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Prominence from Complexity: Capturing Tianjin Ditonal Patterns*

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This paper explores the six ditonal sandhi that spawn from an inventory of four tones (Low, High, Rising, and Falling) in an attempt to provide an account for why only certain ditonal combinations trigger alternation but not others. Earlier accounts have relied on Obligatory Contour Principle (OCP) applying to adjacent syllables both at the level of the full tone contour and also of the tonal features that comprise the contour. Another account has explained sandhi in terms of leveling across syllables so that excessive contours are avoided. A careful exploration reveals that neither of these approaches is adequate, nor are some of their stipulations necessary. Instead, a more viable solution might be found if we accept that Tianjin prosody is right-headed such that prosodic prominence is reflected through tone complexity. To this end, I propose the Head Tone Complexity (HTC) constraint that partners with OCP to generate the attested ditonal sandhi patterns.

Key words: OCP, prosodic prominence, Tianjin, tone complexity, tone sandhi

1. Introduction

The Tianjin dialect of Mandarin (spoken in Tianjin 120 km south of Beijing) has four lexical tones, summarized below, using Chao's (1930) tone letter system to indicate the tone values. These tones combine to yield six ditonal sandhi patterns (Wee 2004 and Wee et al. 2005; but see §5 for different reports that claim a different set of sandhi patterns). No other ditonal combinations trigger tone sandhi.

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(1) Inventory of Tianjin lexical tones

	Description (Chen 2000; Wang 2002a; Yip 1989)	Li & Liu (1985)	Shi (1990)	Tone value of Standard Mandarin Cognate[1]
Tone 1	Low level (L)	21	11	55 (high level)
Tone 2	High level (H)	45	55	15 (rising)
Tone 3	Rising (R)	213	24	214 (dipping)
Tone 4	Falling (F)	53	53	51 (falling)

(2) Ditonal sandhi patterns

2nd * / 1st σ	L	H	R	F
L	LL→RL	LH	LR	LF
H	HL	HH	HR	HF
R	RL	RH→LH	RR→HR	RF→LF
F	FL→HL	FH	FR	FF→LF

a. LL → RL
   i. *feiL jiL* → *feiR jiL* 'fly machine (=airplane)'
   ii. *kaiL cheL* → *kaiR cheL* 'drive car'

b. RR → HR
   i. *zongR liR* → *zongH liR* 'overall manage (=prime minister)'
   ii. *xuanR juR* → *xuanH juR* 'select support (=election)'

c. FF → LF
   i. *fuF guiF* → *fuL guiF* 'prosperity expensive (=prosperous)'
   ii. *shiF jieF* → *shiL jieF* 'world domain (=world)'

d. FL → HL
   i. *siF fangL* → *siH fangL* 'four square (=square)'
   ii. *qiF cheL* → *qiH cheL* 'gas vehicle (=car)'

e. RF → LF
   i. *banR dengF* → *banL dengF* 'board chair (=bench)'
   ii. *shouR duanF* → *shouL duanF* 'hand segment (=methods, means)'

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1 Standard Mandarin has a rather different set of tone values from Tianjin, with Tianjin having a much more sophisticated set of sandhi rules. In Standard Mandarin, Tone 3 becomes rising when followed by an adjacent Tone 3, but is otherwise flattened to a low tone in all non-final positions. Tone 3 in Tianjin alternates only when followed by Tones 2(H), 3(R), and 4(F).

f. RH → LH
  i. *zhaoR qianH* → *zhaoL qianH* ‘find money (=give change)’
  ii. *zhuR renH* → *zhuL renH* ‘master person (=master/mistress)’

The lexical tones as described in (1) appear to differ across reports. Essentially, Li & Liu’s (1985) tone values do not agree well with the others.[2]

That only six ditonal combinations trigger sandhi has spawned at least two different theories to account for them. Earlier among the two is the OCP account (Yip 1989), where sandhi is treated as being triggered due to violations of OCP at the level of the tone contour (e.g. RR and FF) and at the level of the tone feature (e.g. FL, where the end of F is low in coincidence with the following L). The OCP account and its difficulties will be explored in §2. Another account that has found recent currency is inspired by Hyman’s (1978) Principle of Ups and Downs (PUD), where sandhi happens partially in response to the need to avoid contours across the ditonal string. This is explored in §3, where its inadequacies will also be explained through attempts at an analysis appealing to the PUD. The patterns of Tianjin tone sandhi have spawned many interesting analyses that often extend to polysyllabic sequences (Chen 1986, 2000; Li & Liu 1985; Milliken et al. 1997; Wee et al. 2005; Zhang 1987; Zhang & Liu 2011, among others). However, as I shall show in the ensuing sections, the ditonal patterns have yet to receive a full account.

In this paper, I suggest that a viable account for Tianjin ditonal sandhi cannot turn a blind eye to Tianjin’s prosodic properties. This is in tune with the idea that tonal complexity and prosodic prominence are correlated (Hyman 2007; Yip 2002:27–30). To this end, I propose the Head Tone Complexity (HTC) constraint in §4 after carefully examining the viability of Tianjin as prosodically right-headed. When the HTC partners with relevant OCP constraints, a full account of the Tianjin ditonal patterns becomes possible. Section 5 provides a discussion of alternative accounts before a conclusion in Section 6.

2. Review of an OCP account

This section looks at one of the two main analyses for the ditonal patterns of Tianjin: the OCP. Though straightforward and insightful, extant OCP accounts fall short of explaining why HH, HF, LR, and FR do not trigger sandhi.

2.1 Basic ideas in the OCP account

In a typical OCP account, the patterns in (2) have been ascribed to the OCP (Chen 2000; Wang 2002a; Yip 1989, among others) at two different levels: tone contour and tone feature.

[2] Various attempts using pitch tracks to determine exact tone values have been made (Zhang & Liu 2011 being among the latest and most elaborate), but phonological patterns necessarily abstract from phonetic/acoustic details. ‘The first requirement for a phonetic description of a language is a good account of the phonology . . . After the phonological contrasts have been observed, then the phonetic differences involved can be described’ Ladefoged (1997:138). For a brief explanation on limitations of pitch tracks, see Gussenhoven (2004:5–9).

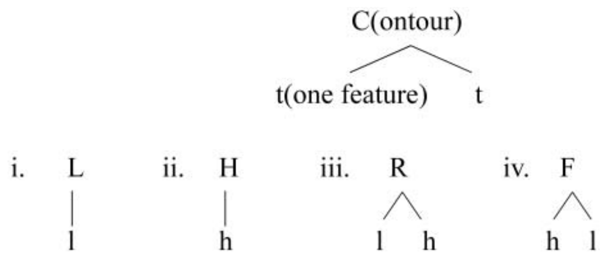
(3) Tianjin ditonal sandhi

a. OCP at the level of tone contour
- i. LL → RL
- ii. RR → HR
- iii. FF → LF

b. OCP at the level of tone feature
- iv. FL → HL (= hl.l → h.l)
- v. RF → LF (= lh.hl → l.hl)
- vi. RH → LH (= lh.h → l.h)

Woo (1969) was among the first to argue that tone contours are made of sequenced tone features, though she did not develop an autosegmental model for the representation of tones. Woo's insight was later echoed in Yip (1980:40, 1989) and Bao (1990, 1999). The four tones in Tianjin may thus be understood as in (4).

(4) Tones in Tianjin



Whether contour tones are made up of units of level tones is a matter of some debate (see Yip 2002:§3.3 for an excellent summary). Some Chinese languages such as Hangzhou Chinese (Hsieh 2008) lend support to the idea that tone contours are non-compositional. Barrie (2007), on the other hand, notes that compositionality of contour tones is well evidenced in African tonal languages, and suggests that tonal languages may differ depending on whether contours are unitary or are clusters of tonal features. Apart from the issue of compositionality of tones, some scholars argue that contour tones are really just the effect of a string sequence of tonal features that are not docked to a tone–contour unit (Chen 2010; Duanmu 1994). This will require tone features to dock directly on the syllable (or whatever tone-bearing unit one assumes). In an OCP account, it is possible to remain neutral on the issue of whether or not there is a tone–contour unit, since OCP could well apply at the tone-bearing unit (perhaps syllable) that contains the whole tone contour.

In the case of Tianjin, the sandhi patterns in (3a) suggest that the OCP applies to tone contours as a whole (again, not necessarily committing one to a tone–contour unit such as that given in Bao's 1990 model). However, the sandhi patterns in (3b) require an account that construes the Tianjin contour tones as being composed of units of sequenced level tones. In the case of (3ai) LL → RL, OCP would be relevant at both contour and feature levels. Without (4), it would be difficult to state the premises under which the kinds of sandhi in (3b) occur. Proponents of the OCP account would find the representations in (4) are useful for understanding Tianjin tone sandhi because of the versatility provided by having both the level of tone features and the level of tone contour[3] to which the OCP applies.

2.2 Challenges to an OCP account

As mentioned in §1, the OCP approach is challenged by the non-sandhi of HH, FR (=hl.lh), LR (=l.lh), and HF (=h.hl). This subsection explains the difficulties of an analysis that is over-reliant on the OCP, such as that put forth in Yip (1989) et seq. Recalling the patterns in (3a), a set of constraints such as (5) will be necessary.

(5) OCP[C]
Identical adjacent tone contours are forbidden.
Max[t]
Do not delete any tone feature.
Dep[t]
Do not insert any tone feature.

With Max[t], one can ensure that the tone features of R and F undergo deletion to yield level tones only to avoid violating OCP[C]; likewise with Dep[t], one can ensure that tone features would be added to L only when collocated with another L. However, notice that HH does not undergo sandhi, which indicates that H behaves differently from R, F, and L in terms of OCP. Following this line of thought, OCP[C] is best understood as a family of constraints including OCP[R], OCP[F], OCP[L], and OCP[H], which may be ranked. In Tianjin, the ranking would be as in (6), using a comparative tableau (Prince 2002).[4]

(6) Effects of OCP[C]

a. input: LL	OCP[L, R, F]	Max[t]	Dep[t]	OCP[H]
i. LL	*W		L	
⚐ ii. RL			*	
iii. HL		*W	*	
💣 iv. FL			*	
v. oL		*W	L	

[3] To be fair, an OCP account does not commit one to the existence of the contour–tone unit. As early as Duanmu (1994) and as recently as Chen (2010) arguments have been advanced against such a contour–tone unit. In models that do not have the contour–tone unit, tone features would hang off the syllable to give the syllable its contour tones. One can easily claim that OCP enforcement on tone contours apply at the level of the syllable.

[4] In rows corresponding to the unattested candidates (loser rows), W indicates that the constraint favors the attested candidate (winner) and L indicates favoring the loser. Every loser-favoring constraint must thus be dominated by some winner-favoring one if the analysis is to be viable.

b. input: RR				
i. RR	*W	L		
⚐ ii. HR		*		
💣 iii. LR		*		
iv. FR		*	*W	
v. oR		**W		
c. input: FF				
i. FF	*W	L		
⚐ ii. LF		*		
💣 iii. HF		*		
iv. RF		*	*W	
v. oF		**W		
d. input: HH				
☞ i. HH				*
ii. LH		*W	*W	L
iii. RH			*W	L
iv. FH			*W	L
v. oH		*W		L

Legend: ☞ indicates attested and optimal candidate
⚐ indicates attested but suboptimal candidate
💣 indicates erroneously selected optimal
* indicates number of violations

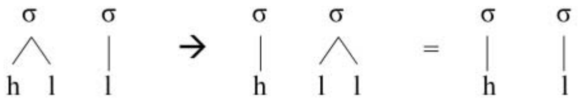
In (6), inputs are given in the top left-hand corner before each set of candidates (ignoring for the moment candidates where the second tone changes, on which there is more in §4.1 and the Appendix). Along the first row, constraints are listed in order of dominance from left to right. The 'o' in candidate v for all cases indicates total deletion of the initial tone, yielding a neutral tone syllable. As may be seen in (6), no matter how one chooses to rank the constraints, one fails to arrive at the attested candidate across the inputs LL, RR, FF, and HH.

The analysis in (6) is inadequate because it does not take into account the facts in (3b). In (3b), it is the adjacency of identical tonal features that triggers sandhi. It is also for this reason that there are a number of non-attested but potentially optimal candidates in the above tableau (candidates (6a.iv), (b.iii), (c.iii)). The account therefore needs to include a trigger for FL, RF, and RH, all of which involve adjacency of identical tone features: [l] in the case of FL (i.e. hl.l) or [h] in the case of RF and RH (i.e. lh.hl and lh.h respectively).[5] As Chen (2000:106, citing Hyman & Schuh 1974)

[5] Obviously FR, LR, and HF are exceptions to this pattern, hence challenges to the OCP account, as the ensuing paragraphs will elaborate.

explains, these are cases of tone absorption where an OCP-offending tone feature undergoes a rightward shift.[6]

(7) Tonal absorption



(cf. (3biv), FL → HL)

Prima facie, tonal absorption is a phonetic issue of articulatory overlap, triggered perhaps by the inability to produce a contour tone in anticipation of the following pitch height. However, sequences like FR, RL, FH, and LR are all exempt from sandhi.[7] As such, one cannot, on the basis of FL → HL, RF → LF, and RH → LH, conclude that absorption is due to the response time needed by the vocal folds to execute the tone contour. Consequently, the alternation rules in (3b) must be part of the phonological system of Tianjin and require a phonological account. Such an account may be constructed with the OCP applying at the level of tone features, given as (8).

(8) OCP[t]
Identical adjacent tone features are forbidden.[8]

OCP[t] must outrank the faithfulness constraints Max[t] and Dep[t] in order to select the right candidates for inputs FL, RF, and RH, shown in (9).

(9) Effects of OCP[t]

a. input: FL	OCP[t]	Max[t]	Dep[t]
i. hl.l (=FL)	*W	L	
☞ ii. h.l (=HL)		*	
b. input: RF			
i. lh.hl (=RF)	*W		
☞ ii. l.hl (=LF)		*L	
c. input: RH			
i. lh.h (=RH)	*W		
☞ ii. l.h (=LH)		*L	

6 Bamileke, Mende, Kikuyu, Hausa, and Ngizim have been identified by Hyman & Schuh (1974) as among the many languages where such absorption processes occur. It is also possible to think of absorption as simply the deletion of the second tone feature of the first syllable in such OCP[t]-offending situations.

7 An account of these will be taken up in §2.3.

8 That the OCP can apply at two different levels of contour and feature is relatively uncontroversial and is compatible with most models of tone structure, e.g. Bao (1990, 1999), Duanmu (1990), Yip (1980, 1989) (though in Duanmu's model this is only possible at the laryngeal node). See Yip (1995) for an excellent summary.

d. input: HH			
☞ i. h.h (=HH)	*L		
💣 ii. hl.h (=FH)			*W
e. input: FR			
☞ i. hl.lh (=FR)	*L		
💣 ii. h.lh (=HR)		*W	
f. input: LR	OCP[t]	Max[t]	Dep[t]
☞ i. l.lh (=LR)	*L		
ii. lh.lh (=RR)			*W
💣 iii. h.lh (=HR)		*W	*W
g. input: HF			
☞ i. h.hl (=HF)	*L		
ii. hl.hl (=FF)			*W
💣 iii. l.hl (=LF)		*W	*W

With (9d–g), the problem becomes apparent. OCP[t] would also apply to HH, FR, LR, and HF sequences which do not undergo sandhi. In particular in (9f–g)—even if OCP[t]-violating candidates are discarded—one would still have to contend with candidates ((9f.iii), (g.iii)) which would still be erroneously preferred over the unsandhied forms. There is no possible ranking for the above constraints that would ensure selection of the attested candidates across these inputs.

Having outlined the difficulties of an OCP account of the Tianjin ditonal sandhi patterns, the next section explores a different approach appealing to PUD.

3. Review of a PUD account

An alternative to thinking of Tianjin ditonal sandhi as OCP-triggered is to appeal to the Principle of Ups and Downs (PUD, Hyman 1978:261) where 'Tonally induced changes tend to minimize the number of ups and downs over a given stretch'. This idea was taken up in Hyman (2007), where Tianjin tone sandhi is cited as an illustrative case of PUD, summarized as follows.

(10) Hyman's (2007) account of Tianjin tone sandhi:
  i. L must be preceded by a high tone feature [h], thus LL → RL in violation of PUD
  ii. RR → HR as required by PUD in satisfaction of (i) above, hence *RR → LR
  iii. FL → HL by absorption

The stipulativeness of (10i) aside, part of the strength of the PUD account is the phonetic grounding it offers through ease of articulation—or perhaps phonetic undershoot. It also removes the need to assume the compositionality of (contour) tones.

For a PUD account to work, it is necessary to have a constraint that punishes contours within a given domain. In the case of Tianjin, that domain would be across a ditonal string. A possible way of stating PUD in terms of a workable constraint is given in (11).

(11) PUD (simple di-tonal)
Within a disyllabic string, there may be no tone contours.

One can imagine various alternative ways of stating PUD, but (11) probably offers the most direct interpretation of Hyman's (1978:261; see above) statement of PUD in a way relevant to the ditonal patterns of Tianjin.[9] Now, (11) would trigger sandhi for FF and RR, and the resultant forms LF and HR respectively do indeed involve fewer ups and downs. However, one would have to explain why the sandhied form for FF is not HF and for RR not LR since HF and LR involve even fewer ups and downs. In any case, PUD is not an adequate trigger, and since LL, which is flat, would not undergo sandhi by that reckoning, some form of OCP might still be needed. In this case, an ideal solution might be found in OCP[t], as given in (8).

Potentially, OCP[t][10] would punish LL (=l.l), HF (h.hl) and LR (l.lh). Hence, it is possible for FF to become LF rather than HF. Similarly, RR becomes HR rather than LR. To give the PUD account maximum advantage, the tableaux are worked out in (12) using OCP[h] and OCP[l] as separate constraints.

(12) Dealing with LL, RR, and FF

a. input: LL	OCP[l]	OCP[h]	Max[t]	PUD	Dep[t]
i. LL	*W			L	L
☞ ii. RL				**	*
iii. HL			*W	*L	*
iv. FL	*W			*L	*
v. oL			*W	L	L
b. input: RR					
i. RR			L	W***	
☞ ii. HR			*	**	
iii. LR	*W		*	*L	
iv. FR	*W		*	**	*W
v. oR			**W	*L	

9 One might suggest, for example, stating that at most one contour is allowed in a ditonal string, or, following a reviewer's suggestion, a scale like *n + 1peaks » *n peaks, which would prefer a reduction of tonal peaks by precisely one for a given input. Neither route would explain (i) why FH would not trigger sandhi but FL would (similarly with RL which does not undergo sandhi, but RH would); (ii) why LL → RL, which increases the number of contours; and (iii) why the sandhi of FL → HL, RH → LH, and RF → LF do not actually reduce the number of peaks.

10 Hyman (2007) referred to this rose by another name: -αT. It is needed as a supplementary constraint to trigger the sandhi where PUD is irrelevant.

c. input: FF					
i. FF			L	***W	
⚐ ii. LF			*	**	
iii. HF		*W	*	*L	
iv. RF		*W	*	**	*W
v. oF			**W	*L	
d. input: HH					
⚐ i. HH		*			
ii. LH		L	*W	*W	*W
iii. RH		*		*W	*W
iv. FH		L		**W	*W
v. oH		L	*W		

From (12a), OCP[l] and Max[t] must outrank PUD. However, in (12b), PUD must outrank Max[t] to trigger sandhi (and assuming that one could remove candidate (12b.v) by stipulating that all syllables must be parsed for tone). This leads to a ranking paradox. Similarly, in (12c), PUD must outrank Max[t] but must rank below OCP [h] to avoid getting either of the unattested FF and HF from the input RR. However, (12d) requires PUD to outrank OCP[h]. It should be apparent that there is no ranking possibility that would allow the selection of the attested candidate across all the relevant inputs listed in (12).

An alternative might be to appeal to a version of PUD so that it does not punish contours within the syllable. Hyman & VanBik (2004) formalized this as NoJump, given in (13). Even this does not help, as is demonstrated below.

(13) PUD as NoJump

NoJump

Tonal contours are disallowed across syllables

a. input: LL	OCP[l]	OCP[h]	Max[t]	NoJump	Dep[t]
i. LL	*W			L	L
⚐ ii. RL				*	*
iii. HL			*W	*	*
iv. FL	*W			L	*
v. oL			*W	L	L
b. input: RR					
i. RR			L	*	
⚐ ii. HR			*	*	
iii. LR	*W		*	L	

iv. FR	*W		*	L	*W
v. oR			**W	L	
c. input: FF					
i. FF			L	*	
☞ ii. LF			*	*	
iii. HF		*W	*	L	
iv. RF		*W	*	L	*W
v. oF			**W	L	
d. input: HH					
☞ i. HH		*			
ii. LH		L	*W	*W	*W
iii. RH		*			*W
iv. FH		L		*W	*W
v. oH		L	*W		

As can be seen in (13), even with NoJump, there is no viable ranking from all the constraints above that would yield the attested output across all relevant input cases. Note in particular how in (13b–c), sandhi-triggering candidates (13b.i, c.i) harmonically bind the desired optimal. Also, the ranking paradox between NoJump and Max[t] as well as between NoJump and OCP[h] persists in this alternative scenario.

The situations with FL → HL, RF → LF, and RH → LH are no more optimistic. One will also have to explain why FL does not surface as LL, RF not as HF, and RH not as HH. Similarly, one has to explain why LR, HF, and FR do not trigger sandhi. An attempt is shown in (14), with both PUD and NoJump[11] options separated by dashed lines.[12]

(14) Dealing with FL, RF, RH, LR, HF, and FR

a. input: FL	OCP[l]	OCP[h]	Max[t]	Dep[t]	PUD	NoJump
i. FL	*W		L		*	L
☞ ii. HL			*		*	*
iii. LL	*W		*		L	L

[11] In the case of Tianjin, failure with appealing to NoJump would also preclude efforts such as Chen's (2010) that appeal to constraints specifying the number of tonal curves allowed in a given stretch.

[12] Recall (10iii) that Hyman's (2007) explanation for FL → L is by absorption and not triggered by PUD. This raises the question of why absorption does not apply to FR, when presumably absorption also applied to RH and RF. Appealing to Zhang & Liu (2011) that non-final rising is shortened due to phonetic difficulty is not a viable solution, because that would predict that the initial R in these cases may remain unsandhied in adequately slow speech. However, speakers that exhibit R → L/ __{F,H} appear to do so categorically.

iv. RL			*	*W	**W	*
v. oL			**W		L	L
b. input: RF						
i. RF		*W	L		**	L
⚐ ii. LF			*		**	*
iii. HF		*W	*		*L	L
iv. FF			*	*W	***W	*
v. oF			**W		*L	L
c. input: RH						
i. RH		*W	L		*	L
⚐ ii. LH			*		*	*
iii. HH		*W	*		L	L
iv. FH			*	*W	*	*
v. oH			**W		L	L
d. input: LR						
⚐ i. LR	*				*	
ii. HR	L		*W	*W	**W	*W
iii. RR	L			*W	***W	*W
iv. FR	*			*W	**W	
v. oR	L		*W		*	
e. input: HF						
⚐ i. HF		*			*	
ii. LF		L	*W	*W	**W	*W
iii. FF		L	L	*W	***W	*W
iv. RF		*	L	*W	**W	
v. oF		L	*W	L	*	
f. input: FR						
⚐ i. FR	*				**	
ii. LR	*		*W		**	
iii. HR	L		*W		**	*W
iv. RR	L		*W	*W	***W	*W
v. oR	L		**W		*L	

In (14), one can again see that OCP must outrank Max[t] in (14a–c), but vice versa in (14d–f). Strikingly, PUD/NoJump would not contribute much to addressing the issues in these cases.

In the PUD/NoJump account presented so far, tone sandhi is triggered by a combination of two factors: the desire to flatten contours and, when inadequate, the application of OCP. Despite efforts in (12)–(14), this has not been successful. Perhaps the PUD/NoJump account might be salvaged from Zhang's (1999, 2002, 2007) observation that contour tones are not licensed in prosodic initial positions. This looks promising since RR, FF, FL, RH, and RF all trigger sandhi. The ensuing paragraphs explore this option using *Rx to refer to the constraint that punishes an initial R, and *Fx to one that punishes initial F.

From (12) and (13), part of the ranking difficulty is between OCP[h] and PUD/NoJump. An option would be to rank OCP[h] » PUD/NoJump, then *Fx » OCP[h] to ensure that HH does not become FH (see (12d) and (13d)). However, this does not rule out LH as an output for HH unless Max[t] ranks high. This option is not possible because high-ranking Max[t] would prevent sandhi from applying to RH, RF, and FL, leading us back to the same ranking problems as before. Another option would be to rank PUD/NoJump » OCP[h]. This move, however, offers no solution as to why FF → LF (see (12c)), since HF would be a superior candidate in terms of PUD/NoJump and *Fx would be neutral between LF and HF. The difficulties do not end here. Because RL and FH do not undergo sandhi, *Rx or *Fx must be ranked lower than Max[t]. This means that *Rx and *Fx cannot in themselves be triggers for the sandhi of RR → HR, FF → LF, RH → LH, RF → LF, and FL → HL. At this point, the only option left seems to be an appeal to constraint conjunction (Itô & Mester 1996, 1998; Krämer 2002; Moreton & Smolensky 2002; Padgett 2002; Smolensky 1993, 1995, 1997, among others). With constraint conjunction, one could claim that RR and FF trigger sandhi as a consequence of the ganging-up of PUD/NoJump and *Rx/*Fx; RH, RF, and FL trigger sandhi as a consequence of the ganging-up of OCP and *Rx/*Fx. This however leaves the non-sandhi of FR (violating both *Fx and OCP[l]) unexplained.

As an endnote to this exploration of a PUD account, I should mention that Hyman (2007:11–14) would classify Tianjin along with languages like Falam (a Kuki-Chin language) as being driven by perceptual complexity. Thus, RL and FH do not undergo sandhi because they are not perceptually complex (supported apparently by Zhang & Liu's 2011 study). To get LL to sandhi, it would have to be assisted by something like OCP[l] (presented above). However, I doubt that this would be adequate to resolve the problems. In any case, the PUD account appears to me less attractive than the OCP account at this point when it fundamentally also appeals to OCP in attributing LL → RL and FL → HL to OCP[l]; RR → HR and FF → LF to PUD; RL and FH to be perceptually non-complex; RF → LF and RH → LH to OCP[h], and yet somehow excepting HH and FR along the way. In contrast, the OCP account in §2 appears to generalize a lot more neatly across what is common about LL, RR, FF, RF, RH, and FL.

4. Solution from constraint on tone via prosody

As seen in §2, the OCP account falls short of explaining the non-sandhi of HH, HF, LR and FR sequences. In §3, the PUD account appears to do a little better, though also failing to capture FR despite appealing to numerous devices including also OCP among its constraints. Personally, I feel that the PUD account, though intuitively appealing at first blush, is too labored.

One of the most striking omissions in both the OCP and the PUD accounts is the relevance of prosody. For starters, either account would have to take care of the fact that the second tone is always stable. Another property about Tianjin ditonal sandhi that is sometimes overlooked is that sandhi applies to the ditonal string that is parsed as a prosodic unit (possibly a foot or a phonological phrase). In constructing a viable account, it might therefore be helpful to first to consider some prosodic issues.

4.1 Headedness in Tianjin prosody

Figuring out the prosodic units in Chinese languages is not always easy. On the one hand, each toned syllable (i.e. syllables that do not carry a neutral tone) is a legitimate prosodic word. Assuming that a minimal prosodic word must be a foot, then it follows that the foot for Chinese is a bimoraic syllable.[13] This is also true of Tianjin. On the other hand, Hayes (1995:88–89) provides a list of languages where degenerate feet can also be words, so it is no longer straightforward that each Tianjin syllable is indeed a foot.

Neutral tones in Tianjin might offer some insight into the matter. Neutral-toned syllables in Chinese (i.e. syllables whose tone values are determined by the tone of the preceding syllable or by some kind of default pitch depending on the phonetic environment) never occur in isolation and are necessarily bound morphemes. Neutral-toned syllables are shorter in duration (see Wang 2002b for specific treatment of Tianjin neutral-toned syllables as monomoraic). The contrast between the boundedness of the neutral-toned syllable and the free fully-toned syllable in terms of whether or not they can occur in isolation argues that Tianjin tone syllables are in fact bimoraic feet that fulfill the minimal word requirement of foot binarity.[14] Evidently, at the level of the monosyllabic word, it is impossible to tell whether Tianjin is iambic or trochaic. For a disyllabic word with both syllables fully-toned, there is now the possibility of the two syllables/feet together forming a larger prosodic unit, perhaps a phonological phrase.[15] In Tianjin, tone sandhi applies across even syntactic constituencies, as in $[_{S}$ *wo* L $[_{VP}$ *mai* L *cai* F]] $\rightarrow$ $[_{S}$ *wo* R $[_{VP}$ *mai* L *cai* F]] ‘I buy vegetables’, where the initial L undergoes sandhi to become R across the syntactic boundary that separates the subject from the verb phrase. At this level, it would be legitimate to query whether the disyllabic phonological phrase (henceforth PhP) is left- or right-headed.

Given the stability of the second tone in all the sandhi-triggering sequences, a natural explanation would be that Tianjin PhP is right-headed, so that by faithfulness to the head position (Beckman 1998), the rightmost tone remains unchanged, illustrated in (15).

13 This follows from the combination of the prosodic hierarchy and foot binarity, which underlies the notion of ‘minimal prosodic word’ (McCarthy & Prince 1995, and references cited therein).

14 Of course, one could insist that the fully-toned monosyllabic word is a degenerate foot and that the neutral-toned syllable is mora-less. This is not a viable option as it would open up the possibility of neutral-toned syllables that consist of only an obstruent consonant (which would be mora-less), unattested in fact.

15 Shih (1986) would have called this a superfoot, while Chen (2000) calls it a rhythmic unit. The label is not particularly important. I think it is more appropriate to call it a phonological phrase since tone sandhi in Tianjin applies across syntactic constituencies.

(15) IDENT-HD [T] (=MAX-HD-T in Yip 2002:89)
Tones corresponding to the head of PhP may not undergo alternation.

/T_1T_2/	SANDHI TRIGGER	IDENT-HD [T]	MAX[t]/DEP[t]
i. T_1T_2	*!W		L
☞ ii. $T_{sandhied}T_2$			*
iii. $T_1T_{sandhied}$		*!W	*

In (15), I have used SANDHI TRIGGER as a stand-in for any (group of) constraint(s) responsible for triggering the alternation, regardless of OCP or PUD. Evaluation of IDENT-HD [T] is made on the assumption that the right-edge syllable is the head.[16]

The position that Tianjin is prosodically right-headed is complicated by the fact that Tianjin has neutral-toned syllables, mentioned earlier. This is because only non-initial syllables may carry the neutral tone. Neutral-toned syllables can occur in succession; a Tianjin example is given below (see Wang 2002a, 2000b for a survey of neutral tones in Tianjin, Beijing, Shanghai, and Urumqi; see also Li 2004:Appendix II for a more comprehensive survey of eight Chinese dialects).

(16) Neutral tone in succession

xiaoR	zi0	men0	de0
small	diminutive	plural	possessive

'that belonging to the boys'

Neutral-toned syllables are indicated with '0'.[17] The neutral tone *zi* in (16) would surface with a high pitch from the [h] tonal element of the preceding syllable. The remaining syllables with neutral tone surface with a gradual fall in pitch as they transit towards a low boundary tone on the rightmost edge. This illustrates that the neutral tone is indeed neutral since its pitch value is not part of the integrity of the syllable. The pitch value is entirely dependent on its environment.

The existence of neutral tones has been used to argue for left-headed prosody (notably Duanmu 2000). Since neutral-toned syllables are phonetically shorter than fully-toned ones, one could argue that disyllabic sequences where the second syllable is neutral-toned are left-headed. Though insightful, it does not follow that all disyllabic sequences are left-headed. As Wang (1999) points out, neutral-toned syllables typically, if not always, involve some amount of morphology: either the neutral-toned syllable is itself a suffix or it is the result of tonal reduction applying to an otherwise fully-toned syllable creating syntactic or semantic change. Some examples are given next in (17).[18]

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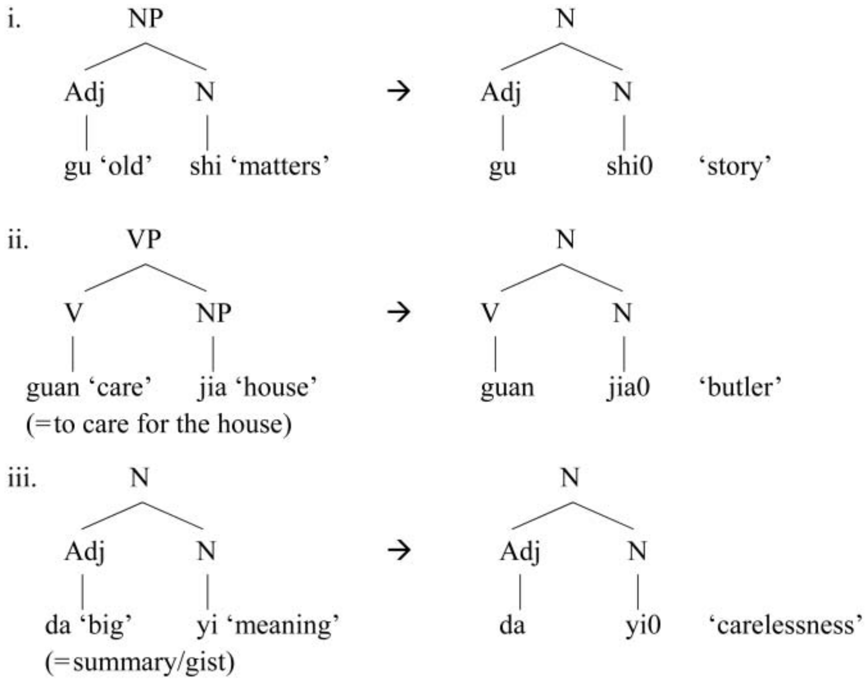
16 One does not appeal to IDENT-RT[T] (requiring identical correspondence of the right-edge element to the input), since as demonstrated in Nelson (1998, 2003), positional faithfulness may apply to elements on the left-edge or both edges, but never to the right edge alone.

17 In Tianjin, the neutral tone surfaces typically with a low/mid pitch, which should not be confused with tone, because neutral tone pitch is entirely phonetic which is an inevitable effect of all voiced segments. I shall not address the issue of neutral tones in this paper since it is tangential to the main focus.

18 Examples apply both to Beijing and Tianjin Mandarin. I have not indicated the tones of non-neutral toned syllables since Beijing and Tianjin have different tone values for these syllables. These patterns or neutral tones are also found in partial (non-tonal) reduplication.

(17) a. Suffix containing neutral tone
i. de0 ‘possessive marker’
ii. men0 ‘plural marker’
iii. zi0 ‘diminutive marker’

b. Syntactic/semantic change

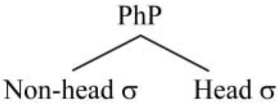


Thus, even if Duanmu (2000) is right in that some Mandarin (including Tianjin) disyllabic sequences are left-headed, these are exceptional in that they uniformly involve the neutral tone and some corresponding morphological process. Also, Davison (1991) noted that neutral-toned syllables in Tianjin absorb high-tone features from the preceding. This is echoed by her phonetic observations that F and R peaks are delayed into the following syllable, which one might justifiably argue is due to the right-headedness of Tianjin prosody. Thus claiming that Tianjin is prosodically left-headed on the basis of neutral tones does not hold water.

The phenomenon of neutral tones may be accounted for through morphology, while right-tone stability during sandhi can only be accounted for with right-headedness. If one adds to this the observation that primary stress on target blocks tone sandhi (Davison 1991:§2.4.1), the parallel of tone stability under primary stress and the stability of the second tone in ditonal sandhi, would lend weight to the claim of iambicity. As such, with the exception of neutral-toned syllables, it seems more reasonable to adopt the position that Tianjin PhP is right-headed.[19]

---

[19] Wang & Feng (2006) study Beijing, a neighboring dialect, and conclude four possible disyllabic prosodic types: (i) heavy-light, (ii) medium-heavy, (iii) heavy-medium, and (iv) indeterminate. The first of these

(18)


(note: σ = foot as explained above)

4.2 Weight by tonal complexity

This section looks at how headedness might be reflected in Tianjin. Prosodic headedness is often reflected in syllable weight or, failing that, in non-reduced vowels. (Recall the Weight-to-Stress Principle, which, according to Duanmu 2009:58–59, goes back as far as Prokosch 1939; Fudge 1969; Hoard 1971; Bailey 1978; Selkirk 1982; Murray & Vennemann 1983; Kager 1989; Prince 1990; Wells 1990; Hammond 1999 and Duanmu 2000.) In English, for example, heavy syllables tend to attract stress (e.g. *'income* but *pa'trol*), and stressed syllables never have schwa as the sole vowel (e.g. *'demon~de'monic*, where the *o* is schwa only when unstressed). Without dwelling on the various devices available to capture these observations (moraic weight and faithfulness to input vowels that are part of the prosodic head syllable, etc.), the main observation here is that prosodic headship is often reflected through complexity either in structure (such as a heavy rime) or in composition (such as more fully specified distinctive features) relative to the non-heads.

The matter of prosodic headship is particularly germane to the case of Tianjin. Unlike English, all Tianjin syllables, excepting those with neutralized tones, are potential words. Section 4.1 has explained that for all phonological purposes the rimes of tone syllables must therefore be construed as being bimoraic. This implies that in parsing syllables in Tianjin into PhP, headship cannot be reflected through the structural complexity of the rime of the constituent syllables, unlike those languages that are sensitive to the Weight-to-Stress Principle. This is due to the uniform bimoraicity of the typical Chinese syllable, hence the lack of strong intuitions for stress by Chinese language speakers.

A possibility opens up with Hyman's (2007) observation that stressed syllables are more hospitable to contour tones. Another way of looking at it would be to say that prosodic prominence is reflected through tonal complexity. Following Yip (2002:27–30), the order of complexity would be rising, falling, high, and low.[20] With reference to the outputs of ditonal sandhi, the right-headedness of Tianjin prosody appears to be asserted by ensuring that the tone of the initial syllable is no more complex than that of the final syllable (i.e. RR → HR, FF → LF, FL → HL, RH → LH, and

involves neutral tones. The second and third correspond to a right-headed and a left-headed configuration respectively. Wang & Feng do not mention if either (ii) or (iii) might be the default structure for Beijing with the other form being derived. I suspect some morphosyntactic parameter might be involved, as can be seen in their example of ***ju***.*ren* 'the 2nd place in the imperial exam' which is a noun (possibly monomorphemic) and *ju*.***ren*** 'to lift someone' which is a phrase. Determining whether Tianjin is like Beijing in having the four disyllabic prosodic types is irrelevant to the issues at hand and would have to wait for a different exploration.

[20] Wang & Feng (2006) also suggested that tones are relevant in figuring out where an accent (i.e. stress or prosodic headship, depending on one's terminology) falls. Earlier, Jiang-King (1999:56) also postulated that prosodic heads should be associated with two tonal features (HeadBinarity), giving the prominent syllable a more complex tone.

RF → LF, excepting LL → RL). A review of the non-sandhi combinations reveals similar tendencies. To formalize this, I propose the HEAD-TONE COMPLEXITY constraint that demands tonal complexity relative to non-heads

(19) HEAD-TONE COMPLEXITY (HTC)
For each degree of separation along the order of tone complexity, where the tone of the prosodic head syllable is less prominent than that of the non-head syllable, assign a violation mark.

Order of Tone Complexity (following Yip 2002:27–30)
Rising » Falling » High » Low

As defined in (19), HTC is a gradient constraint. Assuming right-headedness, HTC would assign one violation mark to HL, RF, and FH; two to FL and RH; and three to RL.

Zhang's (1999, 2002) typological survey also found that contour tones occur more freely in stressed syllables than unstressed ones, with no languages displaying the opposite pattern. In Zhang's phonetically direct account, contour tones are licensed in stressed syllables because stressed syllables are phonetically longer and could therefore adequately house contour tones. Prima facie, Zhang's length-licensing contour–tone account is non-committal to the HTC. However, one wonders if length-licensing might not be shaky when one considers the fact that different speech rates could in principle allow non-stressed syllables to be longer (in largo speech) and stressed syllables shorter (in allegro speech). While it is conceivable that allegro speech might reduce the tones of stressed syllables due to phonetic and physiological constraints, length-licensing would erroneously predict that non-stressed syllables should also freely carry contour tones which surface when speech rate slows adequately. HTC would thus offer a less problematic explanation for the stress–contour correlation. Another reason for the non-reducibility of HTC to a phonetic account comes also from the fact that level tones may also be ordered for complexity, as is indicated in H being preferred over L for association with a prosodically prominent position (de Lacy 2002).

4.3 Ganging-up

The HTC is useful for constructing a viable account for the full set of Tianjin ditonal patterns, though its effects are very modest in the light of examples like RL and FH, which do not undergo sandhi. For these cases, one would have to rank the HTC below MAX[t].

(20) Tolerance of HTC violation

a. input: RL (=lh.l)	MAX[t]	HTC
☞ i. RL		***
ii. HL (=h.l)	*!W	*L
iii. LL	*!W	

b. input: FH (=hl.h)		
☞ i. FH		*
ii. LH (=l.h)	*!W	L
iii. HH	*!W	L

The low ranking of HTC appears unpromising in its role as an attempt to capture Tianjin ditonal patterns. This underdog constraint will have its day when it is allowed to work together with OCP[t], itself a very low-ranking constraint as shown in the non-sandhi of FR and RL (21).

(21) Tolerance of OCP[t] violation

a. input: FR	Max[t]	OCP[t]	HTC	Dep[t]
☞ i. FR		*		
ii. HR	*!W	L		
iii. LR	*!W	*		
iv. RR	*!W	L		
b. input: LR				
☞ i. LR		*		
ii. HR	*!W	L		
iii. RR	*!*W	L		
iv. FR		*		*!W

In (21), we see that Max[t] is active and dominating. For (21b), candidate (21b.iv) is ruled out by Dep[t], though there is at present no ranking argument for where Dep[t] would stand. At first blush, there appears to be little hope of capturing the sandhi-triggering FL, RF, and RH sequences until one notices that these sequences simultaneously violate the HTC and OCP[t], making it plausible that those sequences trigger sandhi because of the ganging-up effect of these two constraints (i.e. constraint conjunction; see §3).

Ganging-up effects, where the power of lower-ranked constraints combines to overcome otherwise higher constraints, are attested in many domains. Examples come from verb agreement with respect to gender, number, and proximity in Hindi (Mohanan 2000), rendaku in Japanese (Itô & Mester 1996), vowel-length patterns in Oromo, labialization in Tashlhiyt Berber (Alderete 1997), place dissimilation in Yucatec Maya (Fukazawa 2001), tone circle in Southern Min Chinese (Wee 2002), spirantization in Polish, and lenition in Campidanian Sardinian (Łubowicz 2002), among many others. OT captures ganging-up effects with local conjunction of constraints, where lower-ranked constraints are allowed to conjoin forces by becoming a singular constraint.[21]

[21] A concern that arises is the fear of runaway proliferation of possible combinations of constraints. I shall not try to address these issues here, except to point out Fukazawa & Miglio's (1998) suggestion that each conjunction be language specific; what is in the Universal Grammar is only the possibility of conjunction. Note also the locality requirement in (22b). In the present analysis, the domain would be the ditonal string, which one may interpret as a rhythmic unit corresponding to a foot or a phonological phrase depending on one's theoretical leanings.

(22) Local conjunction of constraints (from Itô & Mester 1998:10)

a. Definition

Local conjunction is an operation on the constraint set forming composite constraints: Let C_1 and C_2 be members of the constraint set *Con*. Then their local conjunction C_1 & C_2 is also a member of *Con*.

b. Interpretation

The local conjunction C_1 & C_2 is violated if and only if both C_1 and C_2 are violated in some domain.

c. Ranking (universal)

C_1 & C_2 » C_1

C_1 & C_2 » C_2

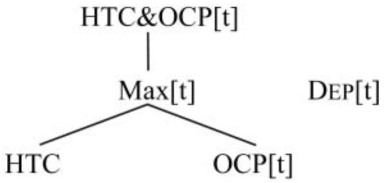
If one conjoins the constraints HTC and OCP[t], an explanation for FL→HL becomes readily available, as shown in (23).

(23) Ganging-up effect of HTC & OCP[t]

a. input: FL	HTC&OCP[t]	Max[t]	HTC	OCP[t]	Dep[t]
i. FL	*!W	L	**W	*W	
☞ ii. HL		*	*		
iii. LL		*		*!W	
iv. RL		*	**!*W		*W
b. input: RF					
i. RF	*!W	L	*	*	
☞ ii. LF		*			
iii. HF		*		*!W	
iv. FF		*			*W
c. input: RH					
i. RH	*!W	L	**W	*W	
☞ ii. LH		*			
iii. HH		*		*W	
iv. FH		*	*!W		*W

With (23), we can see how the otherwise low-ranking underdog constraints HTC and OCP[t] can come together to provide the right trigger for sequences like FL, RH, and RF without doing the same to LR, FR, and HH, since the latter three sequences incur OCP[t] violations without impinging on the HTC. Similarly, HTC-offending sequences like FH and RL are exempt from sandhi because they do not also violate OCP[t]. As for candidate (23b.iv), note that it is in fact the sandhi-triggering FF, and in any case would incur additional violations for Dep[t]. A summary of the constraint ranking thus far is provided in the following Hess diagram.

(24) Ranking hierarchy for Tianjin ditonal sandhi (partial)

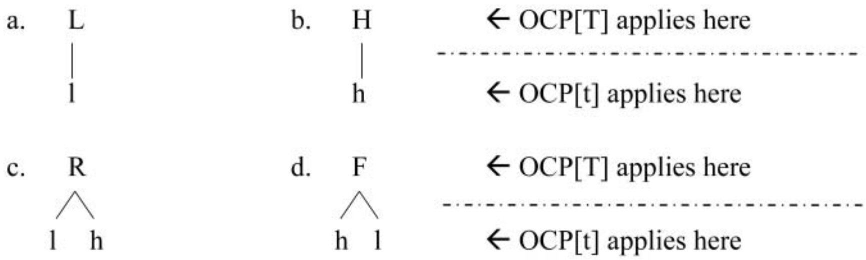


4.4 Return of the OCP

The HTC does not explain LL → RL, RR → HR, or FF → LF. A separate trigger is needed, and appealing to OCP[T] with the HTC and OCP[t] taking care of FL, RF, and RH would actually be able to avoid the problems of the OCP account set out in §2. Requiring that OCP apply to the whole tonal contour F or R does not commit one to a model where there is a tone–contour unit node (see §2.1), though it would be very convenient with a tone–contour node.

With cases like LL, then, both OCP[T] and OCP[t] would apply by virtue of the ambiguity shown in (25).

(25) Levels of OCP application



As can be seen in (25), cases like LL and HH would be subject to both types of OCP. OCP[t] has been discussed in §4.3, and it is OCP[T] that will be the focus in this section.

Ignoring for the moment the non-sandhi of HH, LL→RL, RR→HR, and FF→LF may be accounted for as follows.

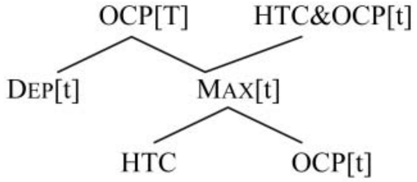
(26) Deriving LL→RL, RR→HR, and FF→LF

a. input: LL	HTC&OCP[t]	OCP[T]	Max[t]	Dep[t]	HTC	OCP[t]
i. LL		*!W		L	L	*W
ii. HL			*!W	*	*L	
☞ iii. RL				*	***	
iv. FL	*!W			*	**L	*W

b. input: RR						
i. LR			*			*!W
☞ ii. HR			*			
iii. RR		*!W	L			
iv. FR			*	*W		*W
c. input: FF						
☞ i. LF			*			
ii. HF			*			*!W
iii. RF	*!W		*	*W	*W	*
iv. FF		*!W	L			L

From (26), one can see how HTC&OCP[t] continues to play an important role in ruling out candidate (26a.iv) and OCP[t] rules out candidates (26b.i, c.ii). The Hess diagram may then be updated as (27).

(27) Ranking Hierarchy for Tianjin Ditonal Sandhi



The only remaining challenge now is with HH, which would violate both OCP[T] and OCP[t] and thus be erroneously expected to sandhi. One way around this is to envisage OCP[T] as a family of constraints comprising OCP[L], OCP[R], OCP[F], and OCP[H], then rank OCP[H] below either Max[t] and HTC or below Dep[t] (see appendix). This is essentially the approach presented in §2.

4.5 A short comparison of HTC, OCP, and PUD

The HTC account is essentially the same as the OCP account augmented with a constraint that recognizes tonal complexity in reflecting prosodic prominence. In so doing, the HTC account shares with the OCP account that the triggers for sandhi in LL→RL, RR→HR, and FF→LF are of a similar type (i.e. OCP[T]), while the triggers for FL→HL, RF→LF, and RH→LH are of another (i.e. HTC, but OCP[t] in the older OCP account). In contrast, the PUD account would have very different triggers for different inputs.

One reason to believe that the HTC account (as also the OCP account) is right comes from feeding and counterfeeding patterns when the ditonal sandhi rules are allowed to interact. As pointed out in Wee (2004:Chapter 3), OCP[T]-triggered sandhi may feed other sandhi, but HTC&OCP[t] sandhi may not feed OCP[T] types of sandhi. This asymmetry is illustrated in (28) and (29).

(28) OCP[T] sandhi-feeding

a. LFF → RLF (via LLF)

e.g. [wen.du] ji ‘thermometer
tong [dian.hua] ‘make a phone call’
san.si.si ‘three four four’

input: LFF
|
LLF
|
output: RLF

b. RLL → HRL (via RR)

e.g. [bao.wen] bei ‘thermos cup’
da[guan.qiang] ‘speak bureaucratically’
ma.la.song ‘marathon’

input: RLL
|
RRL
|
output: HRL

c. FFF →HLF (via FLF)

e.g. [si.ji] qing ‘evergreen
zuo [dian.che] ‘take a tram’
si.si.san ‘four.four.three’

input: FFF
|
FLF
|
output: HLF

(29) HTC&OCP[t] sandhi-feeding and counterfeeding

a. FRH → HLH (via FLH)

e.g. [jia.shi] yuan ‘driver’
po [jiu.ping] ‘broken wine bottle’
si.jiu.ling ‘four nine zero’

input: FRH
|
FLH
|
output: HLH

b. FRF → HLF
e.g. [dai.biao] hui 'representative meeting'
shang [li.bai] 'last week'
si.jiu.si 'four nine four'
input: FRF
|
FLF
|
output: HLF

c. LRF → LLF
e.g. [zhong.biao]dian 'timepiece store'
xin [shou.tao] 'new gloves'
san.wu.si 'three five four'
input: LRF
|
output: LLF
|
*RLF

In (28) and (29), I follow Chen's (2000) presentation format where the locus of sandhi is indicated with an underline and the target of the sandhi is connected with the source with a vertical shaft. I shall not attempt to provide an Optimality Theoretic description of how the effect in (28) may be derived in OT, but would refer the reader to Wee (2004, 2010) and Lin (2008) for some recent accounts. In (28), one can see that OCP[T]-triggered sandhi may in turn trigger other OCP[T] type of sandhi (28a–b) or may feed HTC&OCP[t]-triggered sandhi (28c). In contrast, HTC&OCP[t]-triggered sandhi may only feed sandhi of the same type (29a–b), but will not trigger OCP[T]-type sandhi (29c).

The HTC account is at least consistent with this asymmetry in the feeding relations found in Tianjin tone sandhi, which suggests its superiority to a PUD-inspired account. That HTC&OCP[t]-triggered sandhi should not feed OCPT[T] also suggests that perhaps absorption is really at a level that may be more phonetic than phonological, harking back to the phonetically motivated accounts of Zhang (1999, 2002) and Zhang & Liu (2011). At this point, I am unsure how best to reconcile Zhang's works with these patterns reported here,[22] though one might suggest a study of phonetics that also draws inspiration from phonological patterns in addition to phonetic studies that are carried out independently of phonology.

[22] Nor is it of direct relevance, because the modest goal of this paper is first to provide a coherent and comprehensive phonological account of the patterns. From here, one may then apply phonetic methods to vindicate or falsify. See footnote 2 for Ladefoged's quote on how the first thing about phonetics is a good account of the phonology.

5. Different views about Tianjin tone sandhi

5.1 Traditional descriptions

Exactly which ditonal combinations in Tianjin undergo sandhi is a matter of some recent interest. In the original Li & Liu (1985) account, only four patterns were attested, supported by Ma & Jia (2006), though Zhang & Liu (2011) agree with Wee et al. (2005) that sandhi does apply to RH and RF.

Li & Liu (1985) reported four ditonal sandhi patterns, which is a subset of the patterns treated in the preceding sections. These patterns are listed in (30).

(30) Ditonal sandhi reported in Li & Liu (1985), see (2a–d)

a. LL → RL
   i. *feiL jiL* → *feiR jiL* 'fly machine (=airplane)'
   ii. *kaiL cheL* → *kaiR cheL* 'drive car'

b. RR → HR
   i. *zongR liR* → *zongH liR* 'overall manage (=prime minister)'
   ii. *xuanR juR* → *xuanH juR* 'select support (=election)'

c. FF → LF
   i. *fuF guiF* → *fuL guiF* 'prosperity expensive (=prosperous)'
   ii. *shiF jieF* → *shiL jieF* 'world domain (=world)'

d. FL →HL
   i. *siF fangL* → *siH fangL* 'four square (=square)'
   ii. *qiF cheL* → *qiH cheL* 'gas vehicle (=car)'

This set of patterns is adopted by many subsequent researchers including Yip (1989), Chen (2000),[23] Ma & Jia (2006), Lin (2008), among others. Though I have not met any Tianjin speaker in my studies with only the patterns in (30), it is likely coincidental. In any case, the patterns in (30) call for the same full account for the combinations that do not undergo sandhi, particularly FR. In this classic variety, PUD-based accounts would be even more hard-pressed for an explanation of the tolerance of FR, RH, and RF, given FL→HL.

The present account, on the other hand, could easily deal with this variety by simply recognizing that OCP[t] is in principle a combination of OCP[h] and OCP[l], which could be taken apart and ranked differently. The trigger for FL→HL would thus be the conjunction of HTC&OCP[l] ranked above MAX[t]. Without OCP[h], there is therefore no possible trigger for RF and RH. This is illustrated next as (31).

[23] Chen later acknowledged that there are in fact six in the co-authored work Wee et al. (2005).

(31) Non-sandhi of FR, RH, RF, and LR with sandhi of FL→HL

/FR/	OCP[L,F,R]	HTC&OCP[l]	Max[t]	HTC	OCP[t]	Dep[t]
i. LR			*!		*	
ii. HR			*!			
iii. RR	*!		*			*
☞ iv. FR					*	
v. oR			*!*			

/RH/	OCP[L,F,R]	HTC&OCP[l]	Max[t]	HTC	OCP[t]	Dep[t]
i. LH			* !			
ii. HH			* !		*	
☞ iii. RH				**	*	
iv. FH			* !	**		*
v. oH			*!*			

/RH/	OCP[L,F,R]	HTC&OCP[l]	Max[t]	HTC	OCP[t]	Dep[t]
i. LF			* !			
ii. HF			* !		*!	
☞ iii. RF				*	*	
iv. FF	*!		*			*
v. oF			*!*			

/LR/	OCP[L,F,R]	HTC&OCP[l]	Max[t]	HTC	OCP[t]	Dep[t]
☞ i. LR					*	
ii. HR			* !			*
iii. RR	*!					*
iv. FR					*	* !
v. oR			*!			

/FL/	OCP[L,F,R]	HTC&OCP[l]	Max[t]	HTC	OCP[t]	Dep[t]
i. LL	*!		*		*	
☞ ii. HL			*	*		
iii. RL			*	** !*		*
iv. FL		*!		**	*	
v. oL			** !			

It is noteworthy that even in this classic four-ditonal sandhi variety, the central argument of this paper remains valid and necessary because of the non-sandhi of FR and LR, which a simplistic OCP account would find difficult to circumvent.

5.2 Is Tianjin tone sandhi neutralization?

Though Zhang & Liu (2011) agree that RH and RF patterns are attested, their study based on F0 patterns suggest that neutralization may not have fully occurred (an idea taken up also in Li & Chen 2012). Zhang & Liu note also that the FF pattern may now be obsolete.

The obsolescence of FF→LF does not challenge the present account, since this can be easily addressed by the demotion of OCP[F], and is in fact part of the typological predictions that attest to the essential correctness of the OCP account. After all, a variety that tolerates the non-sandhi of FF but requires the sandhi of RR is not easily captured by PUD-inspired explanations.

Whether or not tone sandhi is truly neutralizing is a more intricate issue.[24] Prima facie, any claim that neutralization did not fully occur would undermine the accuracy of the phonological characterizations of the tone sandhi patterns. There is, however, no real conflict since even by Zhang & Liu's account, tonal alternations did happen, but the sandhied form did not align perfectly with the F0 profiles of the unsandhied L, H, or R targets. F0 profiles, to be fair, are but one aspect of tone manifestations, and should certainly be taken seriously, though one should remain open to the possibility that there are other acoustic cues to tone. In this case, the phonology might be a better guide, since it reveals patterns that might be obscured when one looks too deeply into F0 profiles. Though the F0 studies may suggest that there is no simple neutralization of one tonal category to another during sandhi, it is clearly a step too far to equate 'no full neutralization' with 'no sandhi'. The non-alignment of sandhied tones to unsandhied counterparts could be what phonologists have traditionally distinguished as derived versus non-derived forms.

As further clarification, it is noteworthy that derived Ls and Rs can trigger tone sandhi. For example, the input /RLL/ produces HRL as an output via RRL, where the medial R is derived from LL → RL sandhi. Similarly, /LFF/ → LLF → RLF. Hence, even if the F0 profiles do not show adequate neutralization, one must be careful not to brush aside phonological generalizations.

6. Conclusion

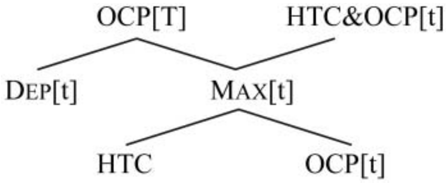
This paper explores an old problem of Tianjin ditonal sandhi that has captured the attention of many scholars (see citations in §1). The two main plausible theories inspired either by OCP or by PUD were discussed and found to be insightful, but also inadequate when dealing with the full set of data, essentially because they have not recognized that tonal prominence and prosodic prominence

[24] A reviewer kindly pointed out that Zhang & Liu's study may have used informants that belonged to a different generation from the speech of those reported earlier. This is certainly possible, though Zhang & Liu did include two informants in their fifties. Li & Chen (2012) studied informants in their twenties (clearly a younger generation) and showed that only adjacent Tone 3 sandhi in Tianjin is a true case of neutralization, much akin to Standard Mandarin and suggesting strong Beijing influence.

might play a role in generating those patterns. To this end, this paper proposes the HTC which requires a head-tone to not be less prominent in terms of tonal complexity than the non-head tone. Though the HTC may itself be a low-ranking constraint for Tianjin, this underdog rises when partnered with OCP[t] as a conjoint constraint. With the HTC, a comprehensive account becomes easy to construct, especially within a framework where OCP is allowed to apply to contour tones (though not necessarily committing one to the existence of a contour–tone unit).

Appendix: Working out all the 16 ditonal combinations

Ranking hierarchy for Tianjin ditonal sandhi



/LL/	OCP[L,F,R]	HTC&OCP[t]	MAX[t]	HTC	OCP[t]	DEP[t]	OCP[H]
i. LL	*!				*		
ii. HL[25]			*!	*		*	
☞ iii. RL				***		*	
iv. FL		*!		**	*	*	
v. oL			*!				
/LH/							
☞ i. LH							
ii. HH			* !		*	*	*
iii. RH				*!*	*	*	
iv. FH				*!		*	
v. oH			*!				
/LR/							
☞ i. LR					*		
ii. HR			* !			*	
iii. RR	*!					*	
iv. FR					*	* !	
v. oR			*!				

[25] Note that in cases where L → H or where H → L, there would be both DEP[t] and MAX[t] violations since they involve the deletion of one tone and the insertion of another.

/LF/	OCP[L,F,R]	HTC&OCP[t]	MAX[t]	HTC	OCP[t]	DEP[t]	OCP[H]
☞ i. LF							
ii. HF			* !		*	*	
iii. RF				*!	*	*	
iv. FF	*!					*	
v. oF			*!				
/HL/							
i. LL	*!		*		*	*	
☞ ii. HL				*			
iii. RL				**!*		*	
iv. FL		* !		**	*	*	
v. oL			*!				
/HH/							
i. LH			* !			*	
☞ ii. HH					*		*
iii. RH				*!*	*	*	
iv. FH				*!		*	
v. oH			*!				
/HR/							
i. LR			* !		*	*	
☞ ii. HR							
iii. RR	*!					*	
iv. FR					* !	*	
v. oR			*!				
/HF/							
i. LF			* !			*	
☞ ii. HF					*		
iii. RF		* !		*	*	*	
iv. FF	*!					*	
v. oF			*!				
/RL/							
i. LL	*!		*		*		
ii. HL			*!	*			
☞ iii. RL				***			

	OCP[L,F,R]	HTC&OCP[t]	MAX[t]	HTC	OCP[t]	DEP[t]	OCP[H]
iv. FL		* !	*	**	*	*	
v. oL			*!*				
/RH/							
☞ i. LH			*				
ii. HH			*		*		*
iii. RH		* !		**	*		
iv. FH			* !	**		*	
v. oH			*!*				
/RR/							
i. LR			*		* !		
☞ ii. HR			*				
iii. RR	*!						
iv. FR			*		* !	*	
v. oR			*!*				
/RF/							
☞ i. LF			*				
ii. HF			*		*!		
iii. RF		* !		*	*		
iv. FF	*!		*			*	
v. oF			*!*				
/FL/							
i. LL	*!		*		*		
☞ ii. HL			*	*			
iii. RL			*	** !*		*	
iv. FL		*!		**	*		
v. oL			** !				
/FH/							
i. LH			*!				
ii. HH			* !		*		*
iii. RH			*!	**	*	*	
☞ iv. FH				*			
v. oH			*!*				

/FR/	OCP[L,F,R]	HTC&OCP[t]	MAX[t]	HTC	OCP[t]	DEP[t]	OCP[H]
i. LR			*!		*		
ii. HR			*!				
iii. RR	*!		*			*	
☞ iv. FR					*		
v. oR			*!*				
/FF/							
☞ i. LF			*				
ii. HF			*		*!		
iii. RF			*	* !	*	*	
iv. FF	*!						
v. oF			**!				

In the above cases, the ‘o’ in candidate (v) indicates total deletion of tones, producing a neutral tone syllable.

References

Alderete, John. 1997. Dissimilation as local conjunction. *Proceedings of the 27th Meeting of the North East Linguistic Society* (*NELS 27*), ed. by Kiyomi Kusumoto, 17–32. Amherst: GLSA.

Bailey, Charles J. N. 1978. *Gradience in English Syllabification and a Revised Concept of Unmarked Syllabification*. Bloomington: Indiana University Linguistics Club.

Bao, Zhiming. 1990. *On the Nature of Tone*. Cambridge: MIT dissertation.

Bao, Zhiming. 1999. *The Structure of Tone*. Oxford & New York: Oxford University Press.

Barrie, Michael. 2007. Contour tones and contrast in Chinese languages. *Journal of East Asian Linguistics* 16.4:337–362.

Beckman, Jill N. 1998. *Positional Faithfulness*. Amherst: University of Massachusetts at Amherst dissertation. *Rutgers Optimality Archive* (ROA#234). http://roa.rutgers.edu/article/view/244

Chao, Yuen Ren. 1930. A system of tone letters. *La Maître Phonétique* 45:24–27.

Chen, Matthew Y. 1986. The paradox of Tianjin tone sandhi. *Chicago Linguistic Society* (*CLS*) 22: 98–154. Chicago: Chicago Linguistic Society.

Chen, Matthew Y. 2000. *Tone Sandhi: Patterns across Chinese Dialects*. Cambridge & New York: Cambridge University Press.

Chen, Tsung-Ying. 2010. Some remarks on contour tone units. *Journal of East Asian Linguistics* 19.2:103–135.

Davison, Deborah S. 1991. Stress and tonal targets in Tianjin Mandarin. *UCLA Working Papers in Phonetics* 78:58–77.

de Lacy, Paul. 2002. The interaction of tone and stress in Optimality Theory. *Phonology* 19.1:1–32.

Duanmu, San. 1990. *A Formal Study of Syllable*, *Stress and Domain in Chinese Languages*. Cambridge: MIT dissertation.

Duanmu, San. 1994. Against contour tone units. *Linguistic Inquiry* 25.4:555–608.

Duanmu, San. 2000. *The Phonology of Standard Chinese*. Oxford & New York: Oxford University Press.

Duanmu, San. 2009. *Syllable Structure: The Limits of Variation*. Oxford & New York: Oxford University Press.

Fudge, Erik C. 1969. Syllables. *Journal of Linguistics* 5.2:253–286.

Fukazawa, Haruka. 2001. Local conjunction and extending Sympathy Theory: OCP effects in Yucatec Maya. *Segmental Phonology in Optimality Theory*, ed. by Linda Lombardi, 231–260. Cambridge & New York: Cambridge University Press.

Fukazawa, Haruka, & Viola Miglio. 1998. Restricting conjunction to constraint families. *Proceedings of the 26th Western Conference on Linguistics* (*WECOL 96*), Vol. 9, ed. by Vida Samiian, 102–117. Fresno: Department of Linguistics, California State University.

Gussenhoven, Carlos. 2004. *The Phonology of Tone and Intonation*. Cambridge & New York: Cambridge University Press.

Hammond, Michael. 1999. *The Phonology of English: A Prosodic Optimality-Theoretic Approach.* Oxford & New York: Oxford University Press.

Hayes, Bruce. 1995. *Metrical Stress Theory: Principles and Case Studies*. Chicago: University of Chicago Press.

Hoard, James E. 1971. Aspiration, tenseness, and syllabification in English. *Language* 47.1:133–140.

Hsieh, Feng-fan. 2008. Preservation of the marked as slope correspondence in Hangzhou Chinese disyllabic tone sandhi. *Interfaces in Chinese Phonology: Festschrift in Honor of Matthew Y. Chen on his 70th Birthday*, ed. by Yuchau E. Hsiao, Hui-chuan Hsu, Lian-Hee Wee & Dah-an Ho, 223–242. Taipei: Institute of Linguistics, Academia Sinica.

Hyman, Larry M. 1978. Historical tonology. *Tone: A Linguistic Survey*, ed. by Victoria A. Fromkin, 257–269. New York: Academic Press.

Hyman, Larry M. 2007. Universals of tone rules: 30 years later. *Tones and Tunes*, Vol. 1: *Typological Studies in Word and Sentence Prosody*, ed. by Tomas Riad & Carlos Gussenhoven, 1–34. Berlin & New York: Mouton de Gruyter.

Hyman, Larry M., & Russell G. Schuh. 1974. Universals of tone rules: evidence from West Africa. *Linguistic Inquiry* 5.1:81–115.

Hyman, Larry M., & Kenneth VanBik. 2004. Directional rule application and output problems in Hakha Lai tone. *Language and Linguistics* 5.4:821–861.

Itô, Junko, & Armin Mester. 1996. Rendaku 1: Constraint conjunction and the OCP. *Rutgers Optimality Archive* (ROA#144-0996). http://roa.rutgers.edu/article/view/155.

Itô, Junko, & Armin Mester. 1998. Markedness and word structure: OCP effects in Japanese. *Rutgers Optimality Archive* (ROA#255-0498). http://roa.rutgers.edu/article/view/265.

Jiang-King, Ping. 1999. *Tone-Vowel Interaction in Optimality Theory*. München: LINCOM Europa.

Kager, René. 1989. *A Metrical Theory of Stress and Destressing in English and Dutch*. Dordrecht: Foris.

Krämer, Martin. 2002. Local constraint conjunction and neutral vowels in Finnish harmony. *Belfast Working Papers in Language and Linguistics 15*, ed. by Karen Brunger, 38–64. Belfast: University of Ulster. Retrieved from http://www.hum.uit.no/a/kraemer/bwpll15-mk.pdf, May 23, 2010.

Ladefoged, Peter. 1997. Instrumental techniques for phonetic fieldwork. *The Handbook of Phonetic Sciences*, ed. by William J. Hardcastle & John Laver, 137–166. Oxford: Blackwell.

Li, Mingxing. 2004. *Neutral Tone in Disyllabic Sequences across Chinese Dialects: An OT Account*. Tianjin: Tianjin Normal University MA thesis.

Li, Qian, & Yiya Chen. 2012. Trisyllabic tone sandhi in Tianjin Mandarin. Paper presented at the Third International Symposium on Tonal Aspects of Languages (TAL 2012), May 26–29, 2012. Nanjing, China.

Li, Xingjian, & Sixun Liu. 1985. Tianjin fangyan de liandu biandiao [Tone sandhi in the Tianjin dialect]. *Zhongguo Yuwen* [*Studies of the Chinese Language*] 1985.1:76–80.

Lin, Hui-shan. 2008. Variable directional applications in Tianjin tone sandhi. *Journal of East Asian Linguistics* 17.3:181–226.

Łubowicz, Anna. 2002. Derived environment effects in Optimality Theory. *Lingua* 112.4:243–280.

Ma, Qiuwu, & Yuan Jia. 2006. Tianjinhua shangsheng de liangtiao "biandiao guize" bianxi [Two new third tone sandhi rules in Tianjin dialect: a critical reanalysis]. *Tianjin Shifan Daxue Xuebao* [*Journal of Tianjin Normal University* (*Social Science Edition*)] 2006.1:53–58.

McCarthy, John J., & Alan Prince. 1995. Prosodic morphology. *The Handbook of Phonological Theory*, ed. by John A. Goldsmith, 318–366. Oxford: Blackwell.

Milliken, Stuart, Guang-Ping Zhang, Xue-Yi Zhang, Zhi-Qui Li, & Ying Lü. 1997. Resolving the paradox of Tianjin tone sandhi. *Studies in Chinese Phonology*, ed. by Jialing Wang & Norval Smith, 53–80. Berlin & New York: Mouton de Gruyter.

Mohanan, Karuvannur Puthanveettil. 2000. The theoretical substance of the optimality formalism. *The Linguistic Review* 17.2–4:143–166.

Moreton, Elliott, & Paul Smolensky. 2002. Typological consequences of local constraint conjunction. *Proceedings of the 21st West Coast Conference on Formal Linguistics* (*WCCFL 21*), ed. by Line Mikkelsen & Christopher Potts, 306–319. Somerville: Cascadilla Press.

Murray, Robert W., & Theo Vennemann. 1983. Sound change and syllable structure in Germanic phonology. *Language* 59.3:514–528.

Nelson, Nicole. 1998. Right anchor, aweigh. *Rutgers Optimality Archive* (ROA#284-0998). http://roa.rutgers.edu/article/view/294.

Nelson, Nicole. 2003. *Asymmetric Anchoring*. New Brunswick: Rutgers University dissertation. *Rutgers Optimality Archive* (ROA#604-0503). http://roa.rutgers.edu/article/view/614.

Padgett, Jaye. 2002. Constraint conjunction versus grounded constraint subhierarchies in Optimality Theory. *Rutgers Optimality Archive* (ROA#530-0702). http://roa.rutgers.edu/article/view/540.

Prince, Alan. 1990. Quantitative consequences of rhythmic organization. *Chicago Linguistic Society* (*CLS*) 26.2:355–398. Chicago: Chicago Linguistic Society.

Prince, Alan. 2002. Arguing optimality. *University of Massachusetts Occasional Papers in Linguistics 26: Papers in Optimality Theory II*, ed. by Angela Carpenter, Andries Coetzee & Paul de Lacy, 269–304. Amherst: GLSA.

Prokosch, Eduard. 1939. *A Comparative Germanic Grammar*. Philadelphia: Linguistic Society of America.

Selkirk, Elisabeth O. 1982. The syllable. *The Structure of Phonological Representations: Part II*, ed. by Harry van der Hulst & Norval Smith, 337–383. Dordrecht: Foris.

Shi, Feng. 1990. Zai lun Tianjinhua de shengdiao ji qi bianhua [Tianjin tones and their sandhi behavior revisited]. *Yuyan Yanjiu* [*Studies in Language and Linguistics*] 1990.2:15–24.

Shih, Chilin. 1986. *The Prosodic Domain of Tone Sandhi in Chinese*. San Diego: University of California at San Diego dissertation.

Smolensky, Paul. 1993. Harmony, markedness, and phonological activity. *Rutgers Optimality Archive* (ROA#87). http://roa.rutgers.edu/article/view/88.

Smolensky, Paul. 1995. On the internal structure of the constraint component *Con* of UG. *Rutgers Optimality Archive* (ROA#86). http://roa.rutgers.edu/article/view/87.

Smolensky, Paul. 1997. Constraint interaction in generative grammar II: local conjunction, or random rules in universal grammar. Handout of talk given at Hopkins Optimality Theory Workshop/ University of Maryland Mayfest (H-OT97), Baltimore, Maryland, USA.

Wang, Jialing. 2002a. Youxuanlun he Tianjinhua de liandu biandiao ji qingsheng [OT and the tone sandhi and tone neutralization in Tianjin dialect]. *Zhongguo Yuwen* [*Studies of the Chinese Language*] 2002.4:363–372.

Wang, Jialing. 2002b. Sanzhong fangyan qingsheng de youxuanlun fenxi [An OT analysis of neutral tone in three Chinese dialects]. *Yuyan Kexue* [*Linguistic Sciences*] 2002.1:78–85.

Wang, Zhijie Jenny. 1999. Cihui biandiao, cifa biandiao he yinxi biandiao [Lexical tone change, morphological tone change and phonological tone change]. *Gongxing yu Gexing* [*Universality and Specificity*], ed. by Liejiong Xu, 288–310. Beijing: Beijing Language and Culture University Press.

Wang, Zhijie Jenny, & Shengli Feng. 2006. Shengdiao duibifa yu Beijinghua shuangyinzu de zhongyin leixing [Tonal contrast and disyllabic stress patterns in Beijing Mandarin]. *Yuyan Kexue* [*Linguistic Sciences*] 2006.1:3–22.

Wee, Lian-Hee. 2002. Of chains and weights. Handout from Seminar Series Grammaticality of the Fittest: Ideas in OT. Hong Kong: City University of Hong Kong.

Wee, Lian-Hee. 2004. *Inter-tier Correspondence Theory*. New Brunswick: Rutgers University dissertation.

Wee, Lian-Hee. 2010. A percolative account of Tianjin tone sandhi. *Language and Linguistics* 11.1:21–64.

Wee, Lian-Hee, Xiuhong Yan, & Matthew Y. Chen. 2005. *Yinan yu Luxiang: Tianjin Fangyan de Liandu Biandiao* [*Tianjin Tone Sandhi: A Final Report*]. Beijing: The Commercial Press.

Wells, John C. 1990. Syllabification and allophony. *Studies in the Pronunciation of English: A Commemorative Volume in Honor of A. C. Gimson*, ed. by Susan Ramsaran, 76–86. London: Routledge.

Woo, Nancy. 1969. *Prosody and Phonology*. Cambridge: MIT dissertation.

Yip, Moira. 1980. *The Tonal Phonology of Chinese*. Cambridge: MIT dissertation.

Yip, Moira. 1989. Contour tones. *Phonology* 6.1:149–174.

Yip, Moira. 1995. Tones in East Asian languages. *The Handbook of Phonological Theory*, ed. by John A. Goldsmith, 476–494. Oxford: Blackwell.

Yip, Moira. 2002. *Tone*. Cambridge & New York: Cambridge University Press.

Zhang, Jie. 1999. A typology on the distribution of contour tones. *Linguistics Notes from La Jolla 20: Proceedings of the 5th Annual Southwest Workshop on Optimality Theory*. San Diego: University of California at San Diego. Retrieved from http://www.humnet.ucla.edu/humnet/ linguistics/people/grads/zhang/swot5-proceedings.pdf, June 1, 2011.

Zhang, Jie. 2002. *The Effects of Duration and Sonority on Contour Tone Distribution*. New York: Routledge.

Zhang, Jie. 2007. A directional asymmetry in Chinese tone sandhi systems. *Journal of East Asian Linguistics* 16.4:259–302.

Zhang, Jie, & Jiang Liu. 2011. Tone sandhi and tonal coarticulation in Tianjin Chinese. *Phonetica* 68.3:161–191.

Zhang, Zheng-sheng. 1987. The paradox of Tianjin: another look. *Journal of Chinese Linguistics* 15.2:247–273.

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源於複雜性的凸顯性：捕捉天津方言二字組變調規律

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天津方言高低升降四個基本調形，兩兩組合成十六個二字組，當中有六種產生變調。變調之所以產生說法不一：一說是強行曲線原則在聲調的調形與調徵兩個不同層面運行；一說認爲是調形跨音節時平化。細察之則不難發現兩說皆有待補充，而將天津方言視爲通過聲調調形複雜性體現起右重（即抑揚格）節律乃最有效辦法。是故本文提出主位調複雜性制約條件 (HTC) 以配合強行制約原則得出天津方言僅有的六種二字組變調。

關鍵詞：連讀變調，調複雜性，節律主位，強行曲線原則，天津