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Universal 20 and Taiwan Sign Language

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Word order flexibility in sign languages has led some scholars to conclude that sign languages do not have any hierarchical structure. This paper shows that the word order patterns within Taiwan Sign Language nominals precisely follow Greenberg's (1963:87) Universal 20. The manifestation of the universal in this sign language indicates that like oral languages, sign languages have hierarchical structures. Moreover, this paper also discusses the relation between syntactic hierarchy and linearization from the perspective of Taiwan Sign Language. The fact that the word order possibilities stated in Universal 20 are attested in a single language challenges the very notion of language parameter.

Keywords: Universal 20, Taiwan Sign Language, word order, noun phrase, intra-linguistic variation, hierarchy, parameter

1. Introduction

Although in both sign languages and oral languages it is possible to express multiple aspects of a message simultaneously in certain cases, via non-manual markers in the former and suprasegmental markers in the latter, the sequential structure of linguistic units always plays a more important role (see Lillo-Martin 2005 for a study of the relationship between non-manual markers and intonational melodies). In both oral and sign languages, syntactic constituents generally do not occur simultaneously. Usually, one element is uttered or signed after another element (see Vermeerbergen, Leeson, and Crasborn 2007). The issue of word order can be viewed from two perspectives: the syntactic hierarchy and the linearization of the hierarchy. Regardless of whether the two aspects are intrinsically related (see Kayne 1994), word order constraints reflect these two aspects. If there is no constraint on word order, we cannot see the syntactic hierarchy; if there is no structural hierarchy, there is no issue of linearization.

It is widely recognized that word order in sign languages is flexible. This is true not only of verbal domains, but also of nominal domains. Does this flexibility mean that sign languages do not have any structural hierarchy, or that they do have syntactic structure but are less constrained in linearization? The flexible word order within the verbal domain of Quebec

Sign Language (LSQ) has led Bouchard (1996) and Bouchard and Dubisson (1995) to conclude that sign languages in general do not have any hierarchical structure. This conclusion is argued against in Neidle et al. (2000:60-61) and Sandler & Lillo-Martin (2006:305), based on their studies of American Sign Language (ASL). However, the debate focuses on verbal rather than nominal domains. It has been claimed that elements of a verbal domain may be ordered following temporal sequence of the eventuality participants (iconicity), and that case-marked elements may be ordered freely since their thematic relations to the verb are signaled by the case-markers (Bouchard 1996, among others). If iconicity plays a role in word order, or if case-markers correlate with certain flexibility in word order, syntactic hierarchy will not be very explicit. In this paper, we study the word order within the nominal domain in Taiwan Sign Language (TSL). In this language, nominal-internal elements, i.e., demonstratives, numerals, adjectives, and nouns, do not have any agreement, case, or modification marker, nor does there seem to be any obvious iconic constraint, we thus expect the study to reveal the syntactic properties of nominals more directly.¹

Lai (2005) presents a comprehensive description of the attested nominal-internal word orders in TSL.² But it remains a puzzle why certain orders are attested and others are not. The empirical goal of this paper is to propose an answer to this question. I will show that the word order patterns of TSL precisely follow Universal 20 (Greenberg 1963:87), which deals with the order of elements within the noun phrase. Universal 20 is generalized from typological studies of oral languages, and is formally represented in Cinque (2005) and Abels & Neeleman (2006). It reveals that syntactic structure is hierarchical. The manifestation of Universal 20 in TSL indicates that like oral languages, sign languages have hierarchical structures (contra Bouchard and Dubisson 1995).

In addition to this hierarchy issue, this paper also discusses the relation between syntactic hierarchy and linearization of the hierarchy. Reinhart (1979) raises the possibility that only hierarchy is crucial to “Narrow Syntax”, not linear ordering. If elements that are organized hierarchically can be linearized symmetrically, the left-right linear order is not part of syntax. We call this the symmetrical approach. In this approach, if X asymmetrically c-commands Y, both of the following orders are base-generated: $X > Y$ in (1a) and $Y > X$ in (1b) (“ $>$ ” indicates precedence).

¹ TSL is used by approximately 30,000 deaf persons residing in Taiwan. Its lexicon is very similar to the sign languages of Japan and Korea (Smith 1989, 2005). According to Smith (1977, 2005: 194), TSL displays an underlying SVO order, except that signs with modal force appear at the end of the sentence.

² The data in Lai (2005) are all from a corpus established in the project “A Study of Taiwan Sign Language: Phonology, Morphology, Syntax and Digital Graphic Dictionary” (NSC 90-2411-H-194-025 (I), NSC 91-2411-H-194-030 (II), NSC 92-2411-H-194-007 (III), and NSC 93-2411-H-194-001 (IV)), headed by James H-Y Tai, and sponsored by Taiwan National Science Council (Aug. 2001-July 2005). The data in the corpus are elicited sentences.

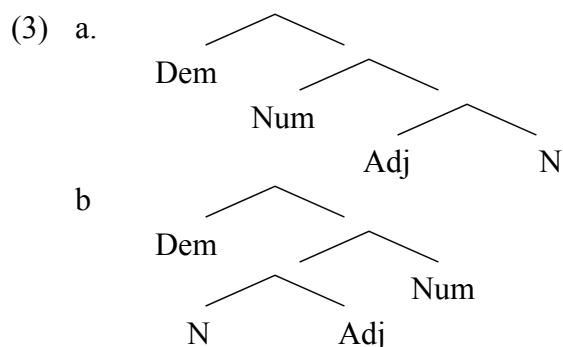


However, if an element of a hierarchical structure bears an asymmetrical c-command relation with another element, yielding a total set of linearly ordered members, then the linear order is part of syntax. An anti-symmetrical approach insists that only one of the two structures in (1) is possible. Kayne (1994) proposes that if X asymmetrically c-commands Y, X must precede Y. Thus only (1a) is the possible syntactic structure.

With respect to the order of nominal-internal elements, the symmetrical analysis is defended in Abels & Neeleman (2006), whereas the anti-symmetrical analysis is defended in Cinque (2005). For instance, the former analysis claims that both the order in (2a) and the one in (2b) are base-generated (Dem is for Demonstrative, Adj is for Adjective, Num is for Numeral, and N is for Noun).

- (2) a. Dem > Num > Adj > N
b. Dem > N > Adj > Num

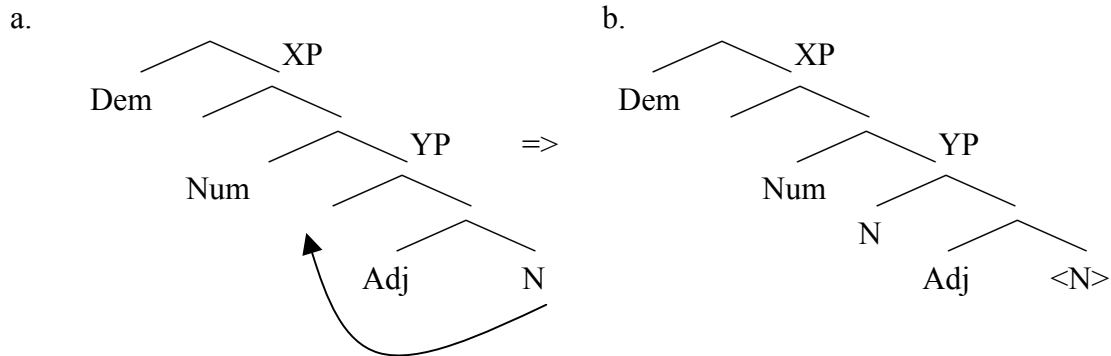
In this symmetrical analysis, it is claimed that in both orders in (2), the Adj is closer to the N than the Num, so the two orders exhibit the same hierarchic structure. The syntactic structures of (2a) and (2b) are (3a) and (3b), respectively (Abels & Neeleman 2006: (8g)). The two structures differ only in the left-right linearization of Adj with respect to N in the bottom merger (Adj precedes N in (3a) and N precedes Adj in (3b)), and the linearization of Num with respect to the combination of N and Adj in the next merger level (Num precedes the combination in (3a) while the reverse order is found in (3b)).



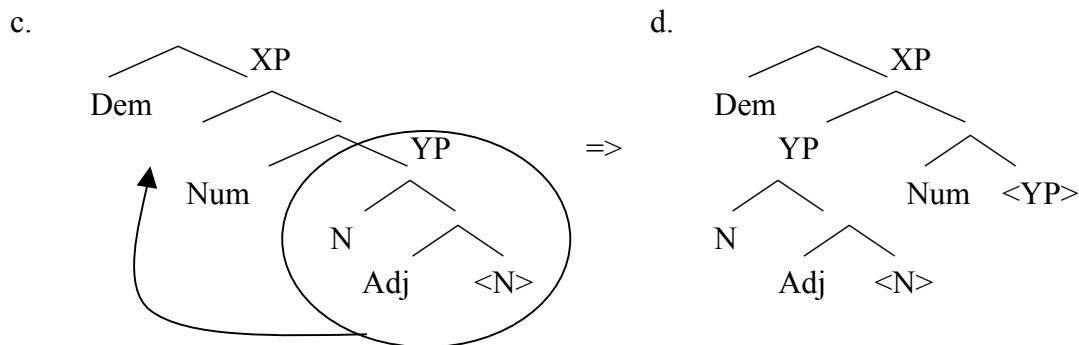
In contrast, in the anti-symmetrical analysis in Cinque (2005:320), it is assumed that (2a), which has a structure similar to (3a), is the only possible base-order, and any other attested orders, including (2b), are derived by the movement of N or elements that contain N. In this approach, the order in (2b) is derived by two major steps: N-raising to the left of Adj, and subsequent movement of the phrase that hosts the raised N, Adj, and the trace of N (labeled as

YP in (4)) to the left of Num. The two steps are illustrated in (4) (see the illustration in Abels & Neeleman 2006: (5). I have simplified the projection layers and labels. \diamond marks the trace position of a moved element):

(4) N-raising to the left of Adj:



YP-raising to the left of Num:



We can see that in order to derive the order in (2b), i.e., $Dem > N > Adj > Num$, the symmetrical approach applies both left-merger and right-merger of the elements, as seen in (3b), whereas the anti-symmetrical approach applies two movement operations in addition to the basic merger operations that integrate the Dem, Num, Adj, and N together.

The two approaches are different in whether rightward merger is allowed. The symmetrical approach allows right-merger, whereas the anti-symmetrical one does not. If elements can be merged at either right or left positions, this freedom suggests that syntax does not dictate the left-right linearization of the immediate constituents of a phrase. This will be compatible with Reinhart's (1979) claim that while a hierarchy is crucial to "Narrow Syntax", linear ordering is not. In this view, linear ordering sequentializes what is primarily only ordered hierarchically (Marantz 1984:7-8). Linear ordering can be a PF phenomenon – forced by the requirements of the speech articulators (Chomsky 1995, 2005:5), or probably a parsing effect (see Chomsky 2006:7 for discussion).

Lillo-Martin (2001:304) states that "future researchers may ask whether SLs may offer any new insights into the recent idea that while hierarchical structure is part of Narrow Syntax, ordering is not." (SLs = sign languages). The study in this paper addresses this issue from the

perspective of TSL. I will show that although all of the attested orders of TSL nominals can be derived in either the symmetrical or anti-symmetrical way, the former is much simpler and is thus preferred. Our study leads us to the hypothesis that if ordering is not considered in narrow syntax, the syntactic derivation of many constructions is simpler.

Furthermore, Cinque (2005:321) suggests a list of parameters of movement, to derive various word orders cross-linguistically. The fact that various word orders exist in TSL nominals shows that TSL allows more than one parameter value, at least from the value “no movement” to the value “movement of NP.” The intra-linguistic variation studied here and observed in other syntactic constructions in both sign and oral languages calls for reconsideration of our current theory of parameter setting.

The paper is organized as follows. In Section 2, we introduce Universal 20, and explain how it is formalized in symmetrical and anti-symmetrical approaches. In Section 3, I show how the universal is attested in TSL. Considering the manifestation of both the flexibility and rigidity of the universal in TSL, I address three theoretical issues in Section 4: the hierarchical structures of sign languages, the status of linear ordering in grammar, and the intra-linguistic variation of the universal. Section 5 presents a brief summary of the main findings.

2. Word order within the noun phrase

2.1 Greenberg's Universal 20

A nominal (i.e. an NP or DP) can contain an Adj, a Num, and a D-element (such as a Dem), in addition to an N. In Rijkhoff (2002:221), Adj, Num, and Dem are called Quality, Quantity, and Location expressions, respectively. Greenberg's (1963:87) Universal 20 states that in a nominal, cross-linguistically, when any or all of the three types of elements precedes the N, they are always found in the order Dem > Num > Adj (U20A); and if they follow the N, the order is either the same (U20B), or its exact opposite (U20C). The three parts of the constraints expressed by this universal are listed in (5).

(5) U20A: Dem > Num > Adj > N

U20B: N > Dem > Num > Adj

U20C: N > Adj > Num > Dem

(6) a. these five large houses

b. haattii ijoollee tana afraanii guddoo hiyeettii [Boraana]

mother children these four vrey poor

‘The mother of these four children is very poor.’ (Rijkhoff 2002: 325)

- c. qimmi-t qaqurtu-t marluk taakku
 dog-PL white-PL two those
 ‘those two white dogs’

[West Greenlandic]

(Rijkhoff 2002: 326)

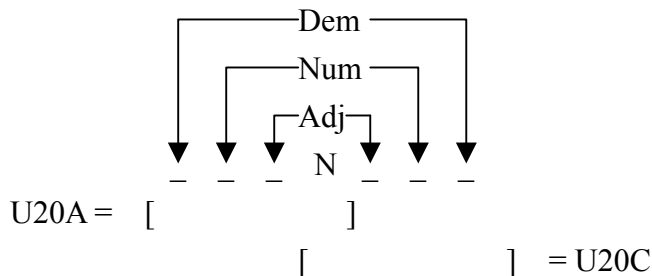
The order in U20A is attested in languages such as English, as seen in (6a). This order is found in many languages of the Afro-Asiatic, Altaic, Caucasian, Indo-European, and Uralic families (Rijkhoff 1998:342-343, Hawkins 1983:119, among others).

The Boraana example in (6b) shows U20B. According to Greenberg (1963:87), U20B is also attested in, for instance, Kikuyu, a Bantu language of East Africa. Other languages that display this order include Turkana, Rendille (Heine 1981), Bai, and Moro (Dryer 2003:20, 43) (see Cinque 2005:319, fn. 10 for a language list of U20B and references).

Finally, the order in U20C is illustrated in the West Greenlandic example in (6c). This order is also found in Cambodian, Javanese, Karen, Khmu, Palaung, Shan, Thai (Rijkhoff 1990:32), and many other languages (see Cinque 2005:320, fn. 19 for a language list of U20C and references).

We can see that the orders in U20A and U20B are the same, except that N occurs at the right edge in the former but at the left edge in the latter. Moreover, U20A and U20C are mirror images of each other, as illustrated in (7). The arrows point to the possible positions of the linked element.

(7)



The significance of the universal is that the orders of nominal-internal elements are not free. Instead, they are strictly constrained. For instance, for all N-final orders, Adj must be closer to N than Num, and Num must be closer to N than Dem. Orders such as (8), in which Num is closer to N than Adj, are not covered by the universal and, as expected, are not attested (Greenberg 1963, Hawkins 1983):³

³ See footnote 2 of Cinque (2005) for discussion of the apparent existence of some cases of the order in (8). Also see Zhang (2006) for differences in interpretation between pre-Num modifiers and post-Num modifiers of indefinite nominals in Mandarin Chinese. Importantly, unlike post-Num modifiers, pre-Num modifiers must be followed by the modification marker *de*. Modification markers in general allow for a more flexible ordering of the modifiers with respect to the noun and each other, and modifiers bearing a modification marker are more external to the noun than bare modifiers (i.e., without modification markers) (Sproat & Shih 1991, Androutsopoulou & Espanol-Echevarria 2007).

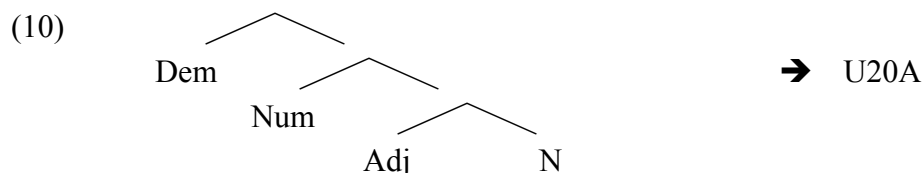
- (8) * Dem > Adj > Num > N

2.2 Formalization of Universal 20

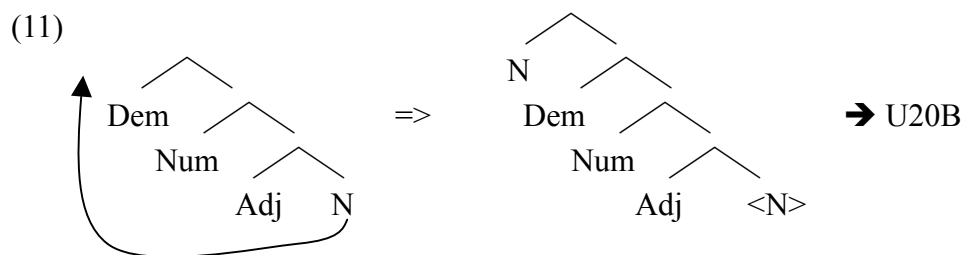
Universal 20 has been formalized in Cinque (2005) and Abels and Neeleman (2006). In both analyses, the order in U20A is treated as a base-order. In Cinque (2005), the order “is derived if nothing moves” (p.321), and it shows “a single, universal, order of Merge” (p.315). Similarly, U20A is formalized in Abels and Neeleman (2006: (7a)) as follows:

- (9) The underlying hierarchical order of Dem, Num, Adj, and N in the extended nominal projection is Dem >> Num >> Adj >> N, where >> indicates c-command;

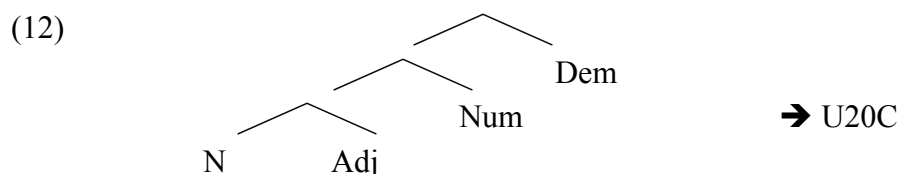
In both approaches, U20A reflects the order of Merge and exhibits the syntactic hierarchy of nominal-internal elements. This hierarchy can be represented by the following tree structure:



As for U20B, in both Cinque (2005:322) and Abels and Neeleman (2006), the order is derived by the leftward movement of N from its base position as captured by U20A (i.e. (10)):



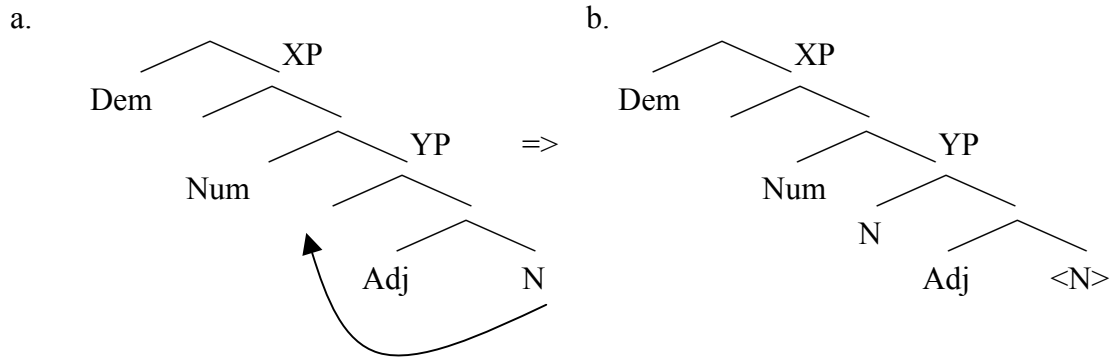
The two analyses are different in their approaches to U20C. In Abels and Neeleman (2006), this order is also a base-generated order. Thus, in addition to (10), the structure in (12) is a possible base-structure (i.e., a structure which is not derived by any movement):



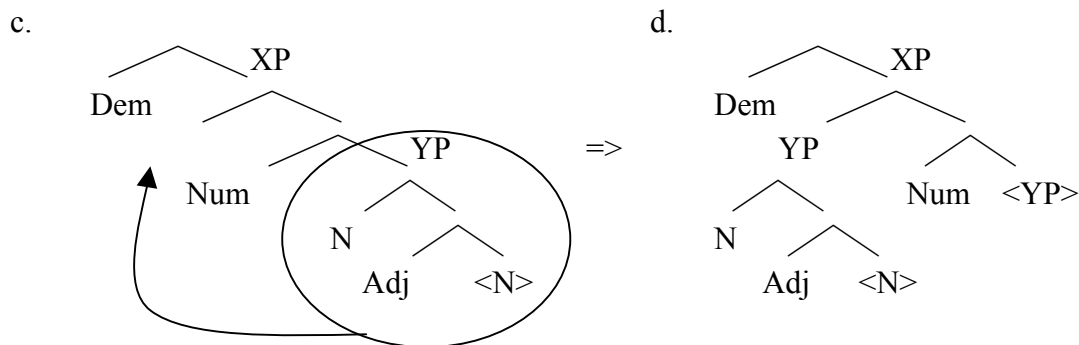
By contrast, in Cinque (2005:324), U20C is not a base-generated order. Instead, it is derived

from U20A by the application of several movement operations, as shown in (13) (see the illustration in Abels & Neeleman 2006: (5). I have simplified the projection layers and labels. The first four trees in (13a) through (13d) are identical to those in (4a) through (4d)).

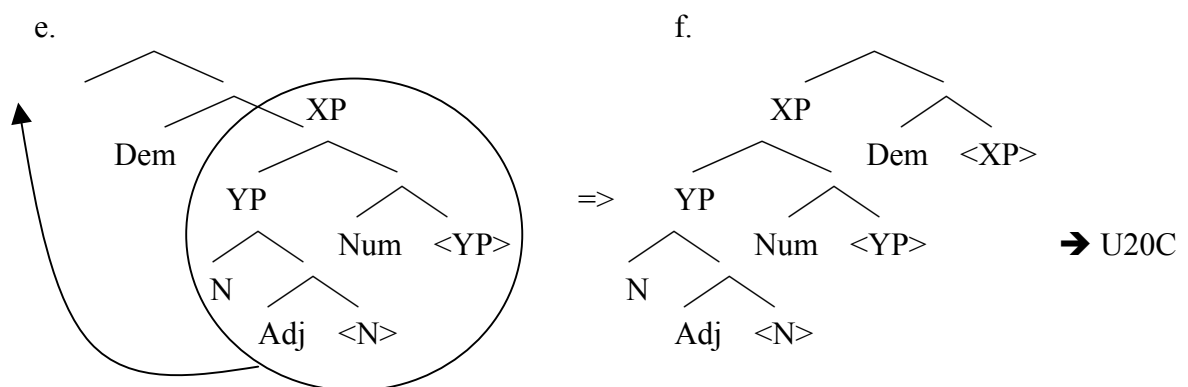
(13) N-raising to the left of Adj:



YP-raising to the left of Num:



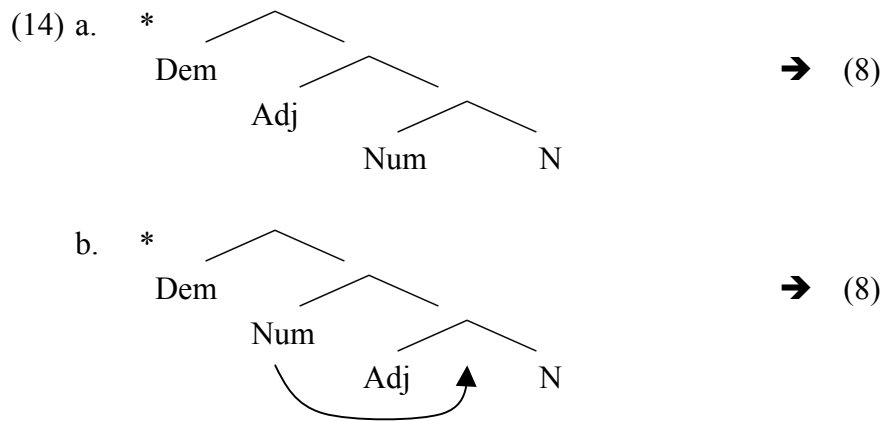
XP-raising to the left of Dem:



As we described in Section 1, the theoretical background of this movement approach to U20C is the following. Adopting Kayne's (1994) theory that all projections are modeled so that if X asymmetrically c-commands Y, X must precede Y, Cinque (2005) claims that the observed orders in which Dem, Num, and Adj are on the right side of N are all achieved by movement.

In formalizing the constraints entailed in Universal 20, both approaches rule out merge operations that do not follow the syntactic hierarchy, and movement operations that are

downward, or rightward. For instance, in order to derive the sequence in (8), one either needs to assume a merge operation that does not follow the syntactic hierarchy in (10), as shown in (14a), or downward and rightward movement, as shown in (14b). Since such operations are not legal, the derived order is not attested.



Regardless of the differences between them in formalizing U20C, both the symmetrical approach and the anti-symmetrical approach claim that the three parts of Universal 20 in (5) reflect either the base-generated hierarchical syntactic structures of noun phrases, or the hierarchical syntactic structures that are derived from the base-generated structures by movement. Thus all of the three parts of Universal 20 exhibit syntactic hierarchical structures. The three parts have been observed cross-linguistically in oral languages. In the following section, I will show that all three parts are attested in a single sign language, TSL.

3. Word order within the TSL noun phrase

This section demonstrates how TSL follows the generalizations expressed in the three parts of Universal 20.

Taking into account the four types of elements, Dem, Num, Adj, and N, a nominal can be composed of two, three, or all four of them, deriving nominals of two layers, three layers, and four layers, respectively. Regardless of how many layers a nominal is composed of, there are always several ordering possibilities for the same group of elements in TSL.

It is important to clarify that our informants deny any interpretation differences correlating with the ordering difference in the data studied here (Lai 2005:43, also Hsin-Hsien Lee, p.c.) (for a different situation reported for ASL and some other languages, see Section 4.3 and endnote 8).

3.1 Two layers

If a nominal consists of only two elements, either of the two possible orders is fine in TSL, as illustrated in (15).⁴

- (15)  $\alpha = \{\text{Adj, Num, Dem}\}$

The following examples show the free order of all possible combinations of N and another element, i.e., Adj, Dem, or Num. Note that throughout the examples “Lai:X (Y)” should be read as Lai 2005, page X, example Y.

- (16) a. CUTE CAT IX_{PRO1S} LIKE.⁵ (Lai:15 (7a)) *Adj N*
 b. CAT CUTE IX_{PRO1S} LIKE. (Lai:15 (7b)) *N Adj*
 Both: ‘I like cute cats.’
- (17) a. IX_{DET} AIRPLANE REACH AMERICA. (Lai:67 (11b)) *Dem N*
 b. AIRPLANE IX_{DET} REACH AMERICA. (Lai:67 (11a)) *N Dem*
 Both: This plane is flying to America.’
- (18) a. TEACHER TABLE THREE BOOK PUT. (Lai:44 (13b)) *Num N*
 b. TEACHER TABLE BOOK THREE PUT. (Lai:44 (13a)) *N Num*
 Both: ‘The teacher put three books on the table.’

Recall that Universal 20 allows nominal-internal elements to occur to either the left or the right of N. The examples in (16) through (18) are thus all compatible with this flexibility. Moreover, since no two elements occur to the same side of N in two-layered nominals, none of these examples violates the universal.

3.2 Three layers

If a nominal has elements α and β , in addition to N, the two non-core elements (α and β) can

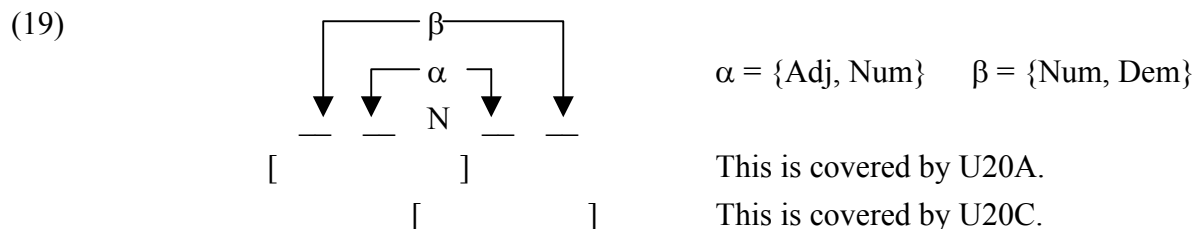
⁴ One fact that we do not discuss in this paper is that the order of a modifier and the head noun in a compound is fixed in TSL: only the order modifier > N is allowed. The following contrast is discussed in Chang (2006:5) (^ is used to link the components of a compound):

- (i) a. BLACK BUG IX_{PRO1S} LIKE.
 b. BUG BLACK IX_{PRO1S} LIKE.
 Both: ‘I like black bugs.’
- (ii) a. BLACK^BUG IX_{PRO1S} LIKE.
 ‘I like ants.’
 b. *BUG^BLACK IX_{PRO1S} LIKE.

IX_{PRO1S} and IX_{PRO3S} represent the first person singular pronoun and third person singular pronoun, respectively.

⁵ Note that grammatical information of elements outside of the nominal, including verb agreement, is not represented or formalized in Lai’s data.

either precede or follow N in TSL. When α and β occur on the same side of N, they must be ordered according to the hierarchy in (7). Assuming that α is closer to N than β , we arrive at the following diagram:



We now list the attested orders of three-layer nominals and see how they are covered by Universal 20.

Four possible orders if $\alpha = \text{Adj}$ and $\beta = \text{Num}$

- (20) a. IX_{pro3s} FIVE CUTE CAT HAVE. *Num Adj N*
‘She has five cute cats.’ (Lai:73 (22))
- b. IX_{pro3s} TELL-ME HAVE TWO MAN GOOD INTRODUCE TO-ME. *Num N Adj*
‘She said she’d like to introduce two good guys to me.’ (Lai:73 (20))
- c. IX_{pro3s} RAISE CUTE CAT FIVE. *Adj N Num*
‘She raises five cute cats.’ (Lai:74 (23))
- d. IX_{pro3s} CAT CUTE FIVE HAVE. *N Adj Num*
‘She has five cute cats.’ (Hsin-Hsien Lee, p.c., Lai:73 (21))

(20a) follows U20A, and (20d) follows U20C. In the other two examples, (20b) and (20c), no two elements occur to the same side of the head noun, and thus the universal is not violated.

Four possible orders if $\alpha = \text{Adj}$ and $\beta = \text{Dem}$

- (21) a. IX_{DET} CUTE CAT IX_{pro1s} BELONG-TO. (Lai:81 (34a)) *Dem Adj N*
- b. IX_{DET} CAT CUTE IX_{pro1s} BELONG-TO. (Lai:81 (34b)) *Dem N Adj*
- c. CUTE CAT IX_{DET} IX_{pro1s} BELONG-TO. (Lai:81 (34d)) *Adj N Dem*
- d. CAT CUTE IX_{DET} IX_{pro1s} BELONG-TO. (Hsin-Hsien Lee, p.c.) *N Adj Dem*
All: ‘That cute cat belongs to me.’

(21a) follows U20A, and (21d) follows U20C. In the other two examples, (21b) and (21c), no two elements occur on the same side of the head noun, and thus the universal is not violated.

Four possible orders if $\alpha = \text{Num}$ and $\beta = \text{Dem}$

- (22) a. IX_{DET.PL} FOUR CAR IX_{pro1s} FRIEND BELONG-TO. (Lai:84 (37a)) *Dem Num N*
- b. IX_{DET.PL} CAR FOUR IX_{pro1s} FRIEND BELONG-TO. (Lai:84 (37b)) *Dem N Num*

- c. FOUR CAR IX_{DET.PL} IX_{pro1s} FRIEND BELONG-TO. (Lai:84 (37c)) *Num N Dem*
 d. CAR FOUR IX_{DET.PL} IX_{pro1s} FRIEND BELONG-TO. (Lai:84 (37d)) *N Num Dem*
 All: ‘Those four cars belong to my friend.’⁶

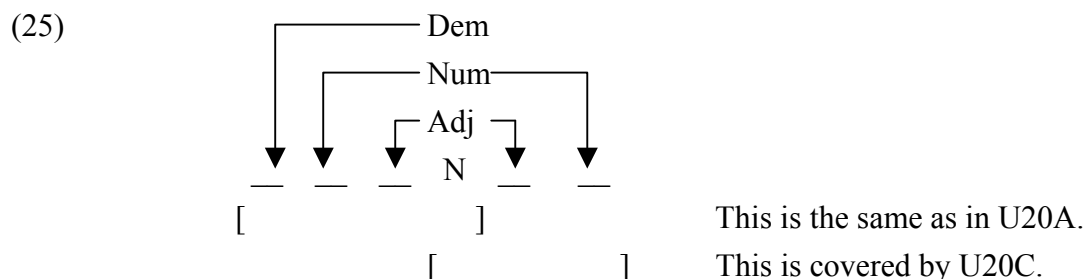
This set of data repeats the pattern observed in (20) and (21). (22a) follows U20A, and (22d) follows U20C. In the other two examples of this group, (22b) and (22c), no two elements occur on the same side of the head noun, and thus the universal is not violated.

Let us now turn to some unattested orders and discuss how they violate Universal 20. If the word orders within a noun phrase were completely free, we would expect to find all logically possible orders. For instance, for N-final orders, we should find both $\beta\alpha N$ and $\alpha\beta N$. We have seen the former order in (20a), (21a), and (22a), all repeated here in (23). However, the latter order is not attested in TSL. The unattested orders in (24) all violate the hierarchy specified in U20A.

- (23) a. Num Adj N (= 20a)
 b. Dem Adj N (= 21a)
 c. Dem Num N (= 22a)
 (24) a. * Adj Num N (= part of (8))
 b. * Adj Dem N
 c. * Num Dem N

3.3 Four layers

If a nominal has four elements, Dem, Num, Adj, and N, the non-core elements Num and Adj can either precede or follow N in TSL. When the non-core elements occur on the same side of N, they must be ordered according to the hierarchy in (7). We thus arrive at the following diagram:



There is an intra-linguistic inconsistency in the language: Dem cannot occur at the right side

⁶ The plurality of the demonstrative is realized by the addition of an arc-shaped movement (Lai 2005:68, also Hsin-Hsien Lee, p.c.).

of N in four-layer noun phrases. Since Dem can follow N in two- and three-layer noun phrases, the constraint is not a general constraint of the language. For the time being, we have no account for this idiosyncratic behaviour of Dem. Given this constraint, there are only four possible orders in four-layer nominals (25).

- (26) a. IX_{DET.PL} FIVE NAUGHTY BOY IX_{pro1s} BELONG-TO STUDENT. *Dem Num Adj N*
 b. IX_{DET.PL} NAUGHTY BOY FIVE IX_{pro1s} BELONG-TO STUDENT. *Dem Adj N Num*
 c. IX_{DET.PL} FIVE BOY NAUGHTY IX_{pro1s} BELONG-TO STUDENT. *Dem Num N Adj*
 d. IX_{DET.PL} BOY NAUGHTY FIVE IX_{pro1s} BELONG-TO STUDENT. *Dem N Adj Num*
 All: ‘These five naughty boys are my students.’ (Lai:86 (42, 40,41,39))

The three examples in (26a) through (26c) follow U20A, and the example in (26d) follows U20C. Thus all the attested orders of four-layer nominals are covered by Universal 20.

Again, let us check how the unattested orders violate the universal. Logically, four elements can combine in 24 different orders (4 factorial = 4 x 3 x 2 x 1 = 24). However, the orders in (26) are the only orders reported in Lai (2005) for four-layer nominals. Orders like the following are not reported, either in Lai (2005), or in the corpus, even though they do not violate the constraint against post-nominal Dem in four-layer noun phrases in TSL. Crucially, all of the unattested orders in (27) violate U20A. Note that in (26), I underline the part of the nominal that violates the hierarchy.

- (27) a. * Num Dem Adj N
 b. * Num Dem N Adj
 c. * Adj Dem Num N
 d. * Adj Dem N Num
 e. * Dem Adj Num N (= (8))
 f. * Num Adj Dem N
 g. * Adj Num Dem N

The contrast between the attested and the unattested orders in both three-layered and four-layered nominals in TSL indicates that the language follows Universal 20 strictly.

3.4 N-raising within the noun phrase

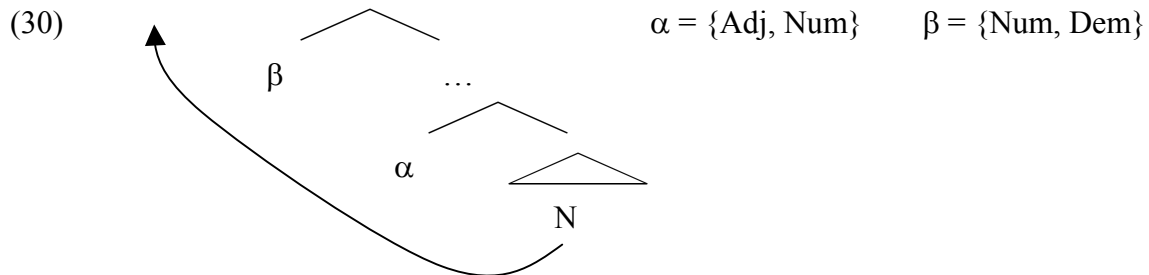
This section demonstrates how TSL exhibits the order specified in U20B, which is derived from the base order as given in U20A by N-raising in the accounts of both Cinque (2005) and Abels and Neeleman (2006) (see (11)).

Under the assumption that α is closer to N than β , we have presented the examples of the

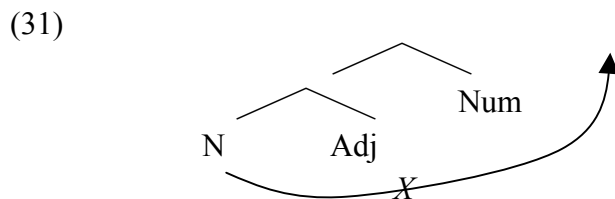
order of $N\alpha\beta$ in (28) in Section 3.2. Now compare these orders with the $N\beta\alpha$ orders in (29).

- (28) a. N Adj Num (= 20d)
 b. N Adj Dem (= 21d)
 c. N Num Dem (= 22d)
- (29) a. IX_{proIs} CAT FIVE FAT HAVE. *N Num Adj*
 ‘I have five fat cats.’ (Hsin-Hsien Lee p.c.)
 b. CAT IX_{DET} CUTE IX_{proIs} BELONG-TO. *N Dem Adj*
 ‘That cute cat belongs to me.’ (Lai:81 (34c))
 c. CAR $IX_{DET,PL}$ FOUR IX_{proIs} FRIEND BELONG-TO. *N Dem Num*
 ‘Those four cars belong to my friend.’ (Lai:84 (37e), also (38b))

The examples in (29), together with the orders in (28), show that in three layer nominals, N-initial order is always fine. We have shown that the $N\alpha\beta$ order in (28) is covered by U20C. At first sight, the orders in (29) seem to be problematic because the element that occurs right-adjacent to N actually belongs to a layer that is non-adjacent to N. For instance, in (29a), Num is closer to N than Adj although Adj should occupy the inner layer and Num the outer layer. However, the $N\beta\alpha$ order can be covered by U20B, and this order can be derived by N raising from the base-generated $\beta\alpha N$ order (i.e., U20A):



If the operation of movement can derive more orders, why then can't the orders in (24) and (27) be derived by movement? In principle, rightward movement could derive these orders. The rightward movement derivation of (27a) (= (8)) has already been exemplified in (14b). Let us now see how the unacceptable (24a) (i.e., Adj Num N) could be derived by rightward movement. Assume that we start from the order in U20C, and derive the unacceptable order by rightward movement of N, as illustrated in (31) (= (12)).



However, the formalization of Universal 20 in both Cinque (2005) and Abels and Neeleman (2006) disallows rightward movement. The formalization thus captures the fact that it is impossible to derive the unattested order of $\alpha\beta N$ in (24) by rightward N movement from the $N\alpha\beta$ order.

3.5 Summary

Summarizing, we have shown that the attested orders of elements within TSL nominals, as listed in (31) through (33), can all be covered by Greenberg's Universal 20. Specifically, the orders in (31) do not violate the universal, since no two elements occur on the same side of N in these orders. The orders in (32) all satisfy U20A, the orders in (32) all satisfy U20B, and the orders in (33) all satisfy U20C.

(31) Orders with no two elements on same side of N:

- a. Adj > N; N > Adj; Dem > N; N > Dem; Num > N; N > Num
[See the examples in (15) through (18)]
- b. Num > N > Adj; Adj > N > Num; Dem > N > Adj;
- c. Adj > N > Dem; Dem > N > Num; Num > N > Dem
[See the b- and c-examples in (20) through (22)]

(32) Orders accounted for by U20A:

- a. Num > Adj > N; Dem > Adj > N; Dem > Num > N;
[See the a-examples in (20) through (22)]
- b. Dem > Num > Adj > N; Dem > Adj > N > Num; Dem > Num > N > Adj
[See (26a), (26b), and (26c)]

(32) Orders accounted for by U20B:

- N > Num > Adj; N > Dem > Adj; N > Dem > Num
[See the examples in (29)]

(33) Orders accounted for by U20C:

- a. N > Adj > Num; N > Adj > Dem; N > Num > Dem
[See the d-examples in (20) through (22)]
- b. Dem > N > Adj > Num
[See (26d)]

Unattested orders such as the ones given in (34) violate the universal.

(34) U20A is violated:

- a. *Adj > Num > N; *Adj > Dem > N; *Num > Dem > N [= (24)]
- b. *Num > Dem > Adj > N; *Num > Dem > N > Adj; *Adj > Dem > Num > N;
*Adj > Dem > N > Num; *Dem > Adj > Num > N; *Num > Adj > Dem > N;
*Adj > Num > Dem > N [= (27)]

In Cinque (2005), all of the orders in (34) (his (6e, f, i, j, m, q, u)) cannot be derived, since there is no leftward movement of N, and the elements to the left of N are in the wrong Merge order.

4. Discussion

The formalization of Universal 20 in Cinque (2005) and Abels and Neeleman (2006) accounts for three formal properties of noun phrases:

- (35) a. Every element of the set {Adj, Num, Dem} can occur either to the left or right of N.
- b. If any two elements of the set occur on the same side of N, they should be ordered according to the closeness relation to N illustrated in (7).
- c. N may undergo leftward movement, but not rightward movement.

(35a) represents flexibility, (35b) represents a restriction, and (35c) represents both the possibility of movement and a restriction on movement direction.

We have observed in Section 3 that TSL exhibits all these properties. In this section, we discuss the significance of this observation.

4.1 Universal 20 and the hierarchical structures of sign languages

The above discussion of TSL data has made clear that TSL strictly follows the restrictions expressed by Universal 20. The formalizations of the universal in both Cinque (2005) and Abels & Neeleman (2006) show that the three parts of Universal 20 reflect either the base-generated hierarchical syntactic structures of noun phrases, or the hierarchical syntactic structures derived from base-generated structures by movement. Thus all of the three parts of Universal 20 in (5) imply the presence of syntactic hierarchical structure. If the order of nominal-internal elements in TSL were absolutely free, the fact that the language strictly follows all three parts of the universal would be unexpected. Since TSL strictly follows the restrictions as expressed by Universal 20, it reveals the same hierarchy found in oral languages. Specifically, TSL shows both the same constraints on merger that have been found in oral languages and the same constraints on movement direction that have been found in oral languages. We thus conclude that Bouchard & Dubuisson's (1995) claim that sign languages do not exhibit any hierarchical structure cannot be maintained. Along with many other studies of sign languages (e.g., Padden 1988, Neidle et al. 2000, Sandler & Lillo-Martin 2006, Pfau 2002), we find that sign languages have similar structural properties and fit into typological generalizations based on spoken languages.

4.2 Representing the flexibility of Universal 20

We have seen that TSL also exhibits the word order flexibility expressed by Universal 20: every element of the set {Adj, Num, Dem} can occur either to the left or right of N. This flexibility can be accounted for either by the freedom of merger directions (allowing right-merger) or by movement operations.

We have introduced both symmetrical and anti-symmetrical approaches to the orders in which Adj, Num, and Dem follow the head noun. In the symmetrical approach (Abels & Neeleman 2006), both the left and right positions of Dem, Num, and Adj are possible base-generation positions. This means that all of the observed orders discussed in Sections 3.1 through 3.3 are base-generated. Such orders are observed simply because they are an option made available by our computational system.

On the other hand, the anti-symmetrical approach (Cinque 2005) adopts Kayne's (1994) assumption that all projections are such that if X asymmetrically c-commands Y, X must precede Y. Thus, in this approach, the post-nominal positions of Dem, Num, and Adj captured in Universal 20 are all achieved by movement. In this approach, many of the observed orders in Sections 3.1 through 3.3, as well as those in Section 3.4, are derived by movement.

A concrete example to show the difference between the two approaches is the way in which the order $\text{Dem} > \text{N} > \text{Adj} > \text{Num}$ is derived. This order is attested in TSL, as seen in (26d). In Section 1, we discussed how the order is derived in the two approaches. We have shown that to derive this order, no movement is involved in the symmetrical approach (see (3b)), whereas at least two operations of movement in addition to the merger operations are required in the anti-symmetrical approach (see (4)).

Intuitively speaking, the anti-symmetrical approach does not seem to be as simple as the symmetrical approach, since the same order is derived by several operations of movement in the former, but does not require movement operations in the latter. The former approach obviously introduces more derivational steps than the latter one, to build the same construction. If we want to reduce descriptive complexity, the symmetrical theory is preferred over the anti-symmetrical one, in representing the flexibility observed in Universal 20.

In sign language studies, the symmetrical approach can be seen in Boster (1996) and Neidle (2002), among others. Recognizing that adjectives occur either to the left or right of nouns in ASL, Boster (1996) suggests that adjectives are freely generated either before or after the nouns they modify, adjoined to N'. In the verbal domain, rightward movement of WH-elements in ASL has been argued for in Neidle et al. (2000) and Neidle (2002), where SpecCP is claimed to be projected rightward in the language (contra Petronio & Lillo-Martin 1997). Cecchetto et al. (2006) also argue for a right SpecCP in Italian Sign Language. Also, a right SpecNegP in German Sign Language and Catalan Sign Language has been argued for in Pfau (2002) and Pfau & Quer (2002).

If we adopt the symmetrical approach, the flexible word orders at all levels of a nominal in TSL have the following two implications:

First, the direction of merger is not configuration-specific. We have seen that Dems, Nums, and Adjs all can occur either to the left or right of Ns. Since it is generally assumed that Dems and Nums are not adjuncts whereas Adjs are, the free order of both types is not compatible with Takano's claim (2003:524) that non-adjuncts, in contrast to adjuncts, are subject to antisymmetry and thus their positions are fixed to the relevant selecting element (i.e., left specifiers and right complements).⁷

A typical example to show that left arguments are structurally higher than right arguments is Barss & Lasnik's (1986) study of double objects. Since Negative Polarity Items (NPIs) such as *any* must be licensed by a c-commanding scope-bearing element, such as a negation element, data like (36) tell us that the arguments of NPIs cannot be licensed by negative arguments to their right (35b). Such data show that right arguments are not structurally higher than left arguments, and that if one argument c-commands another argument, the former must be to the left of the latter.

- (36) a. I gave no one anything.
b. *I gave anyone nothing.

The following examples of Branigan (1992), however, show that right adjuncts may be structurally higher than left adjuncts. The NPI *at all* in (37a) is licensed by the right adjunct *only rarely*. Similarly, the NPI *with any gusto* in (37b) is licensed by the right adjunct *only occasionally*.

- (37) a. John paints pictures at all well only rarely.
b. Jay tells jokes with any gusto only occasionally.

This fact shows that the adjuncts, even though they follow the NPIs they license, are located higher than the NPIs. Based on facts such as (37), Takano (2003) claims that in contrast to non-adjuncts, adjuncts may be merged from the right. However, in our TSL data, we see no contrast between non-adjuncts and adjunct elements (Adjs).

Second, the direction of merger is not category-specific. Based on a study of word order in ASL clauses, Romano (1991, see Sandler & Lillo-Martin 2006:309) claims that phrases projected by lexical categories such as V, N, and P are head-initial the basic orders of lexical categories such as are head-initial, whereas phrases projected by functional categories such as C and I are head-final. This division between lexical and functional categories is rejected in Aarons et al. (1992 and following work) and Petronio (1993). Sandler & Lillo-Martin

⁷ In Cinque (2005), Adjs are base-generated in Spec, rather than adjunct positions.

(2006:310) thus state that “it seems that there may indeed be a split between categories which are head-initial, and those which are head-final, but it is not clear that the split falls along the lines of functional vs. lexical categories.” Another version of “split headedness” is the assumption that while the Specs of TP and FP (FocusP) are on the left, Spec of CP is on the right. This assumption is adopted in Neidle (2002:76). If ASL is underlyingly SVO, the assumption helps Neidle to capture the observation that in ASL questions, the WH-phrase may appear either in situ, as in (38), or in a CP-final position (in which non-WH-phrases do not appear), and that CP-final WH-phrases are always focused, as seen in (39) (‘tm1’ means head tilted slightly back, a non-manual marker accompanying the moved focused constituents).

(38) Context: I know who will eat the rat, but:

	<u>tm1</u> _____ <u>wh</u>	
	MOUSE _i [WHO EAT t _i]	MOUSE [+ focus], WHO [- focus]
	‘Who will eat the mouse?’	(Neidle 2002: (39))
	_____ <u>wh</u>	
(39)	SEE JOAN WHO ^{part:indef}	WHO [+ focus]
	‘Who saw Joan?’	(Neidle 2002: (54))

In order to represent the focused reading of the right WH-elements in ASL, Neidle proposes that in this language, there is a projection on the left periphery above TP that hosts focused elements, as seen in (40b).

(40) a. JOHN LOVE MARY.

‘John loves Mary.’

tm1

b. JOHN_i MARY LOVE t_i.

‘John Mary loves.’

JOHN [+ focus]

(Neidle 2002: (17), (19))

She further argues that focused WH-phrases move to the Specifier of this projection (FP), and then they undergo WH-movement to the clause-final SpecCP. I illustrate the derivation of a CP-final WH question in (41):

[illegible]

The basic idea of the various versions of the “split headedness” hypothesis is that the direction of a merger operation can be category-specific. In other words, the order of merger seems to be subject to certain category-specific constraints. If category X is head-initial, it cannot be head-final in the same language. Since the scope of our study includes various categories, both lexical (e.g. Adj) and functional (e.g. Dem), all of which can be merged either to the left or the right of N, we conclude that there is no category-specific constraint on the order of merger.

Two points remain to be clarified. First of all, one cannot deny the empirical arguments for the proposals made for the configuration-specific and category-specific constraints on the order of merger. Secondly, we are not proposing any general theory for such constraints in this paper. Nevertheless, the TSL facts studied here challenge the generality of both the configuration-specific and the category-specific constraints on merger. We leave an account of this incompatibility for future research.

4.3 Intra-linguistic variation

Universal 20 is generalized from cross-linguistic investigations. The discussion of TSL data, however, illustrates that the word order possibilities stated in this universal are attested in a single language. The facts presented here show that in the same language and for various nominal-internal categories, the left and right positions are both available, regardless of whether the orders are base-generated or derived by movement.

The significance of this intra-linguistic variation can be viewed from the following perspectives. First, consider the availability of movement for certain types of elements in a language. Cinque (2005:321) proposes a list of parameters of movement. If a language has the NP-internal order specified by U20A, the parameter value for the language is “No movement” (Cinque’s (7b-i)). This is the negative value of the parameter for movement availability. On the other hand, if a language has the order of U20B, the parameter value for the language is “Movement of NP without pied-piping” (Cinque’s (7b-iii)). This is the positive value of the parameter for movement availability. However, we now see that both orders listed in U20A and U20B are found in TSL. This means that TSL has both the positive and negative value of the parameter for movement availability, a contradictory situation. The fact that various word

orders exist in TSL nominals seems to suggest that the language allows contradictory parameter values.

The same theoretical problem is seen from the perspective of the head directionality parameters assumed in the literature (e.g. Travis 1984). If a nominal is composed of an N and an Adj, the formal is the head of the nominal. It is generally assumed that if the order of AN is attested in a language, the language is called head-final language; and if the order of NA is attested in a language, the language is called head-initial language. With respect to the word order parameter, the head-initial order is one value and head-final order is another value, and the two values are in contrast, typologically speaking. The fact that both head-initial (NA) and head-final (AN) orders exist in TSL, again, seems to suggest that the language allows contradictory parameter values.⁸

The intra-linguistic variation attested in TSL has also been described for other sign languages. In British Sign Language, for instance, an attributive Adj can either precede or follow an N (Sutton-Spence & Woll 2003). Similarly, Tang and Sze (2000) mention that both Num N and N Num orders are found in Hong Kong Sign Language.

Of course, not all sign languages exhibit the same intra-linguistic variation. Neidle et al. (2000:103) and Sandler & Lillo-Martin (2006:308, 341) mention both Adj N and N Adj orders in ASL. However, MacLaughlin (1997) claims that left APs and right APs are hierarchically different in the language (see Sandler & Lillo-Martin's 2006:341 for a review). Moreover, determiner-like elements can also occur either to the left or right of N in ASL. However, Bahan, Kegl, MacLaughlin, and Neidle (1995) and MacLaughlin (1997) claim that in ASL, determiners must precede an N, and determiner-like elements following N are adverbials rather than determiners (see also Neidle et al. 2000:89, and Sandler & Lillo-Martin 2006:339).

Generally speaking, the intra-linguistic variation discussed above challenges the very notion of language parameter.

The co-existence of two contrastive settings of a parameter in the same language has also been found in other cases. One such case are the licensing conditions on null arguments. In Romance languages, null subjects are licensed by agreement, as seen in (42a). In East Asian languages, null subjects are licensed by discourse reference, as seen in (42b). In English, neither condition can license any null argument, as seen in (42c).

⁸ As is well known, there are also spoken languages in which certain types of elements within a nominal can either precede or follow the head noun. For instance, adjectives in French and Spanish may occur to the left or right of the head noun. Even in English, one finds both *the visible stars* and *the stars visible* (Bolinger 1967). But generally, in these languages, different orders of the same adjectives correlate with different interpretations (see Ticio 2003: sec 3.2.2 and Larson & Marušič 2004: 271). This is different from what we observe in TSL. As we stated in the beginning of Section 3, the different orders in TSL nominals do not correlate with different interpretations.

- (42) a. Parlo. (Italian)
 speak.1SG
 ‘I speak.’
- b. Ques.: Did you speak?
 Answer: Shuo-le. (Mandarin Chinese)
 speak-PRF
 ‘(I) spoke.’
- c. Ques.: Did you speak?
 Answer: *Spoke.

The cross-linguistic differences have been assumed to be the result of different settings of the null argument licensing parameter. However, in TSL (Smith 1989:111, Li 2006:20), ASL (Lillo-Martin 1986),⁹ and Warlpiri (Legate 2003), both agreement and discourse can license a null argument. In the ASL examples in (43) and (44) (Sandler & Lillo-Martin 2006:15-16), we see null arguments. In (43), the null arguments of the verb *ASK* are licensed by the agreement of the verb. In (44), the verb *EAT-UP* is not an agreement verb and then the null arguments are licensed by the discourse context.

- (43) a. 1-ASK-a
 (I-) ask (-her/him).
- b. b-ASK-1
 (S/he-) asks (-me).
- (44) Ques.: Did you eat my candy?
 Answer: YES, EAT-UP.
 ‘Yes, (I) ate (it) up.’

Another case of the co-existence of two settings of a parameter in the same language is the occurrence of WH movement. In languages like English, if a question sentence has one WH-element, WH-movement is obligatory. In contrast, in Chinese, WH-phrases remain in situ. The cross-linguistic difference has been assumed to be the result of different settings of the WH-movement parameter. However, in ASL, both WH-movement and WH-in-situ are observed, as has been exemplified by the examples (38) and (39) above (also see Lillo-Martin 1990, Sandler & Lillo-Martin 2006:16, ch. 23).¹⁰

⁹ Bahan et al. (2000) claim that in ASL, if the verb is not an agreement verb, a null argument is actually licensed by nonmanual markers, which are treated as realization of agreement. However, their claim is challenged by Thompson et al. (2006).

¹⁰ There are many other examples. One familiar case is the phenomenon split ergativity. If two different case systems co-exist in the same language, the difference should not be covered by different settings of any parameter, which have been assumed to capture cross-linguistic variation. As we know, most of the so-called ergative languages are not pure but split ergative. Thus the issue of split ergativity also challenges the parametric approach. One more example of the co-existence of two settings of a parameter in the same language is the

The intra-linguistic variation studied here casts doubts on the assumption that languages themselves are the immediate locus of parametric variation (see also Newmeyer 2004, Kayne 2005:1). It seems that what the parameter approach tries to explain can be simply covered by feature values. Different values of features can be attested either cross-linguistically or intra-linguistically. The following words of Kayne (2005:3) need to be considered: “The parametric variation that occurs within languages is of exactly the same sort as the parametric variation that occurs across languages. The elements subject to it are the same in both kinds of cases, and the features/properties in question are, too.” We have seen that whether a WH element moves or not correlates with its focus feature in ASL (see (38) and (39)). Moreover, it seems that whether *pro* in ASL is licensed by agreement or by discourse is related to whether the verb in the respective sentence is an agreement verb (such as *ASK*) or not (such as *EAT-UP*). Thus the specific value of a certain feature for a certain element correlates with other properties of the element and its syntactic context. Also importantly, we wonder whether it is possible that the value of a feature is underspecified for certain elements and that the occurrence of certain features is optional for some elements. For instance, assuming that the operation of movement satisfies an edge-feature of an element (see Chomsky 2005:6-7), if the edge feature for N-movement is optional in TSL, the raising of N in this language could be optional. In any case, the fact that the various possible word orders stated in Universal 20 are found in a single language leads us to explore these possibilities. The present paper simply reports the fact, and points out the incompatibility between the facts and current parameter theories, leaving any explanation of the incompatibility for future research.

5. Summary

In this paper, I have shown that both the flexibility of and the restrictions on word order within nominals as generalized in Greenberg’s Universal 20 are attested in Taiwan Sign Language. This study concludes that like oral languages, sign languages have hierarchical structures. Besides that, we also discussed the relation between syntactic hierarchy and linearization from the perspective of TSL. Moreover, we pointed out the fact that although Universal 20 is generalized from cross-linguistic investigations, the word order possibilities accounted for by this universal are attested in a single language. This fact calls for reconsideration of our current theories of parameter setting.

availability of two types of noun incorporation (NI). In compounding NI, the valence of the clause is decreased, whereas in classifying NI, the valence of the clause is not decreased. Many languages with NI consistently use only one type. However, some languages have both types (Hopkins 1988, Mithun 1984).

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