

## Prosody and Head-directionality in Chinese

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### Abstract

Word orders in Chinese are disharmonic in the sense that some heads precede their complements and other heads follow their complements. In this paper, I argue that Chinese is disharmonic in its head-directionality because it has two prosodic patterns: Right Tone and Left Stress. The sequence of words must conform to either Right Strong Tone or Left Stress. Tones on lexical items and neutral tone on functional items work as the output constraint on the movement of complement to the specifier position, which derives head-final order from head-initial order. This prosody-based analysis of word orders also explains the phonological and syntactic differences between northern languages and southern languages in East Asia and between Modern Chinese and Old Chinese. Chinese word order supports the idea that head-directionality is universally determined by prosodic strength realized as stress or tone.

### 漢語的韻律和中心語的位置

漢語中心語和補語的詞序有不同的表現形式。一些中心語位於補語之前，而另外一些中心語則位於補語之後。筆者認為，漢語中心語和補語的詞序是不和諧的，漢語的中心語和補語組合形式有兩個韻律模式：右聲調，左重音，詞序必須符合右聲調或左重音的模式。補語的移動會改變詞序，而聲調是移動制約條件。這種韻律分析可以解釋中國和東亞語言所呈現的地理和歷史的差異。通過聲調和重音實現的韻律形式決定詞序，這在世界語言中是一種普遍規律，漢語的中心語和補語的韻律模式充分支持了這一假設。

### Keywords

tone, stress, word order, movement, prosodic constraint

## 1. Introduction

Kayne (2011) argues, with considerable evidence, that there are no directionality parameters (cf. Kayne 2011). He also considers why the language faculty should be put together in that fashion. The idea of no directionality parameters forces us to reconsider how to analyze the various word orders in the world's languages. Specifically, Kayne (2011) argues that the hierarchical difference between English VO and Japanese OV will necessarily be associated with some difference in movement (internal merge), which will in turn be related to differences in the properties of functional heads. However, the properties of functional heads are not clear. If their properties are claimed to be the strength of abstract features such as EPP, we still do not know what causes the hierarchical difference.

In this paper, I discuss how we can derive word orders in Chinese without assuming syntactic head directionality parameters. I argue that Chinese is disharmonic in its head-directionality (head-initial and head-final) because the language has two prosodic patterns: Right Tone and Left Stress. Tones on lexical items and neutral tone on functional items function as the output constraint on the movement of complement to the specifier position, which derives head-final order from head-initial order. It is also argued that Chinese word order supports the idea that head-directionality is universally determined by prosodic strength realized as stress or tone. In section 2, I point out that the head directionality parameter has another empirical problem than that discussed in Kayne (2011): the head directionality parameter cannot explain the fact that the majority of languages in the world are disharmonic with regard to head-complement orders. That is to say, languages may have both head-initial and head-final order depending on the category of head. I review the previous studies on disharmonic orders in Chinese. In section 3, I point out that the word order in Chinese poses a problem for an analysis based on the Final-Over-Final Constraint proposed by Biberauer et al. (2008, 2014). Section 4 proposes a prosodic constraint on roll-up movement, which derives head-final orders from head-initial orders. Section 5 argues

that this prosody-based analysis of word orders explains the phonological and syntactic differences between northern languages and southern languages in East Asia and between Modern Chinese and Old Chinese. It is also suggested that this study has some implications for the typology of the world's languages. Section 6 concludes the discussion.

## 2. Disharmonic head-complement orders in Chinese

The orders between head (H) and complement (C) in Chinese are disharmonic, as shown in (1) (head-initial) and (2) (head-final) (Li and Thompson 1981, Dryer 1992, Feng 2002).

- (1) a. [IP modal VP]
- b. [NegP negative VP]
- c. [PP P NP] (preposition-NP)
- d. [VP V NP] (V-O)
- (2) a. [Word stem affix]
- b. [PP NP P] (NP-postposition)
- c. [AspP VP aspect]
- d. [CP IP Q] (clause-question particle)
- e. [NP modifier N]
- f. [VP PP V]
- g. [VP [*ba*-NP] V]

Following Dryer (1992), I define “head” as a non-branching category and “complement” as a (potentially) branching category.<sup>1</sup> I call a category “branching” if it is made by merging two syntactic objects, including affixes. Then, an affix is the head of a word as in (2a) because it is non-branching; the stem is the complement of the affix because it is potentially branching (e.g. [<sub>Stem</sub> *friend*]-s; [<sub>Stem</sub> *friend-ship*]-s).

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<sup>1</sup> Dryer (1992) uses the terms “verb patternner/object patternner” in place of “head/complement.”

Similarly, a modifier is the complement of the head noun (e.g. [<sub>Gen</sub> *the girl's*] *cat*; *owner* [<sub>Gen</sub> *of the car*]) as in (2e). These word orders are illustrated in (3) and (4).<sup>2</sup>

- (3) a. děi zǒu (modal-V)  
must go  
'must go'
- b. méiyǒu xiě (negative-V)  
(did) not write  
'did not write'
- c. wǎng nǎr (preposition-NP)  
to where  
'to where'
- d. mǎi jiǔ (V-O)  
buy alcohol  
'buy alcohol'
- (4) a. péngyou-men (stem-affix)  
friend-people  
'friends'
- b. péngyou de (NP-postposition)  
friend DE  
'friend's'
- c. lái le (V-aspect)  
come PERF  
'came'
- d. nǐ lèi ma? (clause-question particle)  
you tired Q  
'Are you tired?'

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<sup>2</sup> In (3), the third tone on the first word changes into the second tone (ˊ) by tone sandhi, as I argue in section 4.

- e. péngyou de fángzi (modifier-N)  
 friend DE house  
 ‘friend’s house’
- f. cóng Zhōngguó lái (PP-V)  
 from China come  
 ‘come from China’
- g. bǎ shì zuò hǎo ([ba-NP]-V)  
 BA thing do well  
 ‘to do things well’

Disharmonic word orders have been a challenge to the principles and parameter theory, which generally assumes a value for a parameter in a language, head-initial or head-final. For example, Bantu languages are consistently head-initial (N-modifier, P-NP, VO) while Japanese is consistently head-final (modifier-N, NP-P, OV). In this respect, Chinese is one of the disharmonic languages in the world, as shown in (3) and (4). Attempts have been made to explain the mixed word orders in Chinese (Huang 1982, 1994, Travis 1984). For example, Huang (1982: 41) assumes two kinds of phrase structure as shown in (5).

- (5) a.  $[x^n X^{n-1} YP^*]$  iff  $n = 1, X \neq N$   
 b.  $[x^n YP^* X^{n-1}]$  otherwise

Here  $YP^*$  means that more than one  $YP$  is allowed. (5a) derives the head-initial order where a non-nominal head  $X^0$  precedes its complement: modal-VP, negative-VP, preposition-NP and V-NP in (1). (5b) covers the head-final order where a nominal head  $N$  follows its complement: modifier-N in (2e).

Huang’s phrase structure rules in (5) are a simple classification of head-directionality. Travis (1984) argues that Chinese is generally head-final except that constituents to be Case-marked (e.g NPs) are placed to the right of the head. She assumes that a head assigns at most one Case to its right (cf. Li 1990). The basic idea is that Chinese is generally head-final except that at most one NP may follow a verb or

a preposition.

This Case-based theory of word orders straightforwardly explains preposition-NP (1c) and V-NP (1d) orders in Chinese because objects of preposition and verb need Case to be licensed. However, the other head-initial order in (1), modal-VP (1a) and negative-VP (1b) cannot be explained by Case-assignment because VPs do not need case to be licensed. One could assume that modal and negative give some license to their complement VP on their right, but this extension of Case licensing would raise a further question as to why VPs as well as NPs must be licensed by their head in Chinese. Another problem would occur in the case of (2c) [<sub>AspP</sub> VP aspect], where VP is on the left of the aspect head. In the next section, I will discuss a syntactic constraint on movement, which derives head-final order from head-initial order.

### 3. Antisymmetric syntax and the Final-Over-Final Constraint

In the antisymmetric syntax, Kayne (1994) argues that consistent C-H order is derived from H-C order by cyclic movement of complement to the specifier position, as shown in (6).

$$(6) \quad \dots X [_{YP} \dots Y ZP] \dots \rightarrow \dots X [_{YP} ZP Y t] \dots \rightarrow \dots [_{YP} ZP Y t_{ZP}] X t_{YP} \dots$$

Assuming this cyclic movement, Biberauer et al. (2008, 2014) propose the Final-Over-Final Constraint (FOFC) in (7), which prohibits complement movement from skipping cycles.

$$(7) \quad * [_{\beta P} [_{\alpha P} \alpha \gamma P] \beta], \text{ where } \alpha P \text{ is the complement of } \beta \text{ and } \gamma P \text{ is the complement of } \alpha.$$

In the unacceptable configuration in (7), a head-final phrase  $\beta P$  dominates a head-initial phrase  $\alpha P$ . FOFC correctly rules out the word orders that are absent or rare in the world's languages, e.g.  $*[_{IP} [_{VP} V O] \text{ Aux}]$  and  $*[_{CP} \dots [_{VP} V O] C]$ , where Aux and C are  $\beta$  and V is  $\alpha$  in (7). However, FOFC wrongly rules out a number of well-formed constructions in Chinese, listed in (8).

- (8) a. clause-Q particle: [<sub>CP</sub> [<sub>IP</sub> ... [<sub>VP</sub> V NP]] C]  
           [<sub>CP</sub> [<sub>IP</sub> nǐ nèng [<sub>VP</sub> xiě hànzì]] ma]?  
                     you can write Chinese character Q  
           ‘Can you write Chinese characters?’
- b. prepositional phrase-V: [<sub>VP</sub> [<sub>PP</sub> P NP] V]  
           tā [<sub>VP</sub> [<sub>PP</sub> cóng Zhōngguó] lái] le  
           3SG from China come PERF  
           ‘S/he has come from China.’
- c. relative clause-N: [<sub>NP</sub> [<sub>VP</sub> V O] de N]  
           [<sub>NP</sub> [<sub>VP</sub> qí zìxíngchē] de rén]  
                     ride bicycle DE person  
           ‘person who ride bicycles’

In these constructions, a head-final phrase dominates a head-initial phrase thus violating FOFC (7): CP dominates VP in (8a), VP dominates PP in (8b), and NP dominates VP in (8c). The acceptability of these constructions leads us to reconsider the nature of constraint on cyclic complement movement. In the next section, I propose an alternative constraint based on possible prosodic patterns in the language.

#### 4. Prosodic constraint on roll-up movement

Instead of FOFC, I propose a prosodic constraint on cyclic complement movement, which derives head-final orders in (2) from head-initial orders. The constraint can be formulated as in (9).

- (9) Complement movement applies if and only if the derived structure observes the prosodic pattern in the language.

I argue that Chinese has the prosodic pattern shown in (10), where TD stands for tonal/sandhi domain, T\* a sequence of tones, CT citation tone (i.e. the original tone in the lexicon, not changed by tone sandhi) and N\* a sequence of neutral (light) tones.

- (10) [<sub>TD</sub> (T\*) CT (N\*)]

The rightmost non-neutral tone, CT, is the phonological head of a TD. Optional tones preceding CT, (T\*), may change from the citation tone to a sandhi tone if they are eligible for the sandhi rule. Some neutral tones (N\*) are possible after CT. The prosodic pattern in (10) may be realized in a number of forms including (11a) and (11b).

- (11) a. <sub>(TD)</sub> T\* CT  
b. <sub>(TD)</sub> CT N

Let us call the tonal pattern in (11a) Right Tone because the rightmost tone keeps its citation tone while the preceding tones may change into a sandhi tone, as we will see below. This tonal change shows that the last tone has some positional strength. The tonal pattern in (11b) should be called Left Stress because the elements following CT do not have any specific tone but neutral tone. Hashimoto (1989) suggests that tonal system (Right Tone, (11a) here) is the original Chinese prosodic pattern, while stress system (Left Stress, (11b) here) is the pattern seen in Altaic languages. Let us look at each of the patterns in detail.<sup>3</sup>

A number of Chinese dialects have the tone sandhi pattern shown in (11a), where the final tone in the tonal domain keeps its citation tone and the preceding tones change into another tone, as shown in (12) (cf. Chen 2000).

- (12) a. Mandarin  
mǎi mǐ jǐu → mǎi mí jǐu  
buy rice wine  
'buy rice wine'

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<sup>3</sup> Yip and Rimmington (2004: 379) also claim that "sentences that do not observe prosodic principles are often regarded not only as stylistically implausible but also as syntactically unacceptable." They argue that Chinese has "disyllabic trochaic rhythms," as schematically shown in (i), where X indicates stress and x indicates non-stress.

(i) Xx Xx X

This rhythm corresponds to Left Stress (11b). However, this is the only pattern they show, and they do not propose other prosodic patterns such as Right Tone (11a).

## b. Taiwanese

21    44    44    →    53    22    44  
 pang hong-ts'e       pang hong-ts'e  
 fly    kite  
 'fly a kite'

In a sequence of the third tones, the tones preceding the last tone change into the second tone in Mandarin as in (12a). Similarly, (12b) shows that the citation tones preceding the last one change into sandhi tones in Taiwanese.<sup>4</sup>

The tonal pattern in (11b) represents a neutral/light tone following a tone. For example, the disyllabic words in (13) represent this pattern.

- (13) a. dōng-xi  
           east-west  
           'thing'
- b. dì-fang  
           earth-direction  
           'place'

Here the second word loses its citation tone. I argue that Right Tone (11a) and Left Stress (11b) correspond to head-initial and head-final word orders, respectively. The mixed prosodic system makes Chinese word orders disharmonic.

Cinque (1993) argues that stress is assigned to the most deeply embedded element in a phrase or a compound. This means that stress is assigned to the complement, which is likely to branch, rather than the head, which is non-branching by definition. Following this idea of stress on the complement (cf. Nespor and Vogel 1986), I propose a universal constraint on linearization of hierarchical syntactic structure as formulated in (14), which I will call Complement Accent.

- (14) Complement must be linearized in the phonological strong position.

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<sup>4</sup> It has been argued that Shanghai Chinese different tonal domain from the other dialects, which I will not discuss here (cf. Tokizaki (2012) and Tokizaki and Nasukawa (2014)).

The phonological strong position in Chinese is the one where citation tone is preserved (Right Tone) and not neutralized (Left Stress). Then, Chinese prosodic patterns in (11a) and (11b) must correspond to head-initial and head-final order, respectively, as shown in (15), where W represents phonological weak position, S strong position, H syntactic head and C complement.

(15) a.  $_{(TD)}(S)T^*CT$

W S

H C

b.  $_{(P_{wd})}CT N$

S W

C H

It is complement that keeps its citation tone in the case of sandhi in a head-initial sequence (15a). Heads in (1) (modal, negative, preposition and verb) have non-neutral tone, which may change into another tone in sandhi. This is acceptable since the complement keeps its citation tone and the head has a non-neutral tone. The examples in (3) are repeated here as (16).

(16) a. děi zǒu (modal-V)

must go

b. méiyǒu xiě (negative-V)

(did) not write

c. wǎng nǎr (preposition-NP)

to where

d. mǎi jiǔ (V-O)

buy alcohol

In (16), the third tone on the first word changes into the second tone (ˊ) by tone sandhi. Suppose that the order was reversed by complement movement in these examples, then (16) would be (17).

- (17) a. \*zǒu děi (V-modal)  
go must
- b. \*xiě méiyǒu (V-negative)  
write did not
- c. \*nǎr wǎng (NP-preposition)  
where to
- d. \*jiǔ mǎi (O-V)  
alcohol buy

I argue that the resulting head-final structure (17) can match neither Right Tone (15a) nor Left Stress (15b). The citation tone on complement (*zǒu*, *xiě*, *nǎr* and *jiǔ*) cannot be changed into a sandhi tone (*zóu*, *xié*, *nár* and *jíu*) to make Right Tone (15a) (TD (S)T\* CT) (*zóu děi*, *xié méiyǒu*, *nár wǎng* and *jíu mǎi*), which violates Complement Accent (14). Also, the citation tone on the head (*děi*, *méiyǒu*, *wǎng* and *mǎi*) cannot be neutralized to make Left Stress pattern (15b) (TD CT N) (*zǒu dei*, *xiě meiyóu*, *nár wang* and *jiǔ mai*) because these head have semantic content. Thus, the only option to realize these phrases is to linearize the words in the head-initial order without complement movement, as in (16) above, which has a non-neutral tone on the head and the citation on complement, conforming to the prosodic pattern (15a).

Now let us consider the head-final orders in (4), repeated here as (18).

- (18) a. péngyou-men (stem-affix)  
friend-people  
'friends'
- b. péngyou de (NP-postposition)  
friend DE  
'friend's'
- c. lái le (V-aspect)  
come PERF  
'came'

- d. nǐ lèi ma? (clause-question particle)  
 you tired Q  
 ‘Are you tired?’
- e. péngyou de fángzi (modifier-N)  
 friend DE house  
 ‘friend’s house’
- f. cóng Zhōngguó pǎo lái (PP-V)  
 from China come PERF  
 ‘to do things well’
- g. bǎ shì zuò hǎo ([ba-NP]-V)  
 BA thing do well  
 ‘to do things well’

Heads in (18) are divided into two categories: clitics (18a-d) (affix, postposition, aspect and Q particle) and lexical words (18e-g) (N and V). In (18a-d), clitic heads have neutral tone and complements keep their citation tone. Thus, (18a-d) conform to Left Stress (11b) (<sub>TD</sub> CT N) or the general pattern (10) (<sub>TD</sub> (T\*) CT (N\*)). These head-final orders are derived by complement movement from the corresponding head-initial orders shown in (19).

- (19) a. rén péngyou (affix-stem)  
 people friend
- b. de péngyou (preposition-NP)  
 DE friend
- c. le lái (aspect-V)  
 PERF come
- d. ma [nǐ lèi] (question particle-clause)  
 Q you tired

Note that these head-initial orders in (19) do not conform to the tonal patterns in Chinese because neutral tone must follow a citation tone. Then, complement movement is the last resort to derive the acceptable tonal pattern in (18a-d).

At first sight, lexical heads in head-final orders (18e-g) might seem to be a problem for this analysis because the head has a tone and the entire phrase does not conform to (11b) (<sub>TD</sub> CT N) or (10) (<sub>TD</sub> (T\*) CT (N\*)). However, a lexical head can make a separate tonal domain from the preceding complement, as shown in (20).

- (20) a. (<sub>TD</sub> péngyou de) (<sub>TD</sub> fǎngzi) (modifier-N)  
           friend    DE       house  
       b. (<sub>TD</sub> cóng Zhōngguó) (<sub>TD</sub> lái) (PP-V)  
           from China           come  
       c. (<sub>TD</sub> bǎ shì) (<sub>TD</sub> zuò hǎo) ([ba-NP]-V)  
           BA thing   do   well

Here, each tonal domain has an acceptable tonal pattern, either Right Tone (<sub>TD</sub> T\* CT) in (20b, c) or Left Stress (<sub>TD</sub> CT N) in (20a). Thus, these head-final orders are derived by complement movement from head-initial orders shown in (21).

- (21) a. fǎngzi [péngyou de] (N-modifier)  
           house friend   DE  
       b. lái [cóng Zhōngguó] (PP-V)  
           come from China  
       c. zuò [bǎ shì] (V-[ba-NP])  
           do   BA thing

Here I assume that *hao* is merged after the complement has moved to the specifier position in (21c). (21a) has been derived from (22) by movement of *pengyou*.

- (22) fǎngzi [de péngyou]  
           house DE friend

The derivation of (20a) from (22) through (21a) is done by a cyclic complement movement, which observes FOFC (7). However, the derivation of (20b) and (20c) from (21b) and (21c) violates FOFC, as we have seen. Let us consider the prosody of the examples violating FOFC shown in (8), where a head-final phrase dominates a head-initial phrase. These word orders conform to the prosodic pattern in Chinese, as shown in (23).

- (23) a. [CP [IP nǐ néng [VP xiě hànzǐ]] ma]?  
you can write Chinese character Q  
(TD T T T T CT N)  
‘Can you write Chinese characters?’
- b. tā [VP [PP cóng Zhōngguó] lái] le  
3SG from China come PERF  
(TD T T T CT) (TD CT N)  
‘S/he has come from China’
- c. [NP [VP qí zìxíngchē] de rén]  
ride bicycle DE person  
(TD T T T CT N) (TD CT)  
‘person who rides bicycles’

Here every prosodic phrase conforms to one of the possible prosodic patterns in Chinese. Thus, complement movement applies to the head-initial sequence in the outer cycle skipping the one in the inner cycle. This is a violation of FOFC but is acceptable in Chinese. Suppose that complement movement applied cyclically to the head-initial sequence from the innermost phrase, then we would have (24), which observes FOFC.

- (24) a. \* [CP [IP nǐ [VP hànzǐ xiě] néng] ma]?  
you Chinese character write can Q  
(TD T T T T CT N)  
‘Can you write Chinese characters?’
- b. \* tā [VP [PP Zhōngguó cóng] lái] le  
3SG China from come PERF  
(TD T T T CT) (TD CT N)  
‘S/he has come from China’
- c. \* [NP [VP zìxíngchē qí] de rén]  
bicycle ride DE person  
(TD T T T CT N) (TD CT)  
‘person who rides bicycles’



## 5. Consequences for variation and universals

So far I have argued that head-complement orders in Chinese are determined by universal Complement Accent and language-particular prosody in (10) and (11). This study has a number of consequences in diachronic and dialectal linguistics and the architecture of grammar. As Hashimoto (1976) argues, southern Chinese dialects and Old Chinese have more tonal characters and more head-initial orders than northern dialects and Modern Chinese. These correlated changes and variations are explained straightforwardly with the prosody-based theory of word orders presented here. To put it simply, northern dialects and Modern Chinese use the Left Stress system in (15b) more often than southern dialects and Old Chinese, which mainly use the Right Tone system in (15a).

(26) a. Northern dialects/Modern Chinese: Left Stress (TD CT N)



C H

b. Southern dialects/Old Chinese: Right Tone (TD T\* CT)

H C

These two tonal patterns correspond to head-final and head-initial orders. Hashimoto (1981) shows that languages in East Asia have a gradational variation of tone complexity and coda inventory (cf. Hashimoto 1978).

(27) Number of tones and codas in Asian languages

	Manchu	Gansu	Beijing	Nanchang	Guangzhou	Thai
# tones	0	3	4	6	8 (9)	8
coda	n/ŋ	n/ŋ	n/ŋ	n/ŋ/t/k	m/n/ŋ/p/t/k	m/n/ŋ/p/t/k
direction	North   South					

This table shows that southern languages are more tonal than northern languages. This fact is expressed by Right Tone in (26b) together with Left Stress in (26a) in the analysis presented here.

Hashimoto also points out the word order variation between these languages: in my terms, northern languages and Modern Chinese tend to have head-initial order

while southern languages and Old Chinese tend to have head-final order. I argue that the word order variation is gradational from small categories such as NP to larger categories such as VP. I show the orders of N-Genitive, N-Adjective, Adposition-N and Adverbial Subordinator-Clause in (28).<sup>5</sup>

(28)	Manchu:	Gen N	Adj N	NP P	O V	Cl AdvSb
	Gansu:	Gen N	Adj N	P NP	O V/V O	n.d.
	Beijing:	Gen N	Adj N	P NP	V O	n.d.
	Nanchang:	Gen N/N Gen	Adj N	P NP	V O	n.d.
	Guangzhou:	Gen N	Adj N/N Adj	P NP	V O	Cl AdvSb/AdvSb Cl
	Thai:	N Gen	N Adj	P NP	V O	AdvSb Cl

Most of the data shown in (28) are taken from Dryer and Haspelmath (2011).<sup>6</sup> (28) shows that northern languages use head-final orders (Gen-N, Adj-N, NP-postposition, Clause-Adverbial Subordinator) while southern languages use head-initial orders (N-Gen, N-Adj, Preposition-NP, Adverbial Subordinator-Clause). Head-final orders are more likely used in small categories such as NP (Gen-N, Adj-N) than in large categories such as PP (NP-P) and VP (Cl-AdvSb). This gradation also supports the idea that complement moves iteratively to the specifier position of the head: cyclic complement movement starts at the lowest cycle and stops at a certain point of derivation. Northern languages or Modern Chinese move complement to make head-final orders because of Left Stress. Southern languages or Old Chinese do not move complement because of their prosodic pattern Right Tone.<sup>7</sup>

Finally, let us consider the status of the analysis presented here in the typological studies of the world's languages. Tokizaki (2011) and Tokizaki and

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<sup>5</sup> Adverbial subordinators are subordinating conjunctions such as *before* in *before you go* (Dryer 2005). I assume that adverbial subordinators are C, which takes IP as its complement.

<sup>6</sup> The data about Gansu and Nanchang are provided by Xinzhong Liu.

<sup>7</sup> Hashimoto (1976) argues that in both NP and VP, northern dialects have complement-head order while southern dialects have head-complement order.

Kuwana (2013) argue that word-stress location decides head-complement orders in stress languages in the world. It is argued that languages with lefthand stress such as Mongolic and Turkic have head-final order while languages with righthand stress such as Oceanic and Romance have head-initial order. Then, Chinese, a tone language, goes together with stress languages in that left stress derives head-final order and strong right tone derives head-initial order, as we have seen above. If this consideration is on the right track, we can generalize stress and tone into a single formalization as in (29).

- (29) Phonological strong position determines word orders between head and complement in the language.

Then, disharmonic head-complement orders are no longer a problem for the minimalist program in that an output condition at PF (phonetic form) decides linearization of hierarchical structure. We can derive head-complement orders without syntactic head-directionality parameters.

## 6. Conclusion

Kayne's (2011) idea that hierarchical difference replaces the head-directionality parameter is a step forward in the minimalist program of Chomsky (1995). What we should do next is to find the nature of movements deriving word order differences including head-complement orders in languages of the world. The strongest position is to assume that the mechanism of syntax is universal while phonology is parametric (cf. Feng 2002 for an alternative idea that syntax and phonology mutually interact). This hypothesis of Universal Syntax and Parametric Phonology (USPP) offers an architecture of grammar that meets the minimalist program. Chinese and other related languages provide us with a good case for testing the USPP hypothesis. We have seen that the prosodic constraint on cyclic complement movement successfully derives the word orders in these languages. This study shows that it is promising to pursue the same line of analysis on other languages in the world.

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