

The Syntactic Condition of Taiwanese Tone Sandhi

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0. Introduction

The discussion of this paper centers around the syntactic condition for Taiwanese Tone Sandhi. The rich and complicated sandhi phenomena of Taiwanese have been a topic for discussion by many Chinese linguists (Cheng 1968, 1973, 1991; Chen 1987, 1992; Chung 1989; Hsiao 1991; Zhang 1992; Hsu 1992). As for the analyses of the tone sandhi domain, the most important ones were made by Cheng (1991) and Chen (1987, 1992). The former has provided us with almost all of the major tone sandhi data for the discussion of some important issues, while the latter is the first to discuss the domain of tone sandhi from the view point of functional relations to heads. In this paper, I will first discuss some problems in previous analyses, especially the one made by Chen, and then try to reanalyze the data as well as propose the revised tone group formation (TGF) for Taiwanese tone sandhi. Finally, this paper will flesh out certain of the theoretical implications of the analysis and summarize the conclusions reached here.

1. Taiwanese Tonal System

Before getting down to business, I will briefly discuss the background of the Taiwanese, according to the viewpoints of most Chinese phonologists in the field of Taiwanese study. In Taiwanese there are seven citation tones, as shown in (1).¹

(1) The Citation Tones in Taiwanese:

a. 44 b. 53 c. 21 d. 22 e. 24 f. 5 g. 3

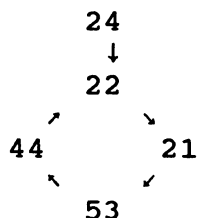
The TS rule and the mode of rule application in Xiamen at phrase structure level are stated in (2) and (3), respectively.²

(2) Tone Sandhi Rule (TSR):

$T \rightarrow T' / \text{---} T]_{\alpha}$

(3) The mode of TSR:

a. Free Syllable:



b. Checked Syllable:

(i) 5 --> 21 (-p, -t, -k)
 21 (-q)

- (ii) 3 --> 5 (-p, -t, -k)
53 (-q)

Generally speaking, there is a process whereby each citation tone assumes a sandhi form in a sort of chain shift. The 'free' syllable tones form a closed circle as depicted in (3a). 'Checked' syllable tones form a subsystem of their own, and the rules are given in (3b). If we disregard the phonetic details, both 'free' and 'checked' syllable TS can be generalized as (2).

2. Chen's TG Formation

According to functional relations to heads, Chen proposes *tone group formation* (TG formation) for Taiwanese tone sandhi, as seen in (4):

(4) TG Formation (Chen 1987):

Mark the right edge of every XP with #, except where XP is an adjunct c-commanding its head.

The TG formation in (4) not only points out that Taiwanese TS depends on functional categories, but also combines two different approaches, namely, the *end-based approach* proposed by Selkirk (1986) and the *relation-based approach* claimed by Kaisse (1985). According to Chen, three conditions need to be taken into consideration in order to ascertain the domain of Taiwanese TS: edge condition, adjunct/argument dichotomy condition, and c-command condition.

Since Reinhart (1981) discussed in detail the notion of c-command, two different definitions have been proposed: a) the preliminary definition given by Reinhart, and b) the revised definition proposed by Chomsky (1986), given respectively in (5a) and (5b):

(5) a. Preliminary definition (Reinhart 1981):

α c-commands β iff
every branching node dominating α dominates β .

b. Revised definition (Chomsky 1986):

α c-commands β iff
every maximal projection dominating α dominates β .

To distinguish these two different c-command definitions, (5a) is generally called c-command while (5b) is termed m-command. It should be noted that the notion of c-command according to Chen is in fact the preliminary definition of c-command according to Reinhart.

As the first effective approach to account for almost all of the data of Taiwanese and also as the most important work ever done in the study of Taiwanese TS, the TG formation in (4) has been widely accepted (Selkirk 1986; Shih 1986; Hung 1987; Hsiao 1991). However, as noticed by Chen himself, the TG formation in (4) fails to explain why the adjunct within VP differs from sentential adjunct.³ In Taiwanese, a VP-adjunct can not form its own TS domain; instead, together with its following head it forms one domain, as seen in (6). A sentential adjunct, on the other hand, must have its own domain, as seen in (7).⁴

- (6) a. Ting sio-tsia yi-king tsau a
 33 55-53 # 55-33 = 53 .
 Ting miss already go ASP
 'Miss Ting has already left.'
- b. Ting sio-tsia kuah-kin tsiaq png
 33 55-53 # 55-55 = 21 33
 Ting miss quickly eat meal
 'Miss Ting quickly ate her meal.'
- (7) a. Ting sio-tsia tai-k'ai tsau a
 33 55-53 # 21-21 # 53 .
 Ting miss probably go ASP
 'Miss Ting has probably left.'
- b. Ting sio-tsia tai-k'ai yi-king tsau a
 33 55-53 # 21-21 # 55-33 = 53 .
 Ting miss probably already go ASP
 'Miss Ting has probably already left.'

By virtue of the *TG formation* in (4), if an adjunct c-commands its head, a TG boundary '#' cannot be inserted. According to the definition of c-command, both *yi-king* 'already' in (6a) and *tai-k'ai* 'probably' in (7a) c-command the closely following *tsau* 'go', but only the former forms one TG with *tsau* while the latter and the following *tsau* form two different TGs. And this fact shows that there is some problem within the *TG formation* in (4).

3. Domain-c-command Approach to Taiwanese TS

After Chen (1987), Chung (1989) made a different analysis based on Hakka TS data. Following Kaisse's idea (Kaisse 1985), he considers the domain of TS an m-command domain with the K-condition instead of functional relations. The general idea of Kaisse's hypothesis is seen in (8a) and her definition of domain c-command is given in (8b):

- (8) a. K-condition (Kaisse 1985):

For a rule to apply to a sequence of two words α and β
 (i) α must domain-c-command β or
 (ii) β must domain-c-command α .

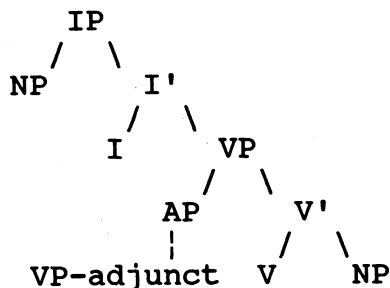
- b. Domain c-command (Kaisse 1985):

In the structure [X^{\max} ... x ...], X^{\max} is defined as the domain of x. Then x c-commands any Y in its domain.

Kaisse's domain-c-command definition is, as a matter of fact, a refurbished version of that of m-command by Chomsky (1986). According to the K-condition in (8a), TS rule applies between α and β , so long as they stand in a head-XP relation, where the XP is neutral between argument and adjunct.

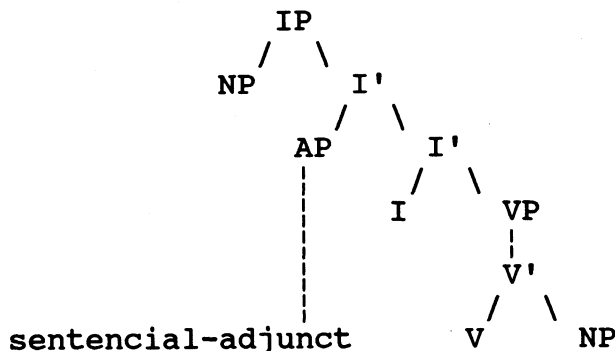
However, Chung's analysis can solve the contradiction between (6) and (7) because the VP-adjunct's position in the syntactic tree is different from that of the sentential adjunct. The former is within the VP and is m-commanded by the head of the VP, namely, the verb, as seen in (9). But the latter is outside the VP, and thus not m-commanded by the verb, as seen in (10).

(9)



Remark: V m-commands AP.

(10)



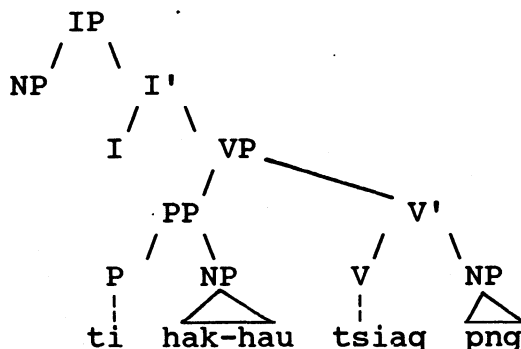
Remark: V does not m-command AP.

Since *yi-king* 'already' in (6a) is a VP-adjunct m-commanded by the verb, the TS rule applies. But *tai-k'ai* 'probably' in (7a) is a sentential adjunct which is not m-commanded by the verb, so the TS rule does not apply. However, Chung's analysis cannot explain cases in which the verb and the preceding PP are divided into two different TGs in Taiwanese, as seen in (11):

- (11) a. Ting sio-tsia ti hak-hau tsiag png
 33 55-53 # 21 3-33 # 21 33
 Ting miss at school eat meal
 'Miss Ting eats her meal at school.'
- b. Ting sio-tsia kuah-kin ti hak-hau tsiag png
 33 55-53 # 55-55 = 21 3-33 # 21 33
 Ting miss quickly at school eat meal
 'Miss Ting ate her meal quickly at school.'

In the syntactic tree, the PP *ti hak-hau* 'at school' is m-commanded by the verb *tsiaq* 'eat', seen as (12):

(12)



According to the K-condition, *tsiaq* m-commands *hak-hau*, so the TS rule should apply between them. But as a matter of

fact, this is a wrong TS output for Taiwanese. Therefore, for Taiwanese TS Kaisse's hypothesis in (8), employed by Chung, is not a successful one.

4. Revised TG Formation

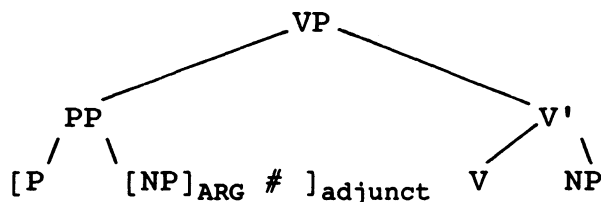
In order to solve the problem left over by Chen (1987) and Chung (1989), Chen (1992) revises the TG formation for Taiwanese, as shown in (13):

(13) Revised TG Formation (Chen 1992):

Mark the right edge of every XP with #, except where XP is an adjunct c-commanding its lexical head.

Compared with the preliminary version in (4), the revised version in (13) also considers that functional relations with the head, instead of pure syntactic relations like m-command, is the key to the analysis of Xiamen TS. Different from (4), (13) emphasizes that the adjunct only c-commands its lexical heads, not all of its heads. Since a sentential adjunct is licensed by I (Infl), which is the head of a functional category, it is a non-lexical head, thus the TS rule must be blocked between a sentential adjunct and its following elements, although the sentential adjunct c-commands its following elements. But the adjuncts within the VP and NP are different because both of them modify lexical heads, and thus the TS rule must be applied between adjuncts and their heads. As for the cases in which the TS rule must be blocked between the PP and the closely following verb, according to Chen the NP (i.e., the XP between the P and verb) is an argument rather than an adjunct, although the PP is the adjunct of the verb, thus blocking the TS rule, as seen in (14).

(14)



Thus it can be seen that the revised version in (13) by Chen not only solves the problem in (6) and (7), but also works out a solution for the problem in (11).

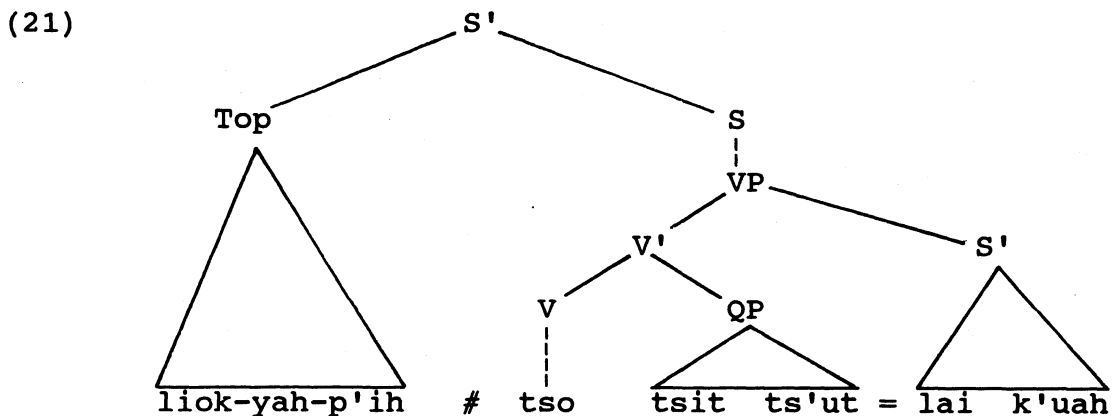
5. Re-revised TG Formation

However, according to my recent study (1992), the hypothesis in (13) still has some problems. First, let us consider the examples from (15) to (20).⁵

- (15) a. tso tsit ts'ut liok-yah-p'ih lai k'uah
 33 3 5 = 3 - 55 - 21 # 33 21
 rent one Cl video-movie to watch
 'Rent a video movie to watch'
- b. liok-yah-p'ih tso tsit ts'ut lai k'uah
 3 - 55 - 21 # 33 3 5 = 33 21
 video-movie rent one Cl to watch
 'Rent a video movie to watch'

- (16) a. bue tsap kuah be-a tsiu lai lim
 55 3 53 = 21-55 53 # 33 55
 buy ten Cl beer wine to drink
 'Buy ten bottles of beer to drink'
- b. be-a tsiu bue tsap kuah lai lim
 21-55 53 # 55 3 53 = 33 55
 beer wine buy ten Cl to drink
 'Buy ten bottles of beer to drink'
- (17) a. tso tsit ts'ut liok-yah-p'ih tsin kui
 33 3 5 = 3 - 55 - 21 # 33 21
 rent one Cl video-movie very expensive
 'It is very expensive to rent a video movie.'
- b. liok-yah-p'ih tso tsit ts'ut tsin kui
 3 - 55 - 21 # 33 3 3 # 33 21
 video-movie rent one Cl very expensive
 'It is very expensive to rent a video movie.'
- (18) a. lim tsap kuah be-a tsiu e tsui
 33 3 53 = 21-55 53 # 21 21
 drink ten Cl beer wine will drunk
 'To drink ten bottles of beer will cause drunkenness.'
- b. be-a tsiu lim tsap kuah e tsui
 21-55 53 # 33 3 21 # 21 21
 beer wine drink ten Cl will drunk
 'To drink ten bottles of beer will cause drunkenness.'
- (19) ts'iuh sah pai siuh t'iam
 53 33 53 # 33 53
 sing three Cl too tired
 'It is too tiring to sing three times.'
- (20) ts'iuh tsit pai hoo yi t'iah
 53 3 55 = 44 22 44
 sing one Cl for him hear
 'Sing once for him to hear.'

Chen has made an analysis of case (15). In his opinion, the adnominal adjunct QP in (15a) for the NP *liok-yah-p'ih* 'video movie', which occupies an object position, is reanalysed as an adverbial phrase as well as a posthead adjunct in (15b) as a result of the topicalization of *liok-yah-p'ih*. The syntactic structure given by Chen for (15b) is shown in (21):



The first question we want to ask is how '=' , which is put at the right edge of the QP to symbolize the application of the TS rule, is obtained. According to the *TG formation* in (13), '#' should be assigned to the right edge of all of the XPs, except when an XP is an adjunct c-commanding its lexical head, for which an '=' should be put instead. But in (21), the QP c-commands only the verb *tso* 'rent' at its left without c-commanding any elements to its right. By Chen's analysis, the QP seems to be an adjunct c-commanding its left head, thus gaining an '=' at its right, although this QP does not have any c-command relation with its right elements. Such an analysis is also suitable for example (16b). But this analysis violates the *locality conditions* (Poser 1981, 1985; Steriade 1987), which maintains that the application of tone sandhi rule to the right should have nothing to do with the syntactic condition at the left.

The second question we want to raise is concerned with 'lexical head'. According to (13), the TS rule must be blocked between the XP and the following elements, except when the XP is an adjunct c-commanding its lexical head. Before discussing the problem involved in (13), let us first present briefly Chinese phrase structures (Huang 1982, 1991; Tang 1990). In the notation of X'-theory, every phrasal category is a projection of a zero-level category in terms of the following formalization:⁶

- (22) a. $X' = X X''^*$
 b. $X'' = X''^* X'$

Zero-level categories are assumed to be of two different types. One type consists of the lexical categories, including N, V, P, and A. Another type covers the non-lexical or functional categories like complementizer (C) and Infl (I). Now let us come back to the problem in (13). According to (13), an adjunct can c-command its lexical head, excluding a non-lexical head or a functional head, i.e., Infl or Comp of CP (see Chen 1992: 19). But *hoo* 'for' in (20) is the head of a functional category, i.e., the Comp of CP, instead of a lexical head, so the TS rule still applies between the QP *tsit pai* 'one' and *hoo*. Thus this shows that the *TG formation* in (13) needs further revision. That is why I propose here in (23) a re-revised *TG formation* for Xiamen.⁷

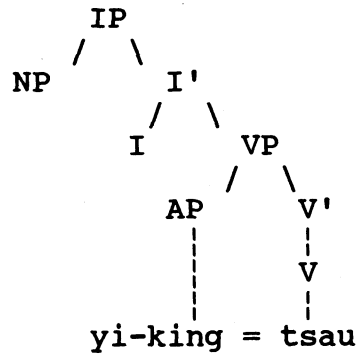
(23) Re-revised TG Formation (Zhang 1992):

Mark the right edge of every XP with #, except where XP is an adjunct m-commanding either its head or the head of XP on the right except Infl.

The *TG formation* in (23) can account for, without any exception, all of the data mentioned above. Adjuncts in both example (6) and (7) m-command their following heads, but since the head of the former is a verb while that of the latter is an Infl, the TS rule can be applied only to (6), but is blocked in (7), as shown respectively in (24) and (25).

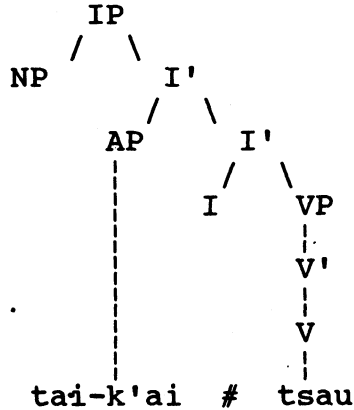
△
K' 1991

(24)



Remark: AP m-commands V, i.e., the head of VP.

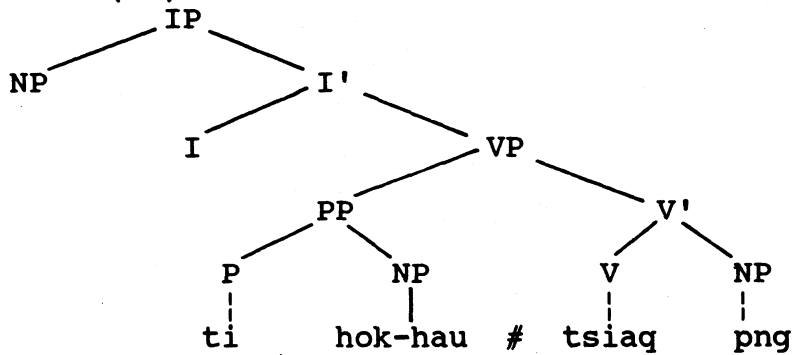
(25)



Remark: AP m-commands Infl, i.e., the head of IP.

In example (11a), the NP *hak-hau* 'school' is an argument, not an adjunct, for the preposition *ti* 'at', so the TS rule is blocked between *hak-hau* and *tsiaq*. The example is reproduced in (26) for the sake of convenience.

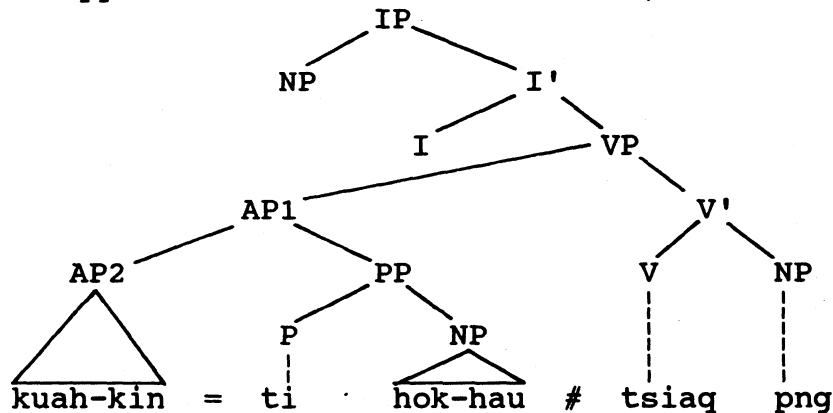
(26)



Remark: The XP before V, i.e., the head of VP, is an argument.

As for example (11b), since the adjunct *kuah-kin* 'quickly' m-commands the head of PP, i.e., *ti* 'at', on the right, the TS rule is applied between *kuah-kin* and *ti*, as seen in (27).

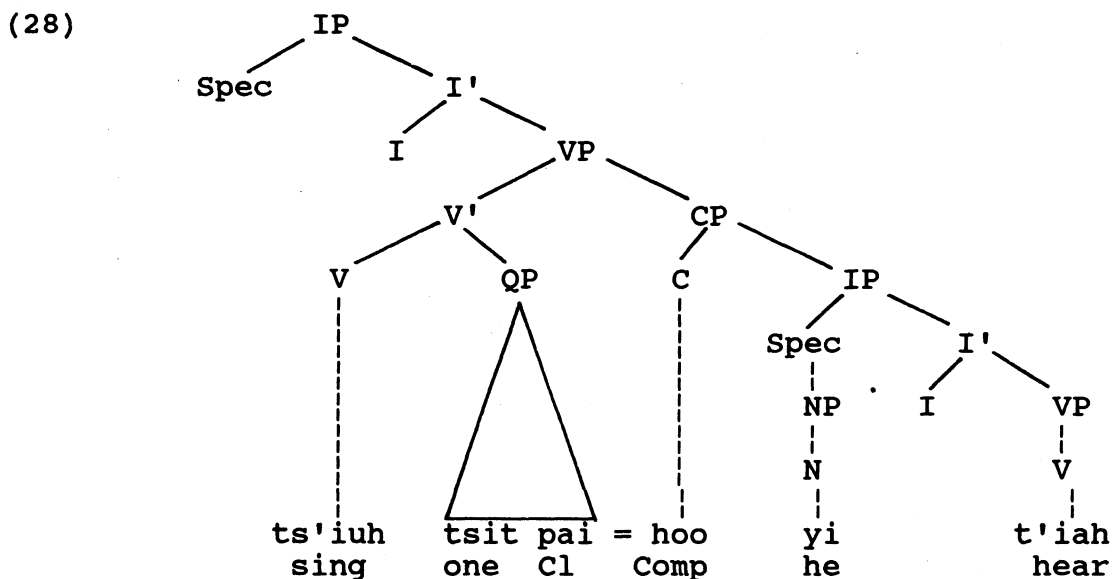
(27)



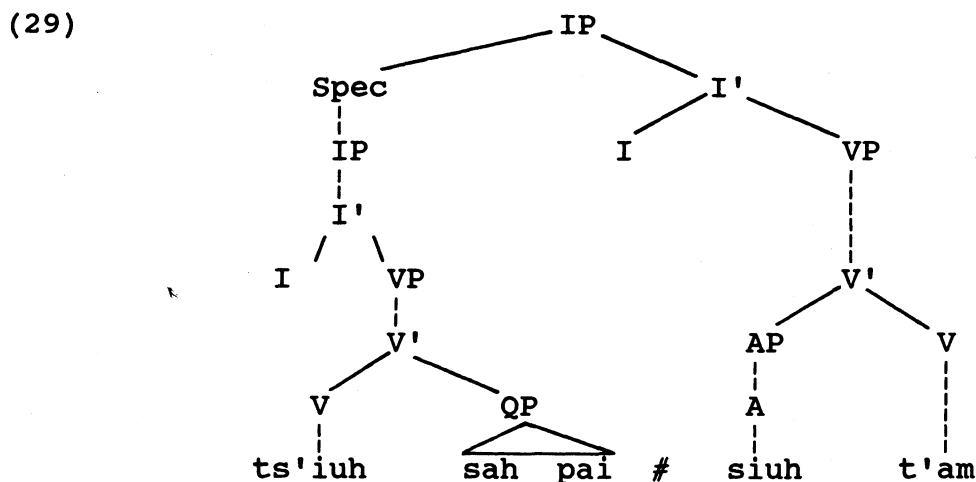
Remark: AP2 m-commands P, the head of PP on the right.

Now, let us consider the examples (15-20) in accordance with the *TG formation* in (23).

In both (15b) and (16b), the QPs, as adjuncts, m-command the right head *lai* 'to'. Likewise, in example (20), the QP m-commands *hoo* 'for', the head of CP on the right. So the TS rule must be applied to (15b), (16b), and (20), in which the heads following the QPs are all complementizers and are all heads of CP. The syntactic tree structure of (20) can be repictured as (28):



As for example (17b), (18b), and (19), their syntactic tree structures are the same as illustrated in (29), in which the QP as an adjunct cannot m-command any of the elements on its right, thus blocking the TS rule.

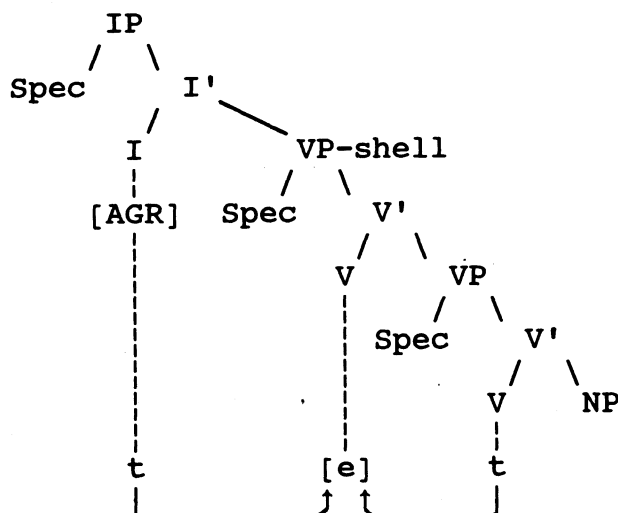


Therefore it can be seen that the *TG formation* in (23) can account for all of the data here.

If we compare the *TG formations* in (23) and (13), we will see such differences between them as: a) the syntactic condition of (23) is m-command, while the syntactic condition of (13) is c-command; b) (23) is concerned only with an adjunct's m-command relations to the right heads while ignoring its left elements (locality conditions are related to this point), but (13) sometimes depends on the relation between an adjunct and its left head in order to decide whether or not there is a boundary to the right of TG; and c) by (23), an adjunct can m-command all

of the following heads, including C of CP, except Infl, but by (13), an adjunct can c-command only its lexical head, excluding all non-lexical heads or functional heads, i.e., either Infl or Comp of CP. One key point concerning (c) is the fact that Infl in Chinese is a trace, i.e., one of the empty categories, in S-structure. Based on the discussion of 'A not A' question sentences, Huang (1990) has proved that the AGR and verb in Chinese move respectively downward from I° and upward from VP to 'VP shell' which is located between I' and VP. So after head-to-head movement, Infl, a head of IP, becomes a trace, as shown in (30).

(30)



Thus it can be seen that the definition in (23) differs from that in (13) in the fact that the former maintains that the tone sandhi rule is blocked by an empty category, while the latter holds that it is blocked by functional words. As we have already mentioned in the previous discussion, the tone sandhi rule is still applicable even if functional heads on the right are m-commanded by an adjunct, and this has been proved by *lai* 'to' in (15b) and (16b) as well as *hoo* 'for' in (20). Therefore, whether tone sandhi should apply is not decided by the distinction between functional words and lexical words, but by the difference between empty and non-empty categories.

6. Concluding Remarks

The complex mapping from syntax to phonology is determined by several conditions, some of which, such as c-command, argument/adjunct, and edge conditions, have been widely discussed. This paper has shown how trace is accessible to Taiwanese tone sandhi. As for the influence of trace upon phonology, discussion always centers around the processes blocked in the case of English contraction. But the common conclusion that many of these linguists have reached is that *to*-contraction in English is not a real phonological rule, but a rule of syntactic restructuring. Their grounds for this conclusion are: a) only *wh*-trace left in the deep structure position of the *wh*-moved phrase blocks contraction (neither *NP*-trace, nor *verb*-trace, nor *PRO*); b) the *to* must belong to the infinitive complement of that host verb, and not to some other infinitival clause; and c) the rule necessarily mentions the identity of the host morpheme (for detailed discussion, see Jaeggli 1980; and Postal & Pullum 1982). Besides the syntactic

restructuring analysis, one more analysis is proposed by Selkirk (1984). Selkirk claims that the *to*-contracted verb forms ultimately turn out to be lexical items themselves (subcategorized for complements without *to*), rather than entities produced by a rule of the syntax. However, none of these linguists, especially phrasal phonologists, have considered the nature of *to*-contraction as a phonological process.

But in my opinion, the reanalysis by Selkirk and others of English contraction only provides us with the fact that *to* might not be proper evidence for the influence of *trace* upon phonology. In other words, Selkirk and others at most rule out an unsuitable example instead of proving 'there is no such story'. Therefore, we have no reason to take empty category out of the menu of syntactic information accessible to phonology. What we need to do is to try to find evidence which is more suitable and more convincing than *to*. In this paper, the study of Taiwanese tone sandhi is just such an effort to realize this purpose.

Notes

1. Here tone shapes are symbolized by a numerical notation, where 5 equals the highest and 1 equals the lowest on a 5-point scale. The last two tones are restricted to 'checked' syllable while the other five co-occur with 'free' syllables.

2. *T* stands for base tone, *T'* for sandhi tone, and α for sandhi domain.

3. For a detailed discussion of the distinction between VP-adjunct and sentential adjunct, see Tang (1990).

4. Here the symbol '#' stands for the boundary between tone groups (TG), and the tone sandhi rule is applied within TG but blocked across TG; the symbol '=' used occasionally for high-lighting the obligatory application of sandhi rule at certain junctions; and the symbol '.' for neutral tone.

5. Miss Hui-chuan Hsu is my informant for these data.

6. In (22), where X^* stands for zero or more occurrences of some maximal projection, X is called a zero-bar projection, X' a single-bar projection, and X'' a double-bar (or maximal) projection.

7. This TG formation is suitable only to TS above the phrasal level. As for the TS of pronoun or grammatical markers, they are different because they belong to clitic group (CG) TS, which is discussed in Zhang (1992).

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