verb and following pronoun make up a single sandhi domain.

- (5) a. (V Pronoun) (N)
 M H L H
 taN ngu nji-tsz
 "hit my son"

Selkirk and Shen propose that PWs in Shanghai Chinese are defined by their left edge, which must be a lexical category of type N, Adj, or V. Any word of such a category will constitute the beginning of a new PW, triggering sandhi phenomena in all following grammatical words until the occurrence of another N, Adj, or V. It is assumed that the post-lexical occurrence of tone sandhi will also apply to tones present inside words/compounds, hence that no repetition of sandhi rules is necessary for compounds within the lexicon.

Interesting additional complications in the patterning of tone sandhi in Shanghai Chinese result from the introduction of focus into sentences. Following a focus, it is found that a Low tone may be substituted for the tone that might otherwise occur on a syllable. However, the substitution of post-focus Low tones does not apply to all words/syllables following a focus, but only to those occurring within the same "Major Phrase/MaP" as the focus. Major Phrases/MaPs are characterized by Selkirk and Shen as constituting higher level prosodic domains than Prosodic Words, and are left-aligned with the maximal projection boundary of a lexical category: VP, NP, or AdjP.

Consider example (6), with focus occurring inside a noun-phrase. As seen in (e), a focus on the initial adjective *oN* "red" results in L-tone substitution throughout the rest of the NP, on all syllables following "red" (with the exception of the linking particle *geq* directly following *oN*, which undergoes OTD and tonal spreading from *oN*). This leads to the conclusion that the whole NP is a MaP, as indicated by the bracketing in (b). In (f), by way of contrast, the medial noun *ho* "flowers" is focused. This results in L-tone substitution on all syllables following the focus (and its linking particle *geq*) until the end of the NP, but does not affect the tones of syllables within the NP which precede the focus.

(6) "seeds of red flowers":

[[[red] flowers"] seeds]					Syntactic constituency
	<i>oN</i>	<i>geq</i>	<i>ho</i>	<i>geq</i>	<i>tsz</i>
a.	Adj	Prt	N	Prt	N
b.	()				Major Phrases/MaPs
c.	LH	LM	HL	LM	MH
	Underlying tones				
d.	(L	H)	(H	L)	(MH)
	Normal TS output of PWs (no focus)				
e.	(L	H)	(L	L)	(L)
	TS patterns due focus of <u><i>oN</i></u> "RED"				
	<u><i>oN</i></u>	<i>geq</i>	<i>ho</i>	<i>geq</i>	<i>tsz</i>
f.	(L	H)	(H	L)	(L)
	TS due focus of <u><i>ho</i></u> "FLOWERS"				
	<i>oN</i>	<i>geq</i>	<u><i>ho</i></u>	<i>geq</i>	<i>tsz</i>

Sometimes the patterning of focus and L-tone substitution leads to the conclusion that MaPs do not correspond to syntactic constituents, even though their left edge must align with the left edge of an XP. Consider (7):

(7) "walk towards the sea"

[_{VP}	[_{PP}	towards	sea]	walk]]	Syntactic constituency
		<i>zaw</i>	<i>he</i>	<i>tsou</i>	

a.	P	N	V	
b.	()	()		Major Phrases/MaPs
c.	LH	MH	MH	Underlying tones
d.	(LH)	(MH)	(MH)	Normal output of PWs (no focus)
e.	(LH)	(MH)	(L)	TS patterns due focus of <u>he</u> "SEA"
	<u>zaw</u>	<u>he</u>	<u>tsou</u>	
f.	(LH)	(MH)	(MH)	TS patterns due focus of <u>zaw</u> "TOWARDS"
	<u>zaw</u>	he	tsou	

First note that when *he* "sea" is focused in (e), this results in L-tone substitution in the following verb *tsou* "walk." The focus-domain MaP is therefore a larger domain than that of PWs, as both *he* and *tsou* otherwise pattern as independent PWs – see (d). Observing the effects of focusing *he* leads to the conclusion that *he* and *tsou* occur in the same MaP, as represented in (b). This is further supported by the patterning in (f), where *zaw* "towards" is focused. Here, the focus on "towards" does not result in L-tone substitution on the following noun *he*, indicating that *zaw* and *he* do not occur in a single MaP, and that the MaP bracketing in (b) is correct. Significantly, the MaP division in (b) does not match up with the syntactic structure of (7), in which a PP made up of the P *zaw* and the NP *he* precedes the V *tsou*: [_{VP} [_{PP} *zaw he*] *tsou*]].

Selkirk and Shen also consider certain apparent puzzles relating to tone sandhi patterns in Shanghai Chinese, and how they may be resolved by hypothesizing hierarchical interactions between MaPs and the formation of PWs. One "puzzle" concerns examples (8) and (9). In both of these examples there is the same linear sequence of words: *z laq zaw-Nhe* "live/be in Shanghai," yet (8) and (9) result in a different PW phrasing of the same words. In (8), there is tone spreading from the verb *z* "be/live" to the linearly adjacent preposition *laq* "in" – (c), indicating that the V and P form a PW, as indicated in the bracketing in (c). In (9), however, (c) indicates that the V and the following P are not phrased together as a single PW – there is no tone spreading, and the P retains its underlying LH tone. This is unexpected from the point of view of PW-formation, which otherwise regularly phrases the linear sequence of a functional/grammatical morpheme (such as a preposition) with any preceding lexical category (N, Adj, or V). As the syntactic structures of (8) and (9) are significantly different, Selkirk and Shen suggest that it must be assumed that the structural embedding of the P in (8) and (9) somehow does come to influence the construction of PWs in these examples.

(8) "live in Shanghai"

	[_{VP}	<i>z</i>	[_{PP}	<i>laq</i>	[<i>zaw-Nhe</i>]]]	Syntactic constituency
		<i>be</i>		<i>in</i>	<i>Shanghai</i>	
		<i>z</i>		<i>laq</i>	<i>zaw-Nhe</i>	
a.	V		P	N		
b.	()	()		Major Phrases/MaPs
c.	(L		H)	(L H)		PWs and TS

(9) "is the son (who is) in Shanghai"

[_{VP} z [_{NP} [[_{PP} laq zaw-Nhe] geq] nji-tsz]] Syntactic constituency

be in Shanghai Prt son

a. V	P	N	Prt	N
z	laq	zaw-Nhe	geq	nji-tsz

b. ()	()	()	()	Major Phrases/MaPs
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c. (LH)	(LH)	(L H	L)	(L H)	PWs and TS
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While the PW mapping algorithm, that grammatical words are phrased with immediately preceding lexical words, regularly appears to be blind to syntactic structure, Selkirk and Shen note that a different sensitivity to structural constituents is present at the higher prosodic level of MaPs – the MaP mapping rule makes critical reference to the edges of *maximal projections*/XPs which are headed by lexical categories (NP, AdjP, VP), hence coherent syntactic constituents rather than just X^0 -level sequences of words. If we now consider the syntactic structures of (8) and (9), and the position of the P in both instances, in (8) there is a PP boundary to the left edge of the P. As PPs do not count as lexical categories for MaP formation, the division of (8) into MaPs is as in (b) in (8), and this matches the division of the three words caused by the PW mapping rules shown in (c). Now consider example (9). Here, the P *laq* is inside an NP constituent, and there is an NP boundary to the left of the P. This means that a new MaP should begin at the P, resulting in the MaP phrasing in (b). The hypothesis that the P in (9) is not part of the same MaP as the preceding V is confirmed by the patterning of tone sandhi under focus conditions. When the V is focused as in (10), this does not result in L-tone substitution on the following P, indicating that the P is part of a separate MaP.

(10) (LH)	(LH)	(L H	L)	(L H)	Focus of the verb <u>z</u> "be"
<u>z</u>	laq	zaw-Nhe	geq	nji-tsz	

Hence with (9), the phrasing of MaPs will result in the V and the P being in different MaPs. With regard to PW formation, the regular PW mapping algorithm is expected to cause V and P to be phrased together as a single PW, as represented in (11c):

(11) "is the son (who is) in Shanghai"

[is [[[_{PP} in Shanghai] Prt] son]] Chinese linear order and constituency

a. V	P	N	Prt	N
z	laq	zaw-Nhe	geq	nji-tsz

b. ()	()	()	()	Major Phrases/MaPs
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c. (LH	LH)	(L H	L)	(L H)	"Expected" output of PWs and TS
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d. (LH)	(LH)	(L H	L)	(L H)	Actual output of PWs and TS
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Selkirk and Shen suggest that the regular application of the MaP and PW phrasing rules represented in (b) and (c) in (11) results in an ill-formed prosodic structure

which violates the Strict Layer Hypothesis/SLH (Selkirk 1984), that elements from lower prosodic levels must be exhaustively included in some higher level prosodic unit. In the expected output shown in (11c), this does not occur, as the PW which should be formed by the V and P in (c) is not contained within any single MaP, and instead is partly in the first MaP and partly in the second MaP. The regular application of the PW and MaP rules therefore results in a situation of conflict which has to be resolved somehow, to avoid a violation of the SLH. Selkirk and Shen propose that in such a situation, there is a Top Down Effect, and the higher level prosodic tier imposes a re-phrasing of lower level prosodic constituents that will accord with the phrasing in the higher level and not violate the SLH. It is suggested that as both of the V and the P project an MaP, this forces the introduction of a PW boundary in a position where it would otherwise not occur, between the V and P, so that these also both constitute distinct PWs, as attested by the tone sandhi patterns shown in (9c) (11d). Factors relating to phrasing of the MaP tier therefore cause the "puzzling" division of V and P in (9) into two PWs, even though the same sequence of words are phrased as one PW in example (8). Selkirk and Shen show that there are also other patterns in Shanghai Chinese which support the hypothesis of a Top Down Effect and which can also be analyzed as resulting from a phrasing "pressure from above" (see Selkirk and Shen 1990: 334–335).

In sum then, the complex set of patterns of tone sandhi found in Shanghai Chinese and discussed by Selkirk and Shen (1990) support the existence of two levels of hierarchically-organized prosodic structure relevant for tone sandhi (and quite possibly other phonological processes). The constituents projected on these levels, Prosodic Words and Major Phrases, are both left-edged. Prosodic Words are composed via the "flat," linear concatenation of X^0 word-level elements, and group functional elements with lexical elements in small clusters which may often not mirror any underlying syntactic organization and constituency. Major Phrases are frequently larger constituents that are formed with reference to maximal projections/XPs, and, because of this, offer more of a reflection of and window into underlying syntax, though only insofar that the occurrence of MaPs identifies the left edge of lexical XPs in a syntactic structure. Both levels of prosodic organization are taken to critically distinguish lexical from functional categories in the formation of prosodic units/tone sandhi domains.

2.2 *Hokkien*

Tone sandhi in Hokkien shows a significantly different patterning from that in Wu varieties of Chinese.¹ Whereas sandhi domains in Wu dialects such as Shanghai Chinese are left-edged, and tone sandhi causes the tone of the leftmost element to spread its tone rightwards replacing the underlying tones of following syllables (or causing Low tone substitution), sandhi domains in Hokkien are right-edged, and there is no tonal spreading from the element on the right edge to adjacent syllables. Instead, syllables which occur at the right edge of an XP maintain their underlying lexical/citation tone, and all other elements preceding this syllable

undergo tonal modification, shifting from their citation tone into a sandhi tone according to fully regular conversion rules for each particular tone, as illustrated in (12), for the Taiwanese variety of Hokkien:

(12) **Tone sandhi changes in Taiwanese**

1	→	7	5	→	7/3 (south/north Taiwan);
2	→	1	6	→	1
3	→	2	7	→	3
4	→	2/8	8	→	3/4

The broad generalization for Hokkien is therefore that: *an absence of tone sandhi in a syllable marks the right edge of an XP*, and elsewhere tone sandhi regularly occurs. Given the right-branching nature of much of clausal structure in Chinese, the absence of tone sandhi occurring in a syllable naturally coincides with various major syntactic junctures and signals the right edge of constituents such as Specifiers, XP adjuncts, and the end of embedded clauses and sentences. In contrast with this, the positive occurrence of tone sandhi in a word can be interpreted as indicating the lack of any following XP boundary and hence that the word occurs in a head-complement relation with the overt material following it. Tone sandhi patterns in Hokkien thus have the potential to reveal and signal much of the syntactic structure projected in this variety of Chinese, and can therefore be used as a potential means to probe underlying syntactic structure, as will be presently shown. Example (13) illustrates the occurrence of tone sandhi on all but the final syllable preceding an XP boundary in a two clause structure. Tone sandhi fails to occur on: (i) the final syllable of the subjects in Specifier positions, (ii) the final syllable of the conditional clause, an adjunct XP, and (iii) the final syllable of the main clause/sentence. Note that for simplicity of representation, the occurrence of tone sandhi in a syllable will be indicated by means of a simple bolded dot following the relevant syllable and the non-occurrence of tone sandhi by a hash-sign # following a syllable. Such symbols therefore represent the right-edge end of tone sandhi domains.

- (13) na•si• A•sin m• khi #, A•hui # ma• be• khi #
 if Asin neg go Ahui also neg go
 ‘‘If Asin is not going, Ahui will also not go.’’

As with Selkirk and Shen’s study of Shanghai Chinese, to some considerable extent it is the apparent oddities of tone sandhi patterning in Hokkien that turn out to be especially informative, challenging, and potentially revealing. Here we will consider a number of syntactic phenomena that may be thrown into clearer light (or controversy) by the observation of the sandhi changes that occur.

With regard to *adverbs*, interesting patterns and discoveries have been made in Hokkien. In various analyses of Hokkien tone sandhi, the variable behavior of tone sandhi found in adverbs has been a major factor in the creation of hypotheses about the mapping of tone sandhi to syntactic structure (e.g., Chen 1987; Lin 1994).

What has been observed is that, intriguingly, some adverbs do not exhibit tone sandhi (in their final syllable), while others do. Examples are provided in (14) and (15).

- (14) A•sin # kai•-tsai # tse• tsit• pan• ki #.
 A-sin fortunately take this CL flight
 "Fortunately, A-sin is taking this flight."
- (15) A•sin # siong• bo• kao• se #.
 A-sin often not pay tax
 "A-sin often didn't pay taxes."

The expectation that one might have, given what is commonly assumed about the syntax of adverbs as either XP-adjuncts or XPs in Specifier positions, is that the final syllable of adverbs as AdvPs would uniformly not undergo tone sandhi marking the right edge of an XP. It is therefore surprising to find that some adverbs do show tone sandhi in their final syllable. The generalization over the data emerging from Chen (1987), Lin (1994), and other earlier work is that adverbs that regularly do not show tone sandhi in their final syllable (i.e., the "expected" case) are sentential level adverbs, whereas those which do surprisingly show sandhi modifications are regularly lower VP-level or subject-oriented adverbs. While Chen (1987) and Lin (1994) offer analyses of this difference in terms of lexical government and c-command of the adverbs by either functional or lexical heads, a more recent, simple characterization of the differential behavior is articulated in Soh (2001), where it is convincingly argued that some adverbs are XP phrases, and others are X^0 heads, developing earlier work on Mandarin adverbs in Fu (1994). Those which project XPs are argued to show the expected patterning that tone sandhi fails to occur in their final syllable, while adverbs that are simply X^0 heads in the main projection line of the clause automatically undergo tone sandhi, as they do not occur at the right edge of any XP. Independent support for such an analysis comes from observations relating to the modification of an adverb with intensifiers, and the addition of particle-like elements following adverbs. In considering Mandarin Chinese, Fu (1994) suggests that if an adverb can be modified by another adverb (such as *hen* "very"), it must be a phrase, and otherwise it may be a head. Fu argues that VP-adverbs in Mandarin are heads when not followed by the particle *de*, and phrases when this marker does occur. It is noted that when *de* does not occur with the adverb, it is not possible to modify an adverb with intensifiers such as *hen* "very," but when *de* does occur, modification is permitted. The same patterns are found in Hokkien with the modification marker *E*. In (16) there is no *E* marker, and the adverb cannot be modified with *ia* "very." In (17) *E* occurs, and the adverb can be modified:

- (16) A•sin # laosit•/*ia• laosit•/# ka• li # kong #
 A-sin honest/very honest with you speak
 "A-sin is speaking honestly/very honestly with you."

- (17) A•sin # laosit•/ia• laosit # E• ka• li # kong #
 A-sin **honest/very honest** Prt with you speak
 "A-sin is speaking honestly/very honestly with you."

Attention should now be paid to the tone sandhi patterns in (16) and (17). In (16), the bare adverb *laosit* undergoes tone sandhi, consistent with it being an X^0 head and not projecting an AdvP maximal projection with an XP boundary. However, in (17), when the occurrence of *E* and *ia* indicate that the adverb is an XP phrase *ia laosit E*, the adverb *laosit* no longer undergoes tone sandhi, clearly suggesting that in this occurrence it occurs at the right edge of an XP. Note also that *E* in (17) itself undergoes tone sandhi, suggesting that it is a head in the main projection line and not at the right edge of any XP. The general conclusions drawn from these patterns are:

- (18) (i) Adverbs may sometimes occur as XPs and sometimes occur as X^0 heads.
 (ii) When adverbs occur as XPs, they occur in the Specifier of a projection whose head position is located in the main projection line of a clause (occupied by *E* in Hokkien).

Conclusion (ii) adds good support to Cinque's (1999) theory of adverbs, that adverbs occur in the Specifiers of functional projections in the main projection line of a clause, and are not XP adjuncts. Conclusion (i) suggests that adverbs are not always in such positions, and may also occur in head positions. This conclusion can be naturally accommodated in Cinque's theory, which assumes that the Specifier and head position of functional projections housing adverbs have the same semantic content, hence it might be natural if in some languages either of these positions could be lexicalized with the same overt material.

A related, interesting pattern has been observed with the Hokkien adverbial element *long-tsong*. Chen (1987) notes that this adverb may have two somewhat different meanings, and that these meanings are associated with different tone sandhi patterns. First, as illustrated in (19), *long-tsong* can mean "all" with the specific interpretation "altogether." With such an interpretation, *long-tsong* patterns like an XP adverb-phrase, failing to show tone sandhi in its final syllable:

- (19) tsit• sah• pun• tseq # long•-tsong # tsap• koo #
 this three CL book all 10 dollars
 "Altogether these three books cost \$10."

However, *long-tsong* can occur in the same sentence and mean "each." When this occurs, the tone sandhi patterns are different, and *long-tsong* patterns like an X^0 head exhibiting tone sandhi in its final syllable, as illustrated in (20):

- (20) tsit• sah• pun• tseq # long•-tsong• tsap• koo #
 this three CL book all 10 dollars
 "These three books each cost \$10."

Hence, the single element *long-tsong* seems able to occur in either Specifier or head positions, and although some kind of common core meaning can be suggested to underlie the occurrence of *long-tsong* in both positions, there is also some semantic variation in its function in the sentence – in the head position *long-tsong* has a distributive reading “each,” in the Specifier a collective reading “altogether.” Cinque’s (1999) theory of adverbs assumes that the Specifiers and the heads of functional projections regularly share a common meaning. Here with *long-tsong* it is seen that some variation relating to a core/related meaning may seem to be possible in the Specifier and head position. One may speculate that the collective vs. distributive distinction can be viewed as mutually exclusive values of the meaning associated with a single functional projection, in the same way that interrogative vs. declarative may be possible values of a single functional projection in the C-domain.

Tone sandhi patterns in Hokkien are also helpful in probing the underlying syntax of *adjectives*. In Hokkien and other varieties of Chinese, it is possible for pre-nominal adjectives to occur in two distinct positions relative to a demonstrative and classifier, as schematized in (21):

- (21) a. Dem Cl Adj N b. Adj Dem Cl N

Considering the tone sandhi patterns in such sequences results in the conclusion that an adjective in the immediate pre-N position (sequence (a)) is in a head position in the main projection line of the DP/NP – it undergoes tone sandhi, which clearly suggests that there is no AdjP/XP boundary following the adjective, hence it is not in a Specifier or XP-adjoined position. The data in (22a) and (22b) and the relevant observations are from Lin (1994):

- (22) a. m•-tang• tsiaq• hit• liap• **tseng•sik•** lingo #
 don’t eat that Cl **green** apple
 b. m•-tang• tsiaq• **tseng•sik#** hit• liap• lingo #
 don’t eat **green** that Cl apple
 “Don’t eat that green apple.”

Such a patterning might seem to support an analysis of bare pre-nominal adjectives as occurring in the heads of functional projections in Hokkien, the lowest of which will select for NP as its complement. In previous work on adjectival modification in Romance languages, it has been suggested that adjectives project as AdjP maximal projections in the Specifier of Agreement Phrases (see Giusti 1997 among others). Patterns of tone sandhi would appear to suggest that Hokkien (and perhaps other varieties of Chinese) allow for adjectives to occur as the heads of these projections, just as adverbs may occur as the heads of clausal functional projections.

Turning to the sequencing in (21b) and the occurrence of adjectives in a position preceding a demonstrative, interestingly a different tone sandhi pattern is observed. As shown in (22b), in the pre-demonstrative position, adjectives do not

undergo tone sandhi, and so show the properties of being full AdjP phrases, which potentially might occur either in a Specifier or XP-adjoined position. In either such a position, the right edge of the AdjP will naturally result in the non-occurrence of tone sandhi, marking the edge of the sandhi domain. Adjectives in Hokkien thus seem to be associated with two different forms of syntactic projection, either occurring as X^0 -heads in the immediate pre-nominal position, or projecting as AdjP phrases when in higher DP-related positions.²

Pursuing further the assumptions that (i) the lack of tone sandhi in a syllable signals the right edge of an XP, and (ii) the occurrence of tone sandhi in the final syllable of a word indicates the absence of any XP boundary, hence what follows the word is in a complement relation to it as a head, the structural status of a range of other elements can potentially be clarified in Hokkien (and therefore perhaps in other varieties of Chinese too). Within the DP domain, a consideration of sandhi patterns suggests that demonstratives, classifiers, and numerals all occur in the head positions of functional projections which combine with each other in a hierarchical head-complement manner: [_{DP} Dem [_{NumP} Num [_{ClP} Cl [_{NP} N]]]]. As illustrated in example (20), demonstratives, numerals, and classifiers all undergo tone sandhi, clearly suggesting that they do not occur in either Specifier or XP-adjunction structures, where the projection of the right edge of an XP might naturally be expected to result in the absence of tone sandhi in such elements. Such patterns might therefore appear to be evidence against recent suggestions that numerals may regularly project as XPs in Specifier or phrasal adjunct positions, or that demonstratives occur in Specifier positions (e.g., SpecDP). Perhaps the only way to sidestep such conclusions would be to suggest that demonstratives, numerals, and classifiers are all functional-grammatical elements and that either (i) only the right edges of *lexical* XPs are signaled by the absence of tone sandhi (hence if numerals project as XPs in the Specifier of a NumP they will not cause a right-edge effect, being "grammatical" XPs), or (ii) all functional-grammatical elements necessarily cliticize rightwards to a following lexical element, forming a clitic group, and therefore never instantiate separate sandhi domains with distinct right edges signaled by a lack of tone sandhi. However, it is actually not true that functional-grammatical elements always fail to signal the right edge of the "functional" XP they occur in. For example, when the Hokkien nominal "linker" element *E* (equivalent to Mandarin *de*) is followed by an overt NP, it undergoes tone sandhi, but when the NP is elided, *E* fails to show tone sandhi and marks the right edge of the functional-grammatical projection it occurs in, as illustrated in (23) from Chen (1987):

- (23) [gua• ti• oq•tng # tak #] E # ke• bue•ki loo #
 I at school study E all forget Asp
 'I've forgotten whatever I learned in school."

Second, if there is any independent appearance of cliticization among demonstratives, numerals, and classifiers from the occurrence of potential pauses between such elements, it would suggest that the closest linking is between classifiers and numerals, with classifiers attaching leftwards as enclitics to numerals rather than

attaching rightwards as proclitics to following nouns. The possibility that demonstratives, numerals, and classifiers are all proclitics attaching rightwards to a noun host consequently does not seem to be well-supported. Finally, the hypothesis that numerals in Hokkien are grammatical elements and so for this reason would not project any distinct sandhi domain does not accord well with sandhi patterns found with parallel elements in Shanghai Chinese. In this variety of Chinese, numerals clearly do instantiate the left edge of new sandhi domains/Prosodic Words, and are not cliticized to the preceding verb, unlike the grouping of other “grammatical” elements with preceding lexical words. This is illustrated in (24) from Selkirk and Shen (1984), where (c) shows *ljaN* “two” forming the beginning of a new Prosodic Word, hence patterning as a “lexical” element.

(24) “buy two books”

- | | | | | | |
|----|------|-------|------|----|----------------------|
| a. | V | Q | CL | N | |
| | ma | ljaN | peN | sz | |
| b. | () | () | | | Major Phrases/MaPs |
| c. | (LH) | (L H) | (HL) | | Output of PWs and TS |

Investigation of tone sandhi patterns in Hokkien (and their comparison with sandhi in other varieties of Chinese) therefore has the potential to shed interesting light on the structural way that elements combine with each other, and may usefully help decide between competing syntactic analyses, if alternative analyses of the sandhi patterns can effectively be excluded. Various other tone sandhi-based analyses of syntactic structures have been attempted in the literature, for example, Wu (2004) suggests that the syntactic status of the nominal linker element *E* as a functional head is supported by the tone sandhi patterns found in relative clause structures in the Taiwanese variety of Hokkien (see also Li 2012), and Simpson and Wu (2001) offer an analysis of the Taiwanese sentence-final particle *kong* based partly on its sandhi behavior (for discussion of this element and its unusual tone sandhi pattern, see also Chapter 7).

A final paradigm relating to both Hokkien and Shanghai Chinese that will be mentioned here concerns the phrasing of nominal structures involving quantifiers in object-of-verb position. Above it was noted that in Shanghai Chinese, the presence of a numeral quantifier results in the initiation of a new Prosodic Word and MaP – example (24). In this way, numerals pattern like other strong quantifiers, such as demonstratives and universal quantifiers, which similarly initiate new Prosodic Words/MaPs (hence such elements should, it seems, be considered lexical rather than grammatical morphemes in Selkirk and Shen’s approach). Other quantifiers show a different pattern, and elements corresponding in meaning to an indefinite article and the English quantifier “some” are phrased in the same Prosodic Word and MaP as the preceding verb, as shown in (25):³

(25) “buy some books”

- | | | | | | |
|----|-------|------|------|----|----------------------|
| a. | V | Q | CL | N | |
| | ma | ljaN | peN | sz | |
| b. | () | | | | Major Phrases/MaPs |
| c. | (L H) | (L) | (HL) | | Output of PWs and TS |

In Hokkien, a parallel patterning has been observed to occur in situations where the noun within a quantified object nominal is elided or topicalized leaving a sequence of quantifier+classifier following the verb, as shown in (26) (Chen 1987; Soh 2001).

- (26) A•sin # ai• buey• nung•-liap•/# lai• tsiaq #
 A-sin want buy two-CL come eat
 "He wants to buy some/two to eat."

It is reported that if the element *nung* is interpreted as meaning "some," no right-edge sandhi break is signaled by the object (the classifier does undergo tone sandhi), whereas if *nung* is interpreted as meaning "two," the classifier following it does not undergo tone sandhi, and therefore does signal the right edge of a tone sandhi domain. Such patterns in Shanghai Chinese and Hokkien are challenging to model in a uniform way, due to the fact that tone sandhi domains in the former variety are anchored at their left edges, while those in Hokkien are right edged. Soh (2001) points out that the natural mode of analysis of the Shanghai Chinese patterns open to Selkirk and Shen, in which quantifiers occurring on the left edge of an object may be taken to result in a new TS domain depending on their lexical or grammatical nature, will not extend straightforwardly to account for Hokkien. In Hokkien, it appears that the choice of quantifier on the left edge of a nominal somehow has effects on the phrasing of its right edge, and the occurrence of tone sandhi in the classifier. Readers are referred to Soh (2001) for details of the unified analysis developed there, which argues that lexical/grammatical distinctions are actually not relevant for tone sandhi phenomena, and that sandhi patterns may be sensitive to more finely-tuned aspects of interpretation, such as in/definiteness distinctions and the syntactic structures produced by DP-internal quantifier movement. What is important to emphasize here is that the comparative investigation of seemingly related tone sandhi patterns in different varieties of Chinese opens up interesting general questions and challenges, for example the following: (i) Is it possible to arrive at broadly unified, parsimonious analyses of tone sandhi phenomena in different varieties of Chinese? (ii) Given differences which seem to exist in the tone sandhi systems in Chinese, is it in fact desirable and justified to aim for fully unified analyses? (iii) What specific kinds of information are and can be accessed by the prosodic phrasing of tone sandhi groups? (iv) To what degree is syntactic structure mirrored and referenced by prosodic organization, and are prosodic events in certain languages/varieties a closer reflection of syntax than in others?

Before we move on to consider other potential manifestations of prosodic phenomena in Chinese and the ways they may link up with syntax, we will close this section with a brief overview of a third system of tone sandhi which is sometimes viewed as more difficult to analyze and model than both Shanghai Chinese and Hokkien – the third-tone sandhi phenomena found in Mandarin Chinese.

2.3 Mandarin Chinese

In sequences of two third-tone syllables in Mandarin, the first, underlyingly, third-tone syllable may be overtly realized with a second tone in a process of sandhi conversion. Given the observations noted above that sandhi phenomena reveal major syntactic junctures in Hokkien, and that sandhi-relevant Major Phrase formation in Shanghai Chinese is sensitive to constituent structure at the XP level, signaling the left edges of lexical maximal projections, it is natural to consider whether Mandarin third-tone sandhi patterns serve as any kind of reflection and reliable mirror of underlying syntactic structure or not.

In Cheng (1973), the position is adopted that the occurrence of third-tone sandhi is indeed determined by syntactic structure, applying in a cyclic fashion. It is suggested that the sandhi rule first applies to the smallest, most deeply embedded, syntactic phrases in a structure, and then applies to progressively larger phrases, fully observing (and revealing) syntactic constituency. Many subsequent approaches to third-tone sandhi, however, have argued that patterns of third-tone sandhi in Mandarin are more varied and complex than would be expected from Cheng's purely syntactic analysis and that a more nuanced account incorporating other non-structural constraints needs to be adopted. One point that is frequently made is that there may often be more than one surface sandhi output available from the sequencing of two or more underlying third tones, as illustrated in (27) from Shih (1997), and that any fully strict and rigid syntax-to-tone sandhi mapping algorithm will not capture this optional variation.

(27) "Lao Li buys good wine."

Lao	Li	buy	good	wine	
Lao	Li	mai	hao	jiu	
3	3	3	3	3	underlying tones
(2	3)	(3)	(2	3)	possible surface sandhi output
(2	2	3)	(2	3)	possible surface sandhi output
(2	3)	(2	2	3)	possible surface sandhi output

Second, it is noted that third-tone sandhi phenomena and the division of elements into sandhi domains occurs in "flat" sequences of syllables that have no underlying hierarchical structure, as in the list of elements in (28) from Zhang (1997):

(28)	horse	dog	tiger	mouse	bird	
	ma	gou	hu	shu	niao	
	3	3	3	3	3	underlying tones
	(2	3)	(2	2	3)	possible surface output
	(2	2	3)	(2	3)	possible surface output

Third, there are frequent instances where third-tone sandhi is possible across a major syntactic juncture, and tone sandhi is not blocked by the presence of an

underlying major break in syntactic structure, as for example between the subject and predicate of a sentence. In example (29), where all syllables have an underlying tone 3, the verb naturally causes tone sandhi on the preceding subject, and tone sandhi also occurs within the object. This results in the division of the sentence into two tone sandhi domains, as indicated by the bracketing added. Not only does the first sandhi domain cross a major syntactic juncture, and hence fail to signal a subject NP-VP break as would be marked by tone sandhi in both Hokkien and Shanghai Chinese, but this first sandhi domain consisting of subject and verb (but excluding the object) does not correspond to any syntactic constituent. The formation of tone sandhi domains within which third-tone sandhi occurs therefore does not seem to mirror or be determined by syntax in such cases.

- (29) "Dogs bite Xiao Mei." (Chen 1987)
- | | | | | |
|-----|-----|------|-----|------------------|
| dog | bit | Xiao | Mei | |
| gou | yao | Xiao | Mei | |
| 3 | 3 | 3 | 3 | underlying tones |
| (2 | 3) | (2 | 3) | surface output |

Similarly in example (30), the division of the sentence into two sandhi domains does not mirror the underlying syntactic structure in any natural way and there is phrasing of the final syllable of the subject together with the predicative adjective. Were third-tone sandhi phrasing to be directly dictated by syntactic structure, one might instead expect the three syllables of the subject in (30) to form one sandhi domain, and the predicate to form a separate sandhi domain, in which case the output of tone sandhi would be the sequence: (2 2 3) (3). As Shih (1997: 94) writes: "... the formation of prosodic feet [resulting in the occurrence of tone sandhi] ... can ignore very deep syntactic junctures, and give rise to apparent discrepancies between prosodic structure and surface syntactic structure."

- (30) "Which kind of wine is good?" (Chen 1987)
- | | | | | |
|-------|-------|------|------|------------------|
| which | kind | wine | good | |
| nei | zhong | jiu | hao | |
| 3 | 3 | 3 | 3 | underlying tones |
| (2 | 3) | (2 | 3) | surface output |

Nevertheless, there are also clear signs that syntactic (and lexical) structure and constituency is not irrelevant for the formation of third-tone sandhi domains, and there are often signs that there is no fully flat linear chunking of syllables into sandhi domains. For example, in (31) the division of syllables into sandhi domains in (a) does accord with the underlying syntax, and the alternate "a-syntactic" output in (b) is not possible:

- (31) "The horse bathed the dog." (Zhang 1997)
- | | | | | | |
|-------|-------|------|------|-------|------------------|
| horse | for | dog | wash | bathe | |
| ma | [[gei | gou] | [xi | zao]] | |
| 3 | 3 | 3 | 3 | 3 | underlying tones |

- | | | | | | | |
|----|-----|----|----|----|----|-------------------|
| a. | (3) | (2 | 3) | (2 | 3) | surface output |
| b. | *(2 | 3) | (2 | 2 | 3) | impossible output |

Word-internally, Shih (1997) also shows that the occurrence of tone sandhi depends at least in part on the hierarchical structuring of morphemes within a word and the direction of branching present in polymorphemic words. There is consequently a need to capture both the apparent "mismatches" between syntactic structure and the phrasing of words into tone sandhi domains, and the fact that syntax (and word structure) sometimes clearly does structure the output of third-tone sandhi.

Such apparently conflicting aspects of third-tone sandhi phenomena are reconciled via an optimality-theoretic type modeling incorporating a set of ranked, violable constraints, in both Chen (1987) and Zhang (1997). In Chen's system, Minimal Rhythmic Units/MRUs constitute the domains relevant for the determination of third-tone sandhi. Such units are optimally disyllabic, as formalized in the two ranked constraints Binarity ("An MRU is at least disyllabic") and Boundedness ("An MRU is at most disyllabic"), which both outrank a syntactic faithfulness constraint Congruence. Where words can be chunked into disyllabic MRUs, the force of Binarity and Boundedness may over-ride the matching of sandhi domains with syntactic structure, as in both (29) and (30) above, where four monosyllabic words are naturally divided into two disyllabic MRUs, satisfying Binarity and Boundedness, though violating the lower-ranked Congruence. The latter constraint shows its presence in examples such as (31), however, where five monosyllabic words occur, and the division of these words into MRUs in output (a) satisfies Binarity and Boundedness as well as is possible in output (b), but also (fully) satisfies Congruence, resulting in output (a) being preferred over the a-syntactic phrasing in output (b).

Although Binarity and Boundedness both outrank Congruence, they are argued to be lower ranked with respect to a constraint valuing lexical integrity "No Straddling." This can be seen in a comparison of the phrasing and tone sandhi output in (30) with that in (32), where the same kind of disyllabic chunking of the first two and second two syllables as occurs in (30) is not possible, as this would involve the phrasing of a syllable that is part of one word (the third syllable *jiu*) with another word, violating the lexical integrity of the word *ji-wei-jiu*. As a result, all four syllables in the sentence are phrased as a single MRU and sandhi domain:

- (32) "The cocktail is good."
 chicken tail wine good
 [ji wei jiu] hao
 1 3 3 3 underlying tones
 a. *(1 3) (2 3) impossible output
 b. (1 2 2 3) surface output

In addition to constraints valuing disyllabic MRUs, lexical integrity, and the alignment of sandhi domains with syntactic constituents, further constraints need

to be added to account for the special phrasing of certain prepositions (see especially Zhang 1997) as well as object pronouns and bare classifiers, which cliticize to preceding verbs. Emphasis of a monosyllabic word may also allow for such an element to occur as an isolated sandhi domain (apparently violating the preference for disyllabic MRUs), and fast rates of speech may allow speakers to build larger MRUs of three to four syllables, apparently violating Boundedness (see Shih 1997).

Altogether, an optimality-type modeling is well-placed to capture the many complexities of Mandarin third-tone sandhi, which displays a range of different properties from tone sandhi patterns in Shanghai Chinese and Hokkien. The ranking and sometimes co-ranking (Zhang 1997) of a set of constraints allows for variability in possible output sequences, as attested, and is able to account for the observation that sandhi domains sometimes do and sometimes do not mirror underlying syntactic structure. In this regard, third-tone sandhi in Mandarin is often, though not always, a less transparent window into constituent structure and its hierarchical organization than patterns regularly found in Hokkien and Shanghai Chinese. However, if attention is paid to the role of constraints that appear to outrank syntactic faithfulness and alignment, and these factors are carefully controlled for, it should in theory also be possible to use surface sandhi patterns in Mandarin to investigate and make claims about underlying syntactic structure. Although so far this has not been carried out in the same way that it has with Hokkien, perhaps due to the complicating interactions of other non-syntactic constraints, it might well be a fruitful area for future research.

3 Other prosody and syntax phenomena in Chinese

While tone sandhi patterns may possibly be the most obvious area to consider prosody and syntax interactions in Chinese, there are also certain other phenomena in which the potential relation of prosody to syntax has been investigated. Section 3.1 discusses issues relating to nuclear stress and syntax, and Section 3.2 considers the effects of prosodic constraints as filters on word and phrase construction, and as forces in diachronic development.

3.1 *Nuclear stress phenomena*

It has often been observed that a sentential nuclear stress is applied to elements that occur in the most deeply-embedded syntactic position in a clause in Romance, Germanic, and various other languages (Cinque 1993; Zubizarreta 1998). Such elements are regularly interpreted as new information foci, and it is argued that nuclear stress serves to highlight this pragmatic function. Where permitted by the syntax of individual languages, elements to be interpreted as new information foci are located in the most deeply embedded position in order to receive nuclear stress, sometimes through the repositioning of other non-focal material in higher syntactic locations (Zubizarreta 1998). Prosodic factors relating to the placement

of focal stress on an element are thus taken to cause the production of certain syntactic structures. It is also noted that nuclear stress appears to allow for the phenomenon of "focus projection" in which the focus of a sentence is interpreted as being either the constituent upon which nuclear stress directly falls, or successively larger constituents which contain the most deeply-embedded element bearing nuclear stress.

In (Mandarin) Chinese, it has been argued in Xu (2003) and Cheung (2009, 2011) that related phenomena occur in the expression of new information focus. Xu (2003) notes that the most natural position for an element constituting the new information focus of a sentence is sentence-final position, corresponding to the most deeply embedded position in the sentence. Using question-answer pairs to illustrate the inappropriateness of the occurrence of VP-internal elements as new information foci in other clause-internal positions, Xu notes that Chinese makes use of syntactic strategies such as verb-copying, the *ba*-construction, and the different object/indirect object sequences in ditransitive constructions to create forms in which new information foci occur in final position in the clause. For example, in instances where a verb is in focus, fronting of the object with *ba* may be employed to create a structure in which the verb is final. Example (33) might be an appropriate answer to a question of the type "What did you do with the coffee?":

- (33) wo ba kafei he-le
 I BA coffee drink-Asp
 'I **drank** the coffee.'

The frequent "attraction" of new information foci to sentence-final position raises the question of whether this occurs in Chinese for the same reasons assumed in Romance and Germanic, namely so that a sentential nuclear stress falls on the final element, highlighting it as the focus of the sentence. Should it indeed be concluded that the syntactic structure of focus sentences in Chinese, like those in Italian, Spanish, and German, is specifically built to satisfy focus-related prosodic factors, wherever this may be possible? Xu suggests that the conclusion here should be negative, based on the simple intonational properties of sentences with a final new information focus. It is pointed out that Chinese does not exhibit any regular, automatic occurrence of nuclear stress in sentence-final position, and that the addition of overt stress to a focused element in final position is fully optional and often not realized, unlike the situation in Romance and Germanic. Xu notes that, in fact, the correlation of stress with the positioning of a focused element actually seems to be the opposite of what might be expected from the application of a nuclear stress rule in Chinese. When VP internal material that is focused (e.g., the direct or indirect object, the verb, or frequency adverbs), is located in sentence-final position, frequently no stress is present or added in this position. However, where syntactic mechanisms do not allow for VP-external foci (such as the subjects of transitive sentence, adverbials, etc.) to be placed in the preferred final focus position, stress is commonly applied to these elements in their *in situ* positions,

as a compensatory device to signal their focus status. In other words, the occurrence of an element in sentence-final position appears to be sufficient to encode it as a focus without the need for any special stress, whereas elements to be interpreted as foci in other, non-final positions generally do require (non-contrastive) stress to highlight their status as new information focus. The general conclusion then is that, unlike the assumptions made for Romance and Germanic, the placement of (new information) foci in sentence-final position in Chinese is not motivated by prosodic reasons relating to nuclear stress, but occurs in order that foci receive some more general kind of positional prominence associated with the final position in a sentence. Such a conclusion raises interesting questions about the placement of focused elements in sentence-final/most deeply embedded positions in Romance and Germanic, and raises the possibility that this occurs primarily as in Chinese (by hypothesis) to achieve a general *positional* prominence, and that the occurrence of nuclear stress in Romance and Germanic is a secondary, overt consequence of this positional prominence rather than the direct trigger for placement in final position. With regard to Chinese, this line of thinking is taken further in Cheung (2009, 2011), as will be seen below.

Interestingly, it is also shown in Xu (2003) that focus projection operates in Chinese in the same way as in languages with nuclear stress, such as English. As shown in (34), the same set of increasingly higher-level constituents that may occur as foci in languages with nuclear stress on an element in final position also occur as potential foci in Chinese (marked by the F-labeled brackets). Focus projection therefore does occur in Chinese, from the most deeply embedded position in the clause to successively higher projections which contain the most deeply embedded position, but significantly it does not necessarily involve any phonological stressing of the element in sentence-final position. Even without any stress, a hearer can interpret sentence (34) as potentially focusing the object, or the VP, or the constituent containing the time adverbial and the VP, or the entire TP. However, if the speaker intends to focus the subject or the adverbial of time, or the verb alone, special non-nuclear stress may need to be applied to the focused item to identify it as being in focus, as also occurs in languages such as English.

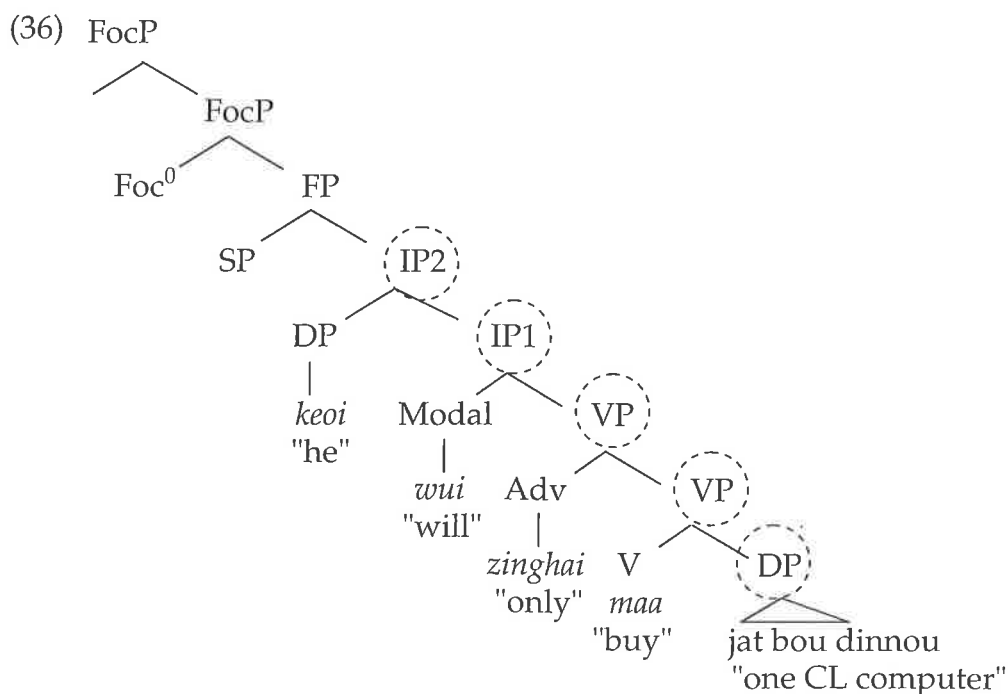
- (34) "Yesterday Old Wang drove a jeep."
 Old Wang yesterday drive-Asp jeep
 [Lao Wang [zuotian [kai-guo [jipuche]]]].
 Object [F]
 VP [F]
 "ZP" [F]
 TP [F]

What is consequently interesting about Chinese informational focus here is that it appears to exhibit a range of syntactic and interpretative phenomena commonly associated with nuclear stress, yet without the necessary overt manifestation of this kind of prosody.

A further interesting paradigm bearing on focus projection and its potential connection with nuclear stress is discussed in Cheung (2009, 2011) with data from the "Dislocation Focus Construction"/DFC in Cantonese and Mandarin. This construction is described in more detail in Chapter 7. It consists in the inversion of the normal sequencing of words in a sentence, so that one or more of the initial constituents in a sentence appears at the end of a sentence, as illustrated in the alternation in (35). Frequently a "sentence-final particle" occurs in the middle of DFC sentences, as seen in (35b):

- (35) a. Keoi zau-zo loeng go zungtau laa3. Regular, uninverted word order
 he leave-Perf two Cl hour Prt
 "He has been gone for two hours."
 b. Loeng go zungtau laa3 keoi zau-zo. DFC
 two Cl hour Prt he leave-Perf
 "He has been gone for two hours."

With regard to the information structure of DFCs, the material which appears inverted in the initial position of the sentence, preceding any sentence-final particle, constitutes or contains the new information focus of the sentence. Syntactically, there are strong arguments that the initial, pre-particle material occurs in its surface position as the result of leftwards movement of a single constituent containing this material (see Chapter 7). Cheung proposes that the movement takes place to the Specifier of a Focus Phrase, and that the "sentence-final particle"/SP actually occurs in a pre-TP functional head (see Chapter 7). The underlying structure of a DFC sentence prior to any movement of a constituent to SpecFocP is represented in (36):



Interestingly, it is found that there is a clear restriction regulating which constituents may undergo movement in DFCs, which Cheung refers to as the "Spine Constraint." In (36), only those constituents located on the spine of the tree structure, indicated by dotted circles, are legitimate candidates for movement, and any elements on left branches, such as the subject, pre-VP adverbs, other left-branch adjuncts and modal and main verbs are not possible targets for movement in DFCs. Cheung points out that there are significant and intriguing parallels between the Spine Constraint in DFCs and the Nuclear Stress Rule/NSR. The set of constituents that the Spine Constraint allows to undergo raising in DFCs is essentially the same as what Reinhart (2006) calls the focus set in focus projection structures identified by nuclear stress – the set of successively larger constituents dominating the most deeply embedded position in a syntactic tree that may occur as foci in languages with nuclear stress. However, as Cantonese is taken to lack any overt manifestation of nuclear stress (Wong *et al.* 2005), it is argued that the Nuclear Stress Rule should be decoupled from the necessary occurrence of overt stress in order to capture the parallel between the NSR and the Spine Constraint. Cheung proposes that the NSR be recast as an abstract rule of focus assignment based on underlying syntactic structure, and refers to this as the "Abstract NSR." The focus set members of a sentence are defined as the syntactic constituents that contain the most deeply embedded word. How such a focus set is overtly marked is language dependent, it is argued. In English, the focus set is associated with overt nuclear stress on the most embedded word, and elements that constitute a new information focus regularly remain *in situ* at PF. Chinese, by way of contrast, may highlight the constituents of the focus set by displacing them syntactically in the Dislocation Focus Construction, in accordance with the Spine Constraint. There consequently seems to be a very interesting connection between prosody and syntax in the cross-linguistic signaling of new information focus – what some languages may achieve with prosody and the use of overt nuclear stress, Chinese may signal via syntactic movement. As both mechanisms appear to be restricted in the same fundamental way, it seems likely that they are both surface manifestations of a deeper notion of structural prominence, as also suggested by Xu's (2003) consideration of new information focus marking and focus projection. In this domain, at least, there appears to be a tight correspondence between prosody and syntax *across* languages, and patterns in Chinese show that what may have been considered primarily a prosodic phenomenon (the linking of focus and focus projection with nuclear stress) may be just one type of output form arising from a more abstract set of underlying relations.⁴

3.2 *Disyllabicity as a prosodic constraint on lexical-syntactic structures*

In a concentrated body of work focused on the potential interaction of prosody and syntax in Chinese, Feng Shengli (1996, 2003, 2010) considers how prosody may frequently act as a filter constraining aspects of syntax and directing the course of historical change in certain ways: "... phonology/prosody is not able

to create syntactic structures, (but) that does not mean that prosody cannot block legitimate syntactic structures and activate potential (or unused) syntactic operations" (Feng 2010: 1). In a number of the topics investigated by Feng, the important role of disyllabicity as a constraint on the creation and occurrence of lexical and syntactic structures is highlighted. One illustration of this relates to the well-formedness of verbal compounds created from the conjunction of two verbs or a verb and a noun. When such combinations are combined with a further post-verbal object NP, the result is only acceptable when the V-V and V-N compounds are disyllabic, and, with just three exceptions,⁵ are regularly ill-formed if the V-V/V-N units contain three or more syllables, as seen in examples (37–39) below:

- [illegible]

The role of disyllabicity as a filter on outputs appears to apply as a constraint within syntactic structures rather than the lexicon. Significantly, the elements combined in the ill-formed sequences in (37–39) may occur in a legitimate output if the post-verbal object is located and licensed elsewhere in the clause, as, for example, via the *ba*-construction or with a preposition:

- (40) ta ba chuanguhu guan-yan-shi le
 he BA window close tight tight Asp
 "He closed the window tight."
- (41) zai Zhongnanhai jiang ke-xue
 in Zhongnanhai talk science
 "give a scientific talk in Zhongnanhai"

This indicates that there is no absolute restriction on the formation of complex predicates with three or more syllables, such as *guan-yan-shi*. The problem arises only when such a unit is syntactically involved in the licensing of an overt NP object in post-verbal position. Feng suggests that verbal compounds of a range of types can only ever license a following NP object if they instantiate an X^0 verbal head position and that, in order for complex predicates to be parsed as single V^0

heads, they must constitute a Prosodic Word, which requires disyllabicity. In the unacceptable combinations (38c) and (39c), the trisyllabic sequences *jiang ke-xue* and *fu ze-ren* will fail to be parsed as single Prosodic Words and will consequently be analyzed as consisting in two separate words, a verb and an N(P) object. Because of this, the verb will not be able to license any additional NP object, causing (38c) and (39c) to be ill-formed.

Appeals to disyllabicity and the nature of prosodic structure are also made by Feng in his analyses of certain diachronic developments in Chinese syntax, such as the emergence of long passive forms from the earlier short passive form (Feng 2010: ch. 6), the development of the *ba*-construction (Feng 2002), and changes that occurred in *wh*-question formation in early Archaic Chinese (Feng 1996). With regard to the latter phenomenon, it is noted that during the early archaic period (1000–500 BC), objects that are *wh*-phrases appear to undergo overt movement to a pre-verbal position, despite the fact that Chinese otherwise has the property of being a robust *wh in situ* language:

- (42) *zi he yan?*
 you what say
 ‘What did you say?’

Feng proposes that the “*wh*-movement” that occurs in such instances is actually a form of cliticization. It is remarked that *wh*-phrases in early Chinese were monosyllabic and “prosodically weak.” Because of this property, Feng suggests such elements had to cliticize to the left of the verb. Later on, from the Han dynasty period, *wh*-phrases crucially became disyllabic and prosodically stronger, and no longer underwent positioning to the left of the verb, instead occurring in the post-verbal position occupied by other prosodically-strong NPs. Feng speculates that only prosodically-strong elements could occur in the post-verbal sentence-final position, due to such a position hypothetically being associated with nuclear stress. Potentially supporting a prosodically-driven cliticization view of “*wh*-movement” in early Archaic Chinese is the observation that object pronouns, which were also prosodically weak monosyllabic forms, were similarly positioned before the verb in negative sentences. Quite generally, Feng argues that the diachronic shift from a stage in which Chinese was predominantly a monosyllabic language to one in which disyllabic forms become widespread and highly valued as Prosodic Words may have had a number of effects on syntactic structures in the language, and that the study of prosody as a force acting on possible syntactic outputs is able to reveal much that would otherwise be unexplained by syntactic factors alone.

4 Summary

This chapter has considered a number of phenomena that bear on connections between prosody and syntax in Chinese. A key issue present in cross-linguistic

investigations of prosody and syntax is understanding the degree to which syntactic structure is manifested in and mirrored by aspects of prosody, and the ways in which prosodic structure may or may not operate independently from syntax in producing overt phonological forms. In reflecting on such questions, much of the chapter focused on the distinctive systems of tone sandhi in three varieties of Chinese, and the different mapping relations that appear to exist between sandhi domains and underlying syntactic structure. The chapter also highlighted the issue of nuclear stress in relation to patterns of focus found in Chinese, and considered the possibility that overt nuclear stress may be one particular surface output of a broader, more abstract notion of prominence, also present in Chinese, which arguably might still be considered prosodic in certain respects (hence Cheung's reference to an "Abstract Nuclear Stress Rule"). Finally, we provided a short review of syntactic patterns which have been argued to be conditioned by the disyllabic property of Prosodic Words, and how the changing properties of Prosodic Words in Chinese over time may have been the cause of certain syntactic innovations. The continued study of prosody and syntax interactions, both synchronically across different varieties of Chinese and diachronically (where this is possible), promises to be a rich and very informative area of future research for Chinese linguistics, and one in which Chinese can contribute importantly to general theories of human language.

NOTES

- 1 Note that the patterns referred to with the global dialect term "Hokkien" here reflect common tone sandhi phenomena identified in a number of varieties of Hokkien, which are sometimes referred to with different/more specific names in the literature, for example "Taiwanese," "Southern Min," "Xiamen Chinese."
- 2 It is also significant to note that bare adjectives in the immediate pre-nominal position are associated with Adjective Ordering Restrictions, and can only occur in certain fixed sequences (Sproat and Shih 1991), whereas phrasal adjectives in higher positions are not strictly ordered, which supports an XP-adjunction analysis of higher adjectives as opposed to a functional-head analysis of adjectives in lower positions. A potential alternative analysis to the idea that bare pre-nominal adjectives occur in the head positions of functional projections due to their tone sandhi patterns is to suggest that such elements are compounded sub-parts of nouns. However, it may not be straightforward to account for the adjective ordering restrictions in such a view, and a compounding approach would seem to lose the parallels that exist between adjectives and adverbs noted here. It seems fairly clear that the X^0 -like behavior of low adverbs in Hokkien cannot be accounted for via the assumption of lexical compounding of an adverb with the verb and its arguments.
- 3 Note that the quantifier here is homophonous with the numeral "two." There are various quantificational elements in Shanghai Chinese that allow for two different interpretations: *lʃa*N: (a) "two," or (b) "some," *sa*: (a) "what," or (b) "any," *iq*: (a) "one," or (b) "a." With the latter (b) interpretations, such elements are always phrased in a PW and an MaP with the preceding verb, as in (25).

- 4 See Cheung (2009, 2011) for further interesting discussion of links between the DFC and the NSR relating to the notion of metrical invisibility (Zubizarreta 1998). It is shown that where *de-accenting* of anaphoric material permits the NSR to apply in different ways in languages such as English, falling on constituents which are not necessarily in the most deeply embedded position, *ellipsis* of material in Cantonese allows for a wider range of material to undergo focus movement in DFCs, including constituents located on left branches which do not contain the most deeply embedded position in a clause.
- 5 The three exceptions are: *xi-ganjing* "wash clean," *kan-qingchu* "see-clear," and *nong-mingbai* "get clear," all of which have second syllables that are in neutral tone and de-stressed.

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