

CHAPTER TWO

LINGUISTIC PROPERTIES AND PREVIOUS STUDIES OF QNPs

In this chapter, I will discuss the similarities and differences between the linguistic properties of English and Chinese QNPs in various syntactic constructions, review theories of QNPs, and evaluate previous studies on the acquisition of QNPs. In section 2.1, I will discuss the ambiguity properties of English and Chinese QNPs. In section 2.2, syntactic analyses of QNPs will be reviewed (Aoun & Hornstein 1985, Aoun & Li 1989, and Kuno *et al.* 1999). In section 2.3, I will report the findings of two studies on the acquisition of Chinese QNPs and of English QNPs (Lee 1991, and Crain *et al.* 1996). Finally, in section 2.4, I will summarize the main points of this chapter.

2.1 Linguistic Properties of QNPs

In this section, adopting the Scope Principle and MBR in Aoun and Li (1989), I am going to discuss what syntactic constructions with the interaction of two QNPs, a universal QNP and an existential QNP, are ambiguous and what are unambiguous. Syntactic constructions included in this section are simple active constructions, simple passive constructions, double object constructions, dative constructions, subject control constructions, and object control constructions.

2.1.1 Simple Active Constructions

In this section, we are going to discuss the interaction of two QNPs, one occupying the subject position and the other the object position, in simple active constructions. Consider the following English examples (1) and (2):

(1) Every farmer is feeding a donkey. (Crain & Thornton 1998:294)

LF: [_T Every farmer_i [_T x_i [_I is [_V a donkey_j [_V t_i [_V feed x_j]]]]]

The Distributive Reading: For every farmer, there is a donkey such that every farmer is feeding a donkey.

The Collective Reading: There is a donkey such that for every farmer, every farmer is feeding the donkey.

(2) A babysitter looks after every child. (Lee 1991:183)

LF: [_T A babysitter_i [_T x_i [_V every child_j [_V t_i [_V look after x_j]]]]]

The Distributive Reading: For every child, there is a babysitter such that a babysitter looks after every child.

The Collective Reading: There is a babysitter such that for every child, the babysitter looks after every child.

According to Aoun and Li's (1989) MBR and Scope Principle, in an English simple active sentence with two QNPs, the QNP in the subject position c-commands the QNP in the object position and the latter QNP c-commands the trace of the former QNP.¹ Following May (1985), c-command can be used to define the scope of QNPs; consequently, both QNPs in (1) or (2) can have wide scope over each other. Sentence (1), cited from Crain and Thornton (1998), has a universal QNP (every farmer) in the subject position and a numeral QNP (a donkey) in the object position. Sentence (1) has two interpretations, distributive and collective. With the distributive interpretation, the mapping between farmers and donkeys must be one- to-one. With the collective interpretation, there is only one donkey and every farmer is feeding it. In (2), the sequence of the numeral QNP and the universal QNP is opposite to that in

¹ See further details; please refer to section 2.2.1 in Aoun and Li (1989).

(1). In (2) both the collective interpretation and the distributive interpretation are possible. The former interpretation says that it is the same babysitter who looks after every child. The later interpretation indicates that different babysitters look after different children. Therefore, English simple active sentences with a universal QNP and an existential QNP are ambiguous.

Let us consider the following Chinese examples (3) and (4):

(3) Mei ge xuesheng dou mai le yi ben shu.
 EveryCL student all buy Asp a CL book
 ‘Every student bought a book’ (Huang 1995)

LF: [_r Meige xuesheng_i [_r x_i [_r [_v yiben shu_j [_v dou mai le x_j]]]]

The Distributive Reading: For every student, there was a book such that
 every student bought a book.

(4) Liang ge nuren du guo mei ben shu.
 two CL woman read Asp every CL book
 ‘Two women have read every book.’ (Norbert Hornstein 1995:165)

LF: [_r Liangge nuren_i [_r x_i [_r [_v meiben shu_j [_v du guo x_j]]]]

The Collective Reading: There are two women such that for every book, the
 two women have read every book.

According to Aoun and Li (1989), unlike English simple active constructions, Chinese simple active constructions with two QNPs are not ambiguous.² In (3) only *meige xuesheng* c-commands and has scope over *yiben shu*, as represented at LF. Therefore, in (3) only the distributive interpretation is possible: there was more than one book and every student bought one book. In (4) *meiben shu* is c-commanded by

² Huang (1982) postulates the existence of the Isomorphic Principle to explain the nonambiguity of Chinese simple active constructions like (3) and (4). The Isomorphic Principle says that if QNP₁ c-commands QNP₂ at S-Structure, then the c-command relationship will be preserved at LF.

and lies in the scope of *liangge nuren*. Therefore, in (4), there are only two women and each has read every book. The distributive interpretation that for every book there are two women such that two women have read every book is impossible.

2.1.2 Simple Passive Constructions

In this section, we will discuss QNPs in English and Chinese simple passive constructions. Similar to simple active constructions, English passive constructions with two QNPs are ambiguous. Consider QNPs in English simple passive constructions (5) and (6):

(5) Everyone is loved by a woman. (Aoun and Li 1993:18)

LF: [_Γ Everyone_i [_Γ x_i [_I is [_v a woman_j [_v [_v love t_i] by x_j]]]]]]

The Distributive Reading: For everyone, there is a woman such that everyone is loved by a woman.

The Collective Reading: There is a woman such that for everyone, everyone is loved by the woman.

(6) A woman is loved by everyone. (Aoun and Li 1993:18)

LF: [_Γ A woman_i [_Γ x_i [_I is [_v everyone_j [_v [_v love t_i] by x_j]]]]]]

The Distributive Reading: For everyone, there is a woman such that a woman is loved by everyone.

The Collective Reading: There is a woman such that for everyone, a woman is loved by everyone.

According to Aoun and Li's (1989) MBR and Scope Principle, in (5) *everyone* c-commands *a woman* and *a woman* c-commands *t_i*, which was left behind after

NP-movement of *everyone* at S-structure. Therefore, two interpretations that *everyone* has scope over *a woman* or *a woman* has scope over *everyone* are possible. The former has the meaning that different persons are loved by different women, while the latter has the reading that there is a specific woman that loves every man. Even though the existential QNP precedes universal QNP in (6), the ambiguity remains.

Different from Chinese simple active constructions but similar to English passives, Chinese simple passive constructions with two QNPs are also ambiguous, as in (7) and (8):

- (7) Mei ge ren dou bei yi ge nuren zhuazou le.
 every CL person all by one CL woman arrest Asp
 ‘Everyone was arrested by a woman.’ (Aoun and Li 1993:17)

LF: [_{TP} Meige ren_i [_{TP} x_i [_{TP} [yige nuren]_j [_{VP} dou bei x_j [_{VP} [zhuazou t_i le]]]]]]]

The Distributive Reading: For everyone, there was a woman such that everyone was arrested by a woman.

The Collective Reading: There was a woman such that for everyone, everyone was arrested by the woman.

- (8) Yaoshi liangge xiansuo bei mei ge ren zhaodao...
 if two CL clue by every CL man find
 ‘If two clues were found by everyone...’ (Aoun and Li 1989: 142)

LF: [_{TP} Liangge xiansuo_i [_{TP} x_i [_{TP} [meige ren]_j [_{VP} bei x_j [_{VP} [zhaodao t_i]]]]]]]

The Distributive Reading: For everyone, there were two clues such that two clues were found by everyone.

The Collective Reading: There were two clues such that for everyone, the two clues were found by everyone.

In simple passive constructions, the QNP in the subject position (like *meige ren* as in (7) and *liangge xiansuo* as in (8)) has scope over the QNP in the object position (like *yige nuren* as in (7) and *meige ren* as in (8)). The QNP in the object position has scope over t_i of the moved NP. Therefore, sentences (7) and (8) are ambiguous. In (7), there are two readings: the distributive interpretation is that one woman arrested one person and the collective interpretation is that one specific woman arrested every person. In (8), the distributive reading is that the two clues everyone found were different and the collective reading is that the two clues everyone found were the same.

2.1.3 Double Object Constructions

In this section, I will discuss English and Chinese double object constructions, [V NP₁ NP₂], in which QNPs appear in the object positions, as in (9) and (10):

(9) The teacher gave every student one book.

LF: [_{IP} the teacher [_{IP} [_{VP} every student_i [_{VP} gave [_{IP} x_i [_{IP} [_{VP} one book_j [_{VP} e x_j]]]]]]]]]]³

The Distributive Reading: For every student, there was one book such that
the teacher gave every student one book.

(10) The chair assigned one advisor every student.⁴ (Kuno 1999: 84)

LF: [_{IP} the chair [_{IP} [_{VP} one advisor_i [_{VP} assign [_{IP} x_i [_{IP} [_{VP} every student_j [_{VP} e x_j]]]]]]]]]]

³ The LF representation is adopted from Aoun and Li's (1989) analysis of double object and dative constructions. See more details; please refer to section 2.2.2 in Aoun and Li (1989).

⁴ Different from Aoun and Li's (1989) claims that double object constructions with two QNPs are not ambiguous and that the preceding QNP has wide scope over the following QNP, Kuno *et al.* (1999) propose one functional account of English quantifier scope. By examining the interaction of syntactic, semantic, discourse, and pragmatic factors, Kuno *et al.* (1999) find that a double object construction like *the chair assigned every student one advisor* is ambiguous.

The Collective Reading: There was one advisor such that for every student,
the chair assigned the advisor every student.

According to Aoun and Li's (1989) analysis of QNPs in double object constructions, (9) and (10) are not ambiguous. The LF representations of (9) and (10) indicate that the preceding QNPs like *every student* in (9) and *one advisor* in (10) c-command and have wide scope over the following QNPs, like *one book* in (9) and *every student* in (10). The only reading for (9) is the distributive one; that is, the teacher had bought more than one book and one book was for one student. (10) only has the collective interpretation: there was only one advisor and the advisor was going to direct every student.

Then, consider QNPs in Chinese double object constructions, as in (11) and (12):

(11) Wo songgei mei ge ren yi ben shu.
I give to every CL man one CL book
'I gave everyone one book.'
(Yang 2001:128)

LF: [_{V1}" Wo [_{V1}" mei ge ren_i [_{V1} songgei [_{I2}" x_i [_{I2} [_{V2}" yi ben shu_j [_{V2}" e x_j]]]]]]]]]

The Distributive Reading: For everyone, there was one book such that I
gave everyone one book.

(12) Wo songgei yi ge ren meiyi ben shu.
I give to one CL man every CL book
'I gave one man every book.'

LF: [_{V1}" Wo [_{V1}" yi ge ren_i [_{V1} songgei [_{I2}" x_i [_{I2} [_{V2}" mei ben shu_j [_{V2}" e x_j]]]]]]]]]

The Collective Reading: There was one man such that for every book, I
gave the man every book.

The same analysis can apply to Chinese double object constructions. Huang (1982) claims that double object constructions like (11) and (12) containing QNPs are not ambiguous. According to Yang (2001), (11) only has the distributive interpretation; that is, books were individually distributed to every student. For (12), the available reading is collective: one specific person had every book.

2.1.4 Dative Constructions

In this section, I will discuss QNPs in English and Chinese dative constructions, [V NP₁ P NP₂], where one QNP occurs in NP₁ position and the other in NP₂ position, as in (13) and (14):

- (13) The chair assigned every student to one advisor. (Kuno 1999:84)

LF: [_{I1} the chair [_{I1} [_{V1} every student_i [_{V1} assign [_{I2} x_i [_{I2} [_{V2} one advisor_j [_{V2} [_{V2} e t_i] to x_j]]]]]]]]]]]

The Distributive Reading: For every student, there was one advisor such that the chair assigned every student to one advisor.

The Collective Reading: There was one advisor such that for every student, the chair assigned every student to the advisor.

- (14) The chair assigned one advisor to every student. (Kuno 1999: 84)

LF: [_{I1} the chair [_{I1} [_{V1} one advisor_i [_{V1} assign [_{I2} x_i [_{I2} [_{V2} every student_j [_{V2} [_{V2} e t_i] to x_j]]]]]]]]]]]

The Distributive Reading: For every student, there was one advisor such that the chair assigned one advisor to every student.

(16) Wo songsan ben shu gei mei ge ren.
 I give threeCL book to every CL man
 ‘I gave three books to everyone.’ (Aoun and Li 1989:167)

LF: [_{V1}” Wo [_{V1}” san ben shu_i [_{V1} song [₁₂” x_i[₁₂ [_{V2}” meige ren_j [_{V2}”[_{V2}” e t_i] gei
 x_j]]]]]]]]]

The Distributive Reading: For everyone, there were three books such that I gave three books to everyone.

The Collective Reading: There were three books such that for everyone, I gave the three books to everyone.

Similar to English dative constructions with two QNPs, Chinese dative constructions with two QNPs are also ambiguous. Huang (1981) and Huang (1982) claim that dative constructions like (15) and (16) containing QNPs are ambiguous in Chinese. Therefore, the analysis of the ambiguity of (15) and (16) is similar to that of (13) and (14). Sentence (15) has two interpretations: the distributive interpretation is that there were many students and one student was given one mathematical question; the collective interpretation is that there was only one student who was assigned every mathematical question by the teacher. The collective reading of (16) is that there were only three books such that everyone was the possessor of them. The distributive reading is that I gave three books to Peter, three to John, three to Jane, and so on.

2.1.5 Subject Control Constructions

In this section, I will discuss QNPs in subject control constructions, where the subject of the higher clause controls the subject of the lower clause. In sentences of this construction, one QNP occurs in the subject position of the main clause and one in the object position of the embedded clause. Consider QNPs in English subject control constructions first, as in (17) and (18):

(17) Every student tried to recite a poem.

LF: [_{IP} Every student_i [_{IP} x_i [_{VP} t_i [_{VP} tried [_{IP} a poem_j [_{IP} PRO_i to recite x_j]]]]]]]

The Distributive Reading: For every student, there was a poem such that every student tried to recite a poem.

(18) A student hoped [PRO_i to recite every poem].

LF: [_{IP} A student_i [_{IP} x_i [_{VP} t_i [_{VP} tried [_{IP} every poem_j [_{IP} PRO to recite x_j]]]]]]]

The Collective Reading: There was a student such that for every poem, the student hoped to recite every poem.

According to May (1977), Aoun and Hornstein (1985), and Aoun and Li (1989), Quantifier Raising is essentially clause-bound. That is, at LF, the QNP occurring in the lower clause cannot move over the clause it occurs. Accordingly, the QNP in the object position of the lower clause can neither c-command nor have scope over the QNP in the subject position of the upper clause, as shown in the LF representations of (17) and (18). In (17), *every student* c-commands and has scope over *a poem*. The distributive interpretation for (17) is that the poems every student tried to recite were different. In (18), *a student* c-commands and has scope over *every poem*. The collective interpretation for (18) is that there was only a student who tried to recite every poem. Therefore, (17) and (18) are not ambiguous.

Let us consider QNPs in Chinese subject control constructions, as illustrated in (19) and (20):

(19) Mei wei yufu dou daying zai yi ge
 Every CL fisherman all promise take one CL
 ren guo he.
 man pass river

‘Every fisherman promised to take a man over the river.’

LF: [₁₁ Mei ge yufu_i [₁₁ x_i [₁₁ [_{V1} dou daying [₁₂ yi ge ren_j [₁₂ PRO_i zai x_j guo
 he]]]]]]

The Distributive Reading: For every fishman, there was a man such that
 every fisherman promised to take a man over the river.

(20) Yi wei yufu daying zai mei ge ren
 One CL fisherman promise take every CL man
 guo he.
 pass river

‘One fisherman promised to take every man over the river.’

LF: [₁₁ Yi ge yufu_i [₁₁ x_i [₁₁ [_{V1} daying [₁₂ mei ge ren_j [₁₂ PRO_i zai x_j guo
 he]]]]]]

The Collective Reading: There was one fisherman such that for every man,
 the fisherman promised to take every man over the river.

Similar to English subject control constructions with QNPs, Chinese subject control constructions with QNPs are not ambiguous, either. Because of clause-boundedness, in Chinese subject control constructions, the QNP in the object position of the lower clause cannot have scope over the subject of the higher clause. In (19), only the distributive interpretation is possible that one fisherman promised to take one person over the river. In (20), only the collective interpretation is possible that there was only one fisherman and he promised to take every person over the river.

2.1.6 Object Control Constructions

After finishing discussing QNPs in subject control constructions, let us now see how QNPs interact in object control constructions. In object control constructions, PRO in the embedded clause is controlled by the object in the matrix clause, as shown in (21) and (22):

(21) Every student persuaded one passenger to donate money.

LF: [_{IP} Every student_i [_{IP} x_i [_{IP} [_{VP} one passenger_j [_{VP} t_i [_{VP} persuaded x_j [_{IP} PRO_j to donate money]]]]]]]]

The Distributive Reading: For every student, there was one passenger such that every student persuaded one passenger to donate money.

The Collective Reading: There was one passenger such that for every student, every student persuaded the passenger to donate money.

(22) At least one person expects every candidate to win. (Hornstein 1995:18)

LF: [_{IP} At least one person_i [_{IP} x_i [_{IP} [_{VP} every candidate_j [_{VP} t_i [_{VP} expects x_j [_{IP} PRO_j to win]]]]]]]]

The Distributive Reading: For every candidate, there is at least one person such that at least one person expects every candidate to win.

The Collective Reading: There is at least one person such that for every candidate, at least one person expects every candidate to win.

Aoun and Hornstein (1985) and Hornstein (1995) argue that object control sentences with one QNP as the subject of the upper clause and the other as the controller of PRO are ambiguous.⁵ According to the MBR and the Scope Principle stated in Aoun and Li (1989), the LF representations of (21) and (22) show that two QNPs in (21), as in (22), can have scope over each other. In (21), the distributive interpretation is that one student persuaded one passenger to donate money, and the collective interpretation is that there was only one passenger such that all students persuaded him to donate money. In (22), the distributive and collective interpretations are both possible, too.

Now, see the following Chinese examples, as in (23) and (24):

- (23) Mei ge kongbufenzi qiangpo yi ge renzhi
 Every CL terrorist force one CL hostage
 qu gen jingcha tanpan
 go with policeman negotiate

‘Every terrorist forced a hostage to negotiate with policemen.’

LF: [_{IP} Mei ge kongbufenzi [_{IP} x_i [_{IP} [_{VP} yi ge renzhi_j [_{VP} qiangpo x_j [_{IP} PRO_j qu gen jingcha tanpan]]]]]]

The Distributive Reading: For every terrorist, there was a hostage such that
 every terrorist forced a hostage to negotiate with
 policemen.

- (24) Yi ge qiangdao yiaqiao mei ge ren ba
 One CL robber ask every CL person BA
 qian na chulai.
 money take out

‘One robber asked everyone to take money out.’

⁵ Aoun and Hornstein (1985) examine QNPs in object control constructions with Quantifier Raising, Empty Category Principle, and Binding Principles, while Hornstein (1995) does so within the Minimalism framework.

LF: [_{IP} Yi ge qiangdao_i [_{IP} x_i [_{IP} [_{VP} mei ge ren_j [_{VP} yiaoqiao x_j [_{IP} PRO_j ba qian na chulai]]]]]]

The Collective Reading: There was one robber such that for everyone, the robber asked everyone to take money out.

Unlike English object control constructions with two QNPs, Chinese object control constructions with two QNPs are not ambiguous. The LF of (23) illustrates that *meige kongbufenzi* c-commands and has wide scope over *yige renzhi*, so the collective interpretation is not possible. The analysis of (23) can apply to (24), in which only the collective interpretation is available. (23) has the reading that one terrorist forced one hostage to negotiate with policemen and (24) has the interpretation that there was only one robber that asked everyone to take money out.

2.1.7 A Comparison of QNPs in English and Chinese Syntactic Constructions

Table 2-1 illustrates the ambiguity properties of QNPs in various English and Chinese syntactic constructions, which have been discussed in previous sections⁶:

⁶ I also did an experiment to compare Chinese speakers' interpretations of Chinese QNPs and English speakers' of English QNPs in different syntactic constructions. I directly translated all the English test sentences into Chinese. For instance, the English test sentence, *Every child wants to eat one piece of chocolate cake*, was translated into *Meige haizi xiang yao chi yikuai dangao*. I asked fifteen Chinese speakers, who majored in Chinese, to participate in the experiment.

The findings of my experiment were not as neat as the comparisons given in Table 2-1. It was found that even in the simple active constructions with QNPs, which were considered to be unambiguous by many researchers, some subjects preferred the distributive reading and some preferred the collective reading. The results supported Kuno *et al.*'s (1999) claim of the degree of ambiguity of sentences containing QNPs more than Aoun and Li's analyses of ambiguity and non-ambiguity of sentences containing QNPs. Generally speaking, when significant differences occurred, the Chinese majors preferred the preceding QNP to have a wide scope interpretation more. Compared with the English speakers, they were not that much in favor of the ambiguous reading.

Table 2-1: A Comparison of QNPs in Different Syntactic Constructions in English and Chinese

Syntactic Constructions	English		Chinese	
	Ambiguous	Unambiguous	Ambiguous	Unambiguous
Simple Active	P			P
Simple Passive	P		P	
Double Object		P		P
Dative	P		P	
Subject Control		P		P
Object Control	P			P

Table 2-1 indicates that except double object and subject control constructions, the other constructions with a universal QNP and an existential QNP are ambiguous in English, and that except simple passive and dative constructions, the other constructions with a universal QNP and an existential QNP are not ambiguous in Chinese.

2.2 Syntactic Analyses of QNPs

There are several studies on the interpretation of QNPs (cf. May 1977, Huang 1982, Huang 1983, May 1985, Aoun & Li 1989, Hornstein 1995). These scholars attempt to interpret various kinds of QNPs with different syntactic accounts. In this section, I will review three studies on the interpretation of QNPs: two of them apply GB theories to the QNP interpretation (Aoun & Hornstein 1985, Aoun & Li 1989) and one takes lexical, syntactic, semantic, pragmatic factors into consideration (Kuno *et al.* 1999).

2.2.1 Aoun and Hornstein (1985)

Agreeing that Quantifier Raising is crucial to determining the scope of QPs⁷ and that the notion ‘scope’ is determined by the relative c-command relation of QPs at LF, Aoun and Hornstein argue that the Empty Category Principle (ECP) together with the Binding theory, which interpret elements in A-positions, can account for the interpretation of the empty categories in A'-positions at LF. Following Kayne's (1981a) and Chomsky's (1981) spirit that the ECP is operative at LF, Aoun and Hornstein apply the Binding theory to the definition of the governing category of QPs, as shown in (25):

(25) Generalized Binding Theory

For X = A or A'

- A. An anaphor must be X-bound in its governing category⁸.
- B. A pronominal must be X-free in its governing category.
- C. A namelike expression must be A-free.

With the assumption that ECP and the Binding theory help interpret QPs in mind, Aoun and Hornstein begin to analyze the following sentences:

(26)a. Someone expects that every Republican will be elected.

LF: *[_S [_S every Republican_j [_S someone_i [_S x_i expects [_S that [_S x_j will be elected]]]]]]]

b. Someone expects (that) every Republican to be elected.

LF: [_S [_S every Republican_j [_S someone_i [_S x_i expects [_S x_j to be elected]]]]]]]

⁷ QPs used in Aoun and Hornstein (1985) and QNPs used in the present study are the same.

⁸ A governing category is defined as follows (Chomsky 1981):

A is a governing category for B if and only if the minimal clause or NP containing B, a governor for B, and a SUBJECT accessible to B, where SUBJECT = Agr, [NP, S], or [NP, NP].

In (26a) and (26b), that *someone* has wide scope over *every Republican* is not problematic. In (26b), *every Republican* can also have wide scope over *someone*. Different from (26b), *every Republican* in (26a) always lies in the scope of *someone*. Since *every Republican* in (26a) and (26b) occurs in the embedded clause, why is its scope interpretation of (26a) different from that of (26b)? Aoun and Hornstein claim that the violation of ECP and the Binding Principle (25A) is the main reason for the unacceptability of the interpretation. According to the ECP, x_j at LF in (26a) is neither antecedent governed nor theta-governed. The governing category of x_j is the embedded clause, in which x_j is governed by Infl and has Agr as its accessible SUBJECT. In the embedded clause in (26a), there is no binder for x_j ; as a consequence, the interpretation that *every republican* has wide scope over *someone* is ruled out. However, in (26b) *every Republican* has a wide-scope interpretation. The variable, x_j , left by raising *every Republican* to LF, is governed by *expect* and its accessible SUBJECT is *every Republican*. Therefore, the governing category of x_j in (26b) is the matrix clause. With the matrix clause as the governing category, x_j is properly bound by *every Republican* at LF. The interpretation that *every Republican* has wide scope over *someone* is acceptable in (26b).

- (27) a. That he_i might be laughed at didn't bother any clown $_i$.
 b. * He_i doesn't believe that anyone $_i$ is home.
 c. That he_i might be laughed at didn't bother John $_i$.
 d. * He_i doesn't believe that John $_i$ is home.
 e. *That he_i might be laughed at didn't bother every clown $_i$.

Different from quantifiers discussed in (26), *any* does not undergo QR (Aoun, Hornstein, & Sportiche 1981). Since at LF, *any* is not raised, it will not leave a

variable behind and it will not be subject to the ECP. *Any* in (27b) is not coindexed with *he* because *he* c-commands *any*, corresponding to the interpretation of *he* and *John* in (27d). In (27a) *any* is coindexed with *he*, which it does not c-command, similar to the coindexing of *he* and *John* in (27c). The *any*-phrase acts like names, like *John* in (27b), and it can coindex with a pronoun without c-commanding it. The *any*-phrase is like an R-expression and subject to Principle C:

(28) a. *Who thinks (that) what was bought by John?

LF: *_{[S[']₂ who_i what_j [_{S₂ x_i thinks [_{S[']₁ (that) [_{S₁ x_j Agr be bought by John]]]]]]}}}}

b. Who thinks (that) John bought what?

LF: [_{S[']₂ who_j what_m [_{S₂ x_j thinks [_{S[']₁ (that) [_{S₁ John_i Agr buy x_m]]]]]]]}}}}

Aoun and Hornstein assume that the ungrammaticality of (28a) and the grammaticality of (28b) are due to the position from which QP is raised in the embedded clause. In (28a) x_j is raised from the subject position of the embedded clause; it is neither theta-governed nor antecedent governed, violating the ECP. Aoun and Hornstein maintain that the variable left by QR at the subject position, like x_j in (28a), is subject to Principle A. In (28a), x_j is not properly governed. Therefore, the violation of the ECP and Principle A rules out (28a). Aoun and Hornstein further claim that the variable left by QR at the non-subject position, like x_m in (28b), is subject to Principle C. In (28b) x_m is theta-governed by *buy*. The governing category of x_m is not S_1 , because *John* is not the accessible Subject⁹ for x_m . The coindexing of *John* with x_m is not permissible. Similar reasons will prevent Agr in S_1 , x_j , and Agr in

⁹ A is accessible to B iff B is in the c-command domain of A and coindexing of A and B would violate neither the *i*-within-*i* Condition nor Principle C.

S_2 from being an accessible Subject for x_m . Thus, x_m is free and is subject to Principle C.

With the above analysis, Aoun and Hornstein claim that there are three types of QPs. The first type of QPs, as indicated in (26a) and (26b), are subject to the ECP and Principle A can restrict their scope interpretations. The second type of QPs, as shown in (28a) and (28b), are also subject to the ECP and Principle A together with Principle C permit them to move out from non-subject positions, but restrain them from subject positions. The third type of QPs like *any* are not subject to the ECP. They function like R-expressions whose interpretations are determined by Principle C.

However, in this study there are some weak points. First, Aoun and Hornstein assume that the three binding principles that help interpret NPs in A-positions can be applied to the interpretation of QPs in A'-positions at LF, but in the analysis only Principles A and C are adopted. The reason why Principle B does not work in A'-positions at LF is left unexplained. Second, the syntactic constructions that Aoun and Hornstein use for the classification of QPs are limited. After classifying QPs, it would be more convincing if they had analyzed QPs in various constructions to confirm their classification of QPs. Third, even though the first type of QPs and the subtype of the second type of QPs are subject to the ECP and Principle A, Aoun and Hornstein did not group them under the same type. They did not give any reason for not doing so.

2.2.2 Aoun and Li (1989)

Following the spirit of May (1985), Aoun and Li assume that quantificational phrases (QPs) are raised at Logical Form (LF) by the rule of Quantifier Raising (QR). According to Chomsky (1986), they assume that QPs can adjoin only to an A'-position such as V', VP, or IP, but not to CP. Besides, Aoun and Li use the Minimal

Binding Requirement, the Scope Principle, and the Constituency Difference, to account for the fact that the interaction between QPs in English differs from that in Chinese.

First of all, Aoun and Li contrast the behavior of QPs in English and Chinese with (29) and (30):

- (29) a. Meigeren dou xihuan yige nuren.
everyone all like one woman
'Everyone loves a woman.'
- b. Yaoshi liangge ren zhaodao meige xiansuo...
if two men found every clue
'If two men found every clue...'

(30) Someone loves everyone.

Chinese sentences (29a-b) are not ambiguous. In (29a) and (29b), *meigeren* and *liangge ren* in the subject position have scope over *yige nuren* and *meige xiansuo* in the object position, respectively. In contrast with these two Chinese sentences, English example (30) is ambiguous. (30) allows both the *someone* > *everyone* interpretation and the *everyone* > *someone* interpretation. Even though (29a) and (29b) are not ambiguous, their passive counterparts are ambiguous, as illustrated in (31):

- (31) a. Meige ren dou bei yige nuren zhuazou le.
every man all by one woman arrested Asp
'Everyone was arrested by a woman.'
- b. Yaoshi liangge xiansuo bei meigeren zhaodao...
if two clues by everyone found
'If two clues were found by everyone...'

In (31a-b) the QPs in the subject position and the QPs following *by* can have wide scope over each other.

In order to explain the contrast behaviors of QPs in (29-31), Aoun and Li propose three assumptions. The first assumption is Minimal Binding Requirement, as given in (32):

(32) Minimal Binding Requirement

Variables must be bound (coindexed and c-commanded¹⁰) by the most local potential antecedent (A'-binder).

Aoun and Li argue that variables left by QR must obey the locality requirement at LF. Therefore, the MBR rules out (33a-b) and only allows (33c): where the variables x_1 and x_2 are traces generated by the raising of QP_1 and QP_2 at LF, respectively:

(33)a. $*[\Gamma^v QP_1 [\Gamma^v QP_2 [\Gamma^v x_1 [v^v \dots x_2 \dots]]]]$

b. $*[\Gamma^v QP_2 [\Gamma^v QP_1 [\Gamma^v x_1 [v^v \dots x_2 \dots]]]]$

c. $[\Gamma^v QP_1 [\Gamma^v x_1 [v^v QP_2 [v^v \dots x_2 \dots]]]]$

In (33c) x_1 and x_2 are properly governed because the most local potential A' binders for x_1 and x_2 are QP_1 and QP_2 .

The second assumption that Aoun and Li propose to explain the contrast behaviors of QPs in (29-31) is the Scope Principle, as stated in (34).

¹⁰ Aoun and Li adopt the definition of c-command by Reinhart (1976, 1981, 1983):
C-command: A c-commands B if and only if the branching node α_1 most immediately dominating A either dominates B or is immediately dominated by a node α_2 that dominates B, and α_2 is of the same category type as α_1 .

(34) The Scope Principle¹¹

A quantifier A has scope over a quantifier B in case A c-commands a member of the chain¹² containing B.

The Scope principle suggests that in a sentence with QP_1 preceding QP_2 , the scope of QP_2 is determined by the chain containing QP_2 and the NP-trace, which is left by NP-movement at S-Structure and is coindexed with QP_2 .

The third assumption is concerned with the constituency difference between English and Chinese. In English, the subject is base-generated in the Spec position of VP at D-Structure and then is raised to the Spec Position of IP at S-Structure. However, the Subject Raising is not available in Chinese due to the lack of overt agreement. With the constituency difference between English and Chinese in mind, Aoun and Li assume that the S-Structures of (29b) and (30) are as follows:

(35) [_r liangge ren_i [_r [_v zhaodao meige xiansuo]]]]

(36) [_r someone_i [_r [_v t_i [_v loves everyone]]]]]

¹¹ Aoun and Li's (1989) definition of the Scope Principle is different from the definition given in May (1985). The Scope Principle May (1985:34) proposes is given below:

(i) The Scope Principle

Members of Σ -sequences are free to take on any type of relative scope relation.

Σ -sequence is defined as follows:

(ii) A class of occurrences of operators O is a Σ -sequence iff for any operator $O_i, O_j \in \Psi$, O_i governs O_j , where "operator" means "phrases in A'-positions at LF".

¹² "The chain" here refers to A-chain, which is formed by the moved NP and its trace. Let's take the sentence, *someone loves Peter*, for instance. According to Aoun and Li (1989), in English, the subject is base-generated in the Spec position of VP at D-Structure and then is raised to the Spec position of IP at S-Structure. Therefore, the S-Structure representation of *someone loves Peter* is [_r someone_i [_r [_v t_i [_v loves Peter]]]]]. *Someone* and t_i form an A-chain, <someone_i, t_i>. A-chain, which is created by NP-movement, differs from A'-chain, which is created by Adjunction.

After providing these three assumptions, Aoun and Li begin to interpret QPs in simplex, raising, dative, and double object constructions. Consider the simple sentences in (29b) and (30), whose LF representations are shown in (37) and (38):

(37)a. $[_R \text{ Liangge ren}_i [_R x_i [_R [_R \text{ meige xiansuo}_j [_R \text{ zhaodao } x_j]]]]]]$

b. $*[_R \text{ Meige xiansuo}_j [_R \text{ liangge ren}_i [_R x_i [_R [_R \text{ zhaodao } x_j]]]]]]$

(38) $[_R \text{ Someone}_i [_R x_i [_R \text{ everyone}_j [_R t_i [_R \text{ loves } x_j]]]]]]$

The Chinese sentence, *Liangge ren zhaodao meige xiansuo*, is not ambiguous. *Meige xiansuo* can only adjoin to the Spce position of VP, obeying the MBR. If it adjoins to I' , as in (37b), x_j will be bound by *liangge ren*, which is not coindexed with x_j ; thus, the MBR is violated. Based on the Scope Principle, only *liangge ren* can c-command *meige xiansuo*. Therefore, the collective interpretation is the only interpretation for the sentence, *Liangge ren zhaodao meige xiansuo*. Different from Chinese, English allows Subject Raising at S-Structure. In (38), t_i is left by the Subject Raising at S-Structure. According to the MBR, x_i and x_j in (38) are properly bound by their own local A'-binder, *someone* and *everyone*. In (38) *someone* c-commands *everyone* and *everyone* c-commands the NP-trace t_i , which is a member of the chain containing *someone*. Based on the Scope Principle, the collective interpretation and the distributive interpretation are both possible.

Similar to QPs in English simplex constructions, QPs in English raising constructions like (39) can be accounted:

(39) Someone seems to love everyone.

$[_R \text{ Someone}_i [_R x_i [\text{seems}[_R \text{ everyone}_j [_I \text{ to } [_R t_i \text{ love } x_j]]]]]]$

However, Subject Raising is not possible in Chinese. Aoun and Li propose a reanalysis approach to interpret Chinese raising constructions, as in (40):

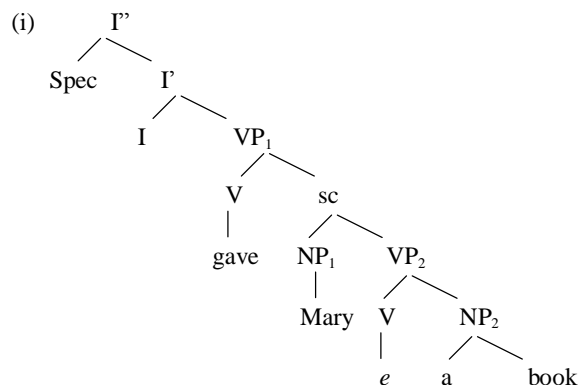
(40)a. Lianggeren [_v kenengkandao] meigeren.
 two men likely see everyone
 ‘Two men are likely to see everyone.’

b. [_r Liangge ren_i [_v x_i [_v meigeren_j [_v keneng kandao x_j]]]]

Keneng and *kandao* are reanalyzed into one verb. The LF of (40a) is represented in (40b). Similar to the analysis of the interpretation of *Liangge ren zhaodao meige xiansuo*, *liangge ren* has scope over *meigeren* but the reverse order is not possible in Chinese. Thus, Aoun and Li conclude that raising structures in Chinese are not ambiguous.

Extending and revising double object and dative constructions proposed by Kayne (1984) and Larson (1988), Aoun and Li first discuss the basic representations of these constructions¹³ and then analyze QPs in these constructions with the MBR

¹³ The basic representations of double object and of dative constructions that Aoun and Li adopt to analyze the interpretation of QPs are illustrated in (i) and (ii):



Kayne (1984) notes that in double object constructions [V NP₁ NP₂], NP₁ can be interpreted as a possessor of NP₂. In (i), *e* denotes a possession relationship between *Mary* and *a book*. *Gave* assigns Case to *Mary* and *e* assigns Case to *a book*. In this structure, *Mary* c-commands *a book*. This corresponds to Larson’s (1988) claim that in [V NP₁ NP₂], NP₁ asymmetrically c-commands NP₂.

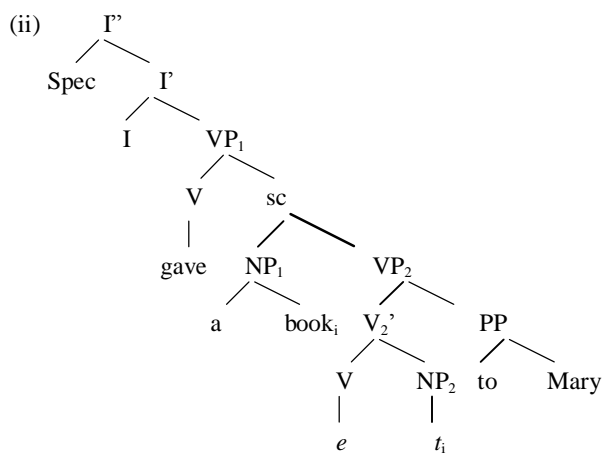
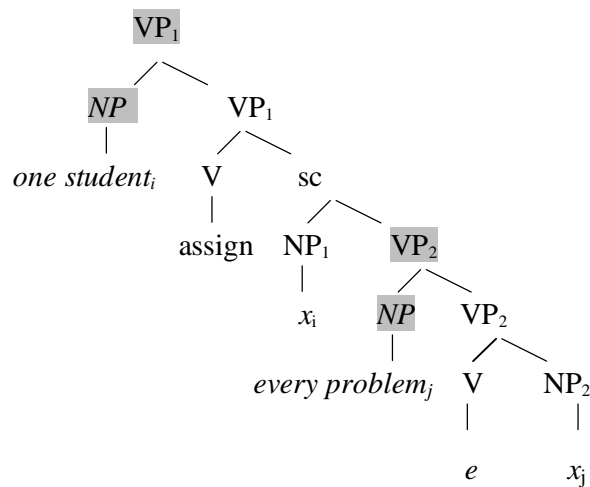
and the Scope Principle. Aoun and Li use (41) and (42) to exemplify non-ambiguity of double object constructions with two QPs and ambiguity of dative constructions containing two QPs:

(41) John assigned one student every problem.

(42) John assigned one problem to every student.

The LF of (41) is represented in (43):

(43) John assigned one student every problem.

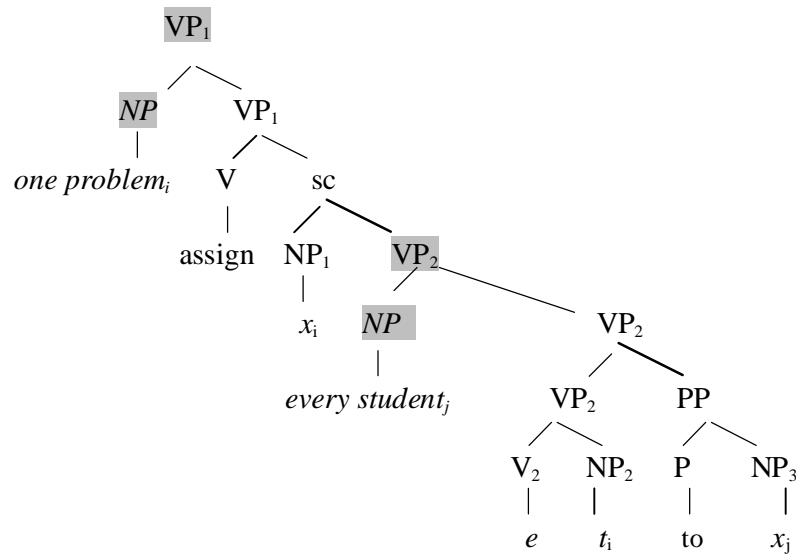


Aoun and Li assume that dative constructions are derived from double object constructions by adopting Larson's (1988) point of view that the link connecting dative and double object constructions is a passive-like process. While the passivization applies to the clause, *Mary e a book*, in (i), *e* is no longer a Case-assigner, which drives *a book* to move to NP₁ position. NP₁ is assigned Case by *gave*. *Mary* is adjoined to VP₂ with the preposition *to*, whose function is similar to *by* in passive constructions. In this structure, NP₁ asymmetrically c-commands *to Mary*.

In (43) *one student* adjoins to VP₁ and *every problem* adjoins to VP₂. *Every problem* cannot adjoin to a higher position; otherwise, the MBR will be violated. Therefore, only *one student* has wide scope. (41) is thus unambiguous.

Sentence (42) has the LF representation, as in (44):

(44) John assigned one problem to every student.



In (44), *one problem* adjoins to VP₁ and *every student* adjoins to VP₂. According to the Scope Principle, *one problem* c-commands *every student* and *every student* c-commands the trace left by NP-Movement of *one problem*. Sentence (42), which has one collective interpretation (*one problem* > *every student*) and one distributive interpretation (*every student* > *one problem*), is therefore ambiguous.

Aoun and Li's analysis of quantifier scope interpretations in English and Chinese is ingenious; however, their analysis is based on a limited set of data. In this study, they discuss QPs in three constructions, but for each construction they use no more than four examples to demonstrate how their assumptions help interpret the contrast behaviors of English and Chinese QPs. Second, the sequence of QPs in sentences that Aoun and Li use to examine the ambiguity or non-ambiguity of one specific syntactic

construction is the same. For instance, while analyzing QPs in raising constructions, Aoun and Li only use examples with an existential QP preceding a universal QP. It would be more convincing if Aoun and Li had reversed the order of an existential QP and a universal QP to see if ambiguity or non-ambiguity still remains.

2.2.3 Kuno *et al.* (1999)

In this study, Kuno, Takami, and Wu propose that the interaction of syntactic, semantic, pragmatic, and idiosyncratic factors can help determine the quantifier scope interpretations of a given sentence. Kuno *et al.* use the following principles, as in (45)¹⁴:

(45) The Principles:

- a. Subject Q > Object Q > Oblique Q: A quantified expression in a subject NP tends to have wide scope over one in a non-subject NP, and a quantified expression in an object NP tends to have wide scope over one in an oblique-case NP.
- b. Lefthand Q > Righthand Q: The lefthand quantified expression tends to have wide scope over the righthand quantified expression.
- c. Human Q > Nonhuman Q: A quantified expression in a human NP tends to have wide scope over one in a nonhuman NP.
- d. Speaker / Hearer Q > Third-Person Q: A quantified expression in the speaker / hearer NP tends to have wide scope over one in a third-person NP.
- e. More D (Discourse)-linked Q > Less D-linked Q: A quantified

¹⁴ The expert system Kuno *et al.* propose “is modeled after a standard technique used in artificial intelligence for arriving at decisions based on diversified factors that are not absolute” (81). The expert system has been applied to the speech recognition system, which relies on the recommendations of four experts: an acoustics expert, a word-statistics expert, a word-sequence-statistics expert, and a POS (Part of Speech) statistics expert.

expression referring to the object that has been talked about in the preceding discourse tends to have wide scope over one that refers to an object that has been newly introduced into discourse.

- f. More Active Participant Q > Less Active Participant Q: A quantified expression in an NP that refers to an active participant in the action represented by the sentence tends to have wide scope over a quantified expression in an NP that refers to a less active participant.
- g. Each > Other Quantified Expression: *Each* tends to have wide scope over other quantified expressions.

(45a) and (45b) are syntactic, (45c) is semantic, (45d-f) are discourse-based, and (45g) is based on idiosyncratic properties of lexical items. Kuno, Takami, and Wu assume that each principle in (45) acts “as a quantifier-scope-interpretation expert”(p.80). These seven experts have equal rights. In a sentence with two QEs (Quantified Expressions)¹⁵ at the S-Structure, the QE that one expert considers to have wide scope will win one vote from this expert. Because each QE has some chance of taking a wide scope interpretation, Kuno *et al.* begin by assigning each QE a baseline vote. The number of votes that each QE wins will determine the degree of ambiguity of sentences containing QEs. Given the principles in (45), it is easy to account for the contrast between (46a) and (46b):

¹⁵ QE (Quantified Expression) in Kuno *et al.* (1999) is the same as QP in Aoun and Li (1989) and QNP in the present study.

(46) a. John assigned one student every problem. (unambiguous)

<i>one student</i>	<i>every problem</i>
Baseline	Baseline
Lefthand Q	
Human Q	
More Active Q	

b. John assigned one problem to every student. (ambiguous)

<i>one problem</i>	<i>every student</i>
Baseline	Baseline
Lefthand Q	Human Q
Object Q	More Active Q

In (46a), *one student* receives four votes while *every student* gets only a baseline vote. Thus, it results in the unambiguous interpretation. In (46b), *one problem* and *every student* each receive three votes; then we get the ambiguous interpretation.

Besides the seven fundamental principles in (45), Kuno, Takami, and Wu elaborate the hierarchy of quantifiers offered by Ioup (1975). They claim that the quantifier hierarchy principle is also relevant to the scope interpretation, as given in (47):

(47) each > some (+ Nsg) > every > all > most > many > several >
some (+ Npl) > a few

The principle in (47) can interpret various QEs. Consider example (48):

(48) Every student admires some professor. (ambiguous)

<i>every student</i>	<i>some professor</i>
Baseline	Baseline
Subject Q	some (+ Nsg) > every
Lefthand Q	

In (48) both the ‘every > some’ interpretation and the ‘some > every’ interpretation are available; accordingly, *every student admires some professor* is ambiguous with the former interpretation favored over the latter.

The above principles can interpret the interaction of QEs in one sentence. However, there are two conditions in which these principles will not work: pragmatic implausibility and topicalization. Consider the following example:

(49) An oak grew from every acorn.

<i>an oak</i>	<i>every acorn</i>
Baseline	Baseline
Subject Q	
Lefthand Q	
An > every	

(49) is an example in which one scope interpretation is pragmatically implausible. Despite the fact that *an oak* receives much more votes than *every acorn*, the ‘an > every’ interpretation is not existent. In the real world, an oak grows from one acorn. The higher-scoring scope interpretation will be eliminated if it is of pragmatic implausibility.

(50) a. Many people come to New York every summer.

b. Every summer, many people come to New York.

(50a) is ambiguous, but (50b) is unambiguous. (50b) has only one interpretation that the topicalized QE, *every summer*, takes scope over the nontopicalized QE, *many people*. Topicalized quantified expressions always have wide scope.

In addition to English quantifier scope phenomenon, Kuno *et al.* point out that the Chinese sentence can also be accounted for by the expert system. They assume

that the principles in (45) are relevant for Chinese. Besides, they add five more principles to analyze the Chinese scope phenomenon, as shown in (51):

- (51)a. WH-Q > Non WH-Q [2 votes]
- b. Numeral Q > Nonnumeral Q [2 votes]
- c. *Mei* ‘every’ > *henduo* ‘many’ (Universal Q > Existential Q)
- d. *Dou*-quantified Q > Non-*Dou*-quantified Q [3 votes]
- e. Subject Q > *By*-agentive Q [3 votes]

The use of the expert system for Chinese quantifier interpretation can be illustrated in (52) and (53):

- (52) *Yige nanren xihuan henduo nuren.* (unambiguous)
 one man like many woman
 ‘One man loves many women.’
- | | |
|---------------------|---------------------|
| <i>yige nanren</i> | <i>henduo nuren</i> |
| Baseline | Baseline |
| Subject Q | |
| Lefthand Q | |
| Numeral Q [2 votes] | |

In (52), *yige nanren* receives five votes and thus has wide scope over *henduo nuren*.

(52) is unambiguous. Consider the Chinese passive sentence in (53):

- (53) *Meigeren dou bei yige nuren zhuazoule.* (ambiguous)
 everyone all by one woman arrested
 ‘Everyone was arrested by a woman.’
- | | |
|----------------------------------|---------------------|
| <i>meigeren</i> | <i>yige nuren</i> |
| Baseline | Baseline |
| Subject Q [3 votes] | Numeral Q [2 votes] |
| Lefthand Q | |
| <i>Dou</i> -quantified [3 votes] | |

In (53), *meigeren* wins eight votes and *yige nuren* gets three. Both the ‘*meigeren* > *yige nuren*’ interpretation and the ‘*yige nuren* > *meigeren*’ are allowed. However, the distributive interpretation has a stronger wide-scope interpretation than the collective interpretation does.

The expert system presented above can apply to interpretations of QEs in Japanese, as in (54):

- (54) Daremo-ga dareka-o aisite-iru.
 everyone-NOM someone-ACC love
 ‘Everyone loves someone.’
- | | |
|---------------|---------------|
| <i>daremo</i> | <i>dareka</i> |
| Baseline | Baseline |
| Subject Q | |
| Lefthand Q | |
| A Universal Q | |

In (54), *daremo* ‘everyone’ receives four votes; *dareka* ‘someone’ receives only one vote. The use of the expert system explains the non-ambiguity of (54).

However, there are some weak points in Kuno *et al.*’s study. First, which principles are relevant for one language may not be easily identified and added. Second, the number of votes that every principle has is hard to be precisely determined. Third, the principle, *each* > *other quantified expressions*, overlaps the principle, *more discourse linked* > *less discourse linked*. Kuno *et al.* point out, “*each* can be used only when the set whose members *each* varies over is well defined in discourse, that is, only when it is D-linked”(p.84). Since there is the principle that more discourse-linked quantified expressions have scope over less D-linked ones, why should there be the principle, *each* > *other quantified expressions*?

Aoun and Hornstein (1985) and Aoun and Li (1989) apply GB theories to the QNP interpretations. According to Aoun and Hornstein, the ECP and the Binding

theory can define the scope of existential and universal QNPs. Aoun and Li claim that the MBR and the Scope Principle can help interpret sentences with QNPs. According to these researchers, syntactic constructions with QNPs analyzed with GB theories are either ambiguous or unambiguous. However, Kuno *et al's* (1999) system determines the degree of ambiguity of sentences containing QNPs. Some ambiguous sentences to them are more conspicuously ambiguous than others. Therefore, they interpret QNPs in a different way from Aoun and Hornstein (1985) and Aoun and Li (1989).

I adopted Aoun and Li's (1989) framework in section 2.1, instead of Kuno *et al's* (1999), because Kuno *et al's* (1999) principles for one language and the number of votes every principle has are hard to determine. In this study, I examine the subjects' interpretations of QNPs in six syntactic constructions, some of which have been analyzed by Aoun and Li (1989) to be ambiguous or unambiguous when these sentences contain universal QNPs and existential QNPs. Therefore, I would like to see if the subjects' interpretations of sentences containing QNPs support Aoun and Li' (1989) analyses. If not, can Kuno *et al's* system account for the ambiguity of sentences with QNPs?

2.3 Previous Empirical Studies of QNPs

Even though empirical studies on first language acquisition of QNPs are abundant (cf., Lee 1991, Philip 1991,1992, Crain *et al.*1996), there lacks empirical studies on L2 acquisition of QNPs. Among these studies of L1 acquisition of QNPs, I will review the experimental studies of Lee (1991) and Crain *et al.* (1996).

2.3.1 Lee (1991)

Lee assumes that in Mandarin Chinese linear order will be relevant for the scope interpretation. That is, the preceding QNP will have scope over the following QNP. In

order to demonstrate that linearity is a strong principle for scope interpretations in Chinese, two sentence types¹⁶ were used in Lee's study. The first type shows QNP₁ in a preverbal locative phrase (a prepositional phrase headed by *zai* "at") and QNP₂ as a postverbal object. This type of sentences is unambiguous, with QNP₁ having scope over QNP₂. In the second type of sentences, QNP₁ is a direct object and QNP₂ is a postverbal object of a locative phrase (a prepositional phrase headed by *zai* "at"). This type of sentences is ambiguous and the linearity principle can predict one of the two interpretations. For each sentence type, there were two experimental settings: the placement of strings on stools and the positioning of towels over the bodies of dolls. Moreover, there were two QNP orders used for each setting in each sentence type: an EA¹⁷ order with an existential QNP preceding a universal QNP and an AE order with a universal QNP preceding an existential QNP. Lee claimed that if the linearity

¹⁶ The test materials of this experiment designed by Lee (1991) are as follows:

- I. Sentence Type One (*zai*-sentences)
- a. X *zai* *yige* *denzi* shang fang *meigen* *shengzi*. (EA)
 at one-CL stool on put every-CL string
 'X puts every string on a stool.'
- b. X *zai* *meige* *denzi* shang dou fang *yigen* *shengzi*. (AE)
 at every-CL stool on all put one-CL string
 'X puts a string on every stool.'
- c. X *zai* *yige* *xiaohai* shen shang gai *meitiao* *maojin*. (EA)
 at one-CL child body on lay every-CL towel
 'X lays every towel on a child.'
- d. X *zai* *meige* *xiaohai* shen shang dou gai *yitiao* *maojin*. (AE)
 at every-CL child body on all lay one-CL towel
 'X lays a towel on every child.'
- II. Sentence Type Two (V-sentences)
- a. X fang *yigen* *shengzi* zai *meige* *dengzi* shang. (EA)
 put one-CL string at every-CL stool on
 'X puts a string on every stool.'
- b. X fang *meigen* *shengzi* zai *yige* *dengzi* shang. (AE)
 put every-CL string at one-CL stool on
 'X puts every string on a stool.'
- c. X gai *yitiao* *maojin* zai *meige* *xiaohai* shen shang. (EA)
 lay one-CL towel at every-CL child body on
 'X lays a towel on every child.'
- d. X gai *meitiao* *maojin* zai *yige* *xiaohai* shen shang. (AE)
 lay every-CL towel at one-CL child body on
 'X lays every towel on a child.'

(X in the above sentences stands for the name of the child subject.)

¹⁷ In Lee (1991), "A" stands for a Universal Quantifier and "E" represents an Existential Quantifier.

principle was correct, then the wide scope of QNP₁ would be possible for all the test sentences.

One hundred and seventeen Mandarin-speaking children aging from 3 to 8 years participated in his experiment. In addition, a group of adults formed a control group. The children were interviewed individually and were asked to act out the meaning of the sentences. Instead of being interviewed individually, five to six adults as a group were shown the props and were asked to write down their interpretations on paper.

For one setting with two test sentences, one with an EA order and the other with an AE order, three categories of responses were identified. In one type of responses, subjects consistently interpret QNP₁ as the wide scope QNP in the two test sentences. Another type of responses showed his subjects consistently assigned wide scope to QNP₂ in the two test sentences. The third type was of inconsistent responses; that is, his subjects had the wide scope reading of QNP₁ in one test sentence and had the wide scope interpretation of QNP₂ in the other sentence.

Figure 2-1 illustrates the results on the *zai*-sentences with an existential quantifier (E) as QNP₁ and a universal quantifier (A) as QNP₂. The majority of the adults followed the linearity principle and consistently assigned E wide scope. With respect to the children who consistently assigned wide scope to E, the percentage of the 3- to 4-year-olds was very low. The percentage increased with age and it reached a peak at age 7. In contrast, the percentage of the children who assigned wide scope to a universal QNP declined with age. The low percentage of the 3- to 4-year-old children who assigned wide scope to E and the relative high percentage (38%) of 3- to 4-year-old children who assigned wide scope to A are due to the task bias¹⁸. The

¹⁸ Lee pointed out that the task bias might influence children's responses to sentences of EA and AE orders. Children preferred the one-to-one correspondence; that is, they put a sting on a stool and a towel on a doll. The task bias reflected children's preference for the wide scope interpretation of a universal quantifier (A).

influence of the task bias gradually declined while the linearity principle was established at older age.

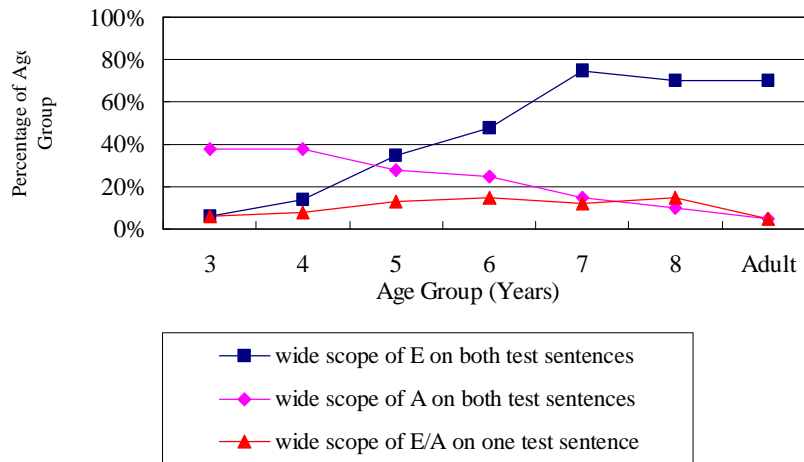


Figure 2-1 Children's Interpretation of Zai-Sentences
 Existential Quantifier (E) Precedes Universal
 Quantifier (A)
 Type I: NP [zai QNP₁] V QNP₂

Figure 2-2 indicates the results on the *zai*-sentences with a universal quantifier (A) as QNP₁ and an existential quantifier (E) as QNP₂. In contrast to the results shown in Figure 2-1, Figure 2-2 shows that the wide scope reading of QNP₁ was acquired very early. The reason for the early onset of the wide scope of QNP₁ was the task bias. Another difference between Figures 2-1 and 2-2 is that in Figure 2-2 few children chose the wide scope of QNP₂ in the *zai*-sentences with the AE order. The wide scope of QNP₂ in the *zai*-sentences with the AE order violates both the task bias and the linearity principle.

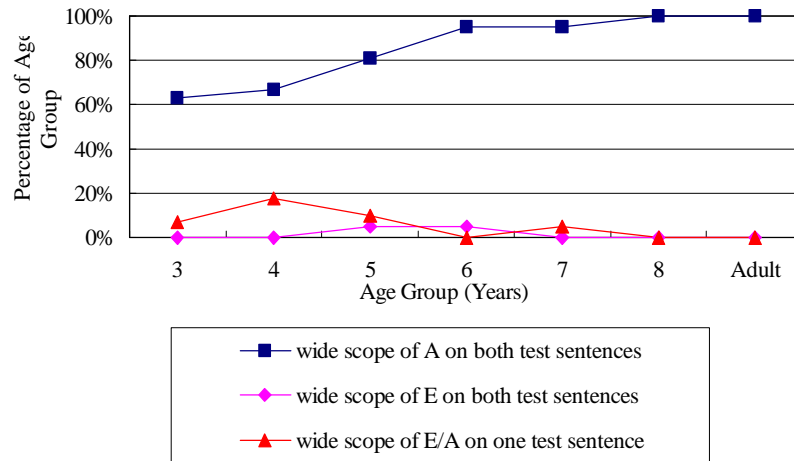


Figure 2-2 Children's Interpretation of Zai-Sentences
 Universal Quantifier (A) Precedes Existential Quantifier (E)
 Type I: NP [zai QNP₁] V QNP₂

Figure 2-3 reports on the subjects' interpretation of two postverbal QNPs with an existential quantifier (E) preceding a universal quantifier (A). Different from the adult data in Figures 2-1 and 2-2, in Figure 2-3 the percentage of the adults who consistently assigned wide scope to QNP₁ reduced to only 55% and that there was 25% adults assigning wide scope to QNP₂, with another 15% fluctuating between these two interpretations. This represents that the adults realized the ambiguity property of these sentences. Similar to Figure 2-1, the percentage of the children who always assigned wide scope to QNP₁ steadily increased with age and reached a peak at age 7. However, at 8 the percentage dropped to 65%. In contrast, the percentage of the children who consistently assigned wide scope to QNP₂ declined to the lowest point at age 7 and stably increased later. This indicates that at the age 7 the linearity principle has been established and after age 7 another principle for scope interpretation is going to be acquired.

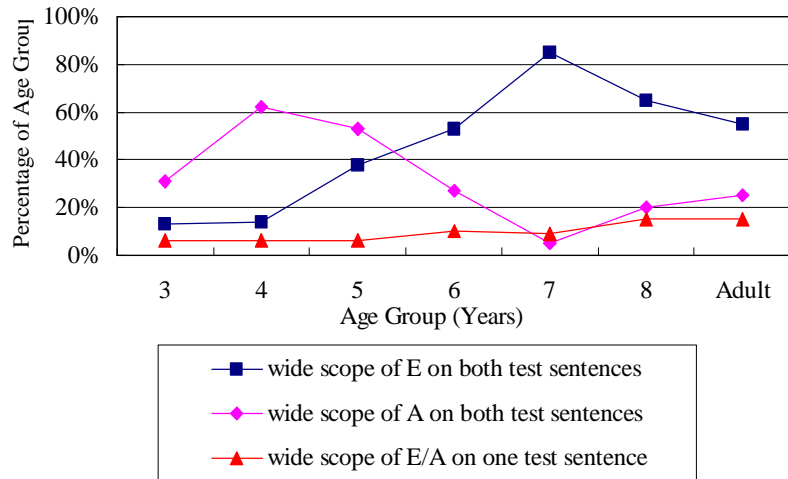


Figure 2-3 Children's Interpretation of V-Sentences
 Existential Quantifier (E) Precedes Universal Quantifier (A)
 Type II: NP V QNP₁ [P QNP₂]

Given in Figure 2-4, the adult data for the V-sentences with a universal quantifier as QNP₁ and the existential quantifier as QNP₂ also exhibited the ambiguity property of these sentences. However, the children's data in Figure 2-4 were divergent from those in Figure 2-3. In sentences with the AE order, a relatively higher percentage of the younger age groups chose the wide scope interpretation of QNP₁. Only a small number of the younger children who consistently assigned wide scope to QNP₂ had wide scope interpretations of QNP₂ and the percentage dropped to 0% after age 6. This was attributed to both the task bias, which was preferred by the younger groups, and the linearity principle, which was acquired later. Moreover, the line connected with squares declined after the age of 6 and the line representing the varying choices between the two scope interpretations increased after age 6. This suggests the ambiguous readings of these sentences emerged after age 6.

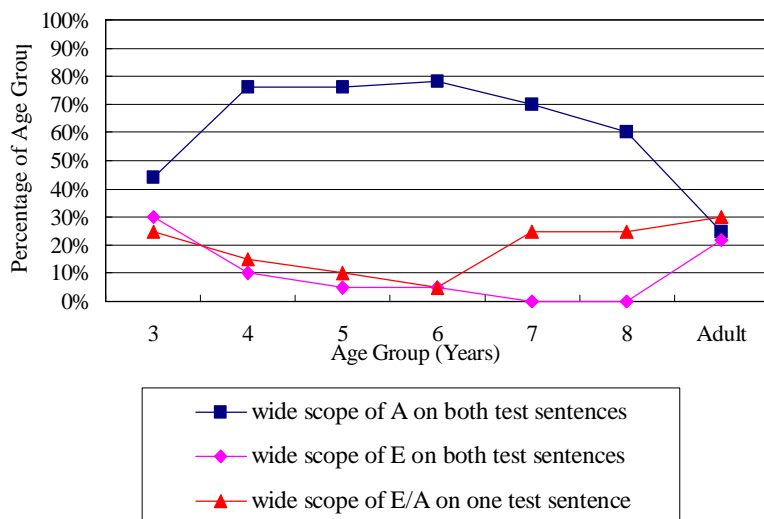


Figure 2-4 Children's Interpretation of V-Sentences
 Universal Quantifier (A) Precedes Existential Quantifier (E)
 Type II: NP V QNP₁ [P QNP₂]

Therefore, the data gathered for this experiment showed that linear order was a strong principle for scope interpretation in Chinese and that the linear order was acquired before the acquisition of some principle, which worked with the linearity principle to interpret ambiguous sentences with QNPs.

However, in this study there were only two types of Chinese syntactic constructions that Li used to demonstrate the significance of the Linearity Principle in Chinese. *Zai*-sentences and *V*-sentences only constituted a small set of Chinese syntactic constructions. It would be more convincing if more syntactic constructions containing QNPs had been adopted for analyses. Besides, 'some' principle, which interacted with the linearity principle to interpret ambiguous sentences, was left unmentioned. Is 'some' principle the one that triggers the Quantifier Raising at LF or it is some other unknown principle that functions?

2.3.2 Crain *et al.* (1996)

It has been widely believed that while being asked to interpret sentences with the universal quantifier, such as *Every farmer is feeding a donkey*, children prefer the symmetrical interpretation. That is, the mapping between *farmers* and *donkeys* must be one to one. It is further claimed that children's symmetrical response is because of their lack of grammatical competence with universal quantification. Against the previous findings, Crain *et al.* argue that all symmetrical responses by children are errors due to flaws in the experimental design. Crain *et al.* claim that if contexts provided are pragmatically felicitous, children's responses will display their grammatical competence with universal quantification. In order to eliminate the possible flaws in the experiment design, the first step is to decide whether the test sentences, like *Is every farmer feeding a donkey*, should be true or false in adult interpretation.¹⁹ Children have a tendency to answer "Yes" when they are uncertain or confused. Therefore, the adult interpretation should be associated with the "No" answer, which requires children to explain the reason for giving the negative judgment. The second step is to divide each test sentence into four components: background, assertion, possible outcome, and actual outcome. Let us take the test sentence *Every farmer is feeding a donkey* for example. In the test sentence, *a donkey* is the assertion and the background is formed by replacing the assertion, which is *a donkey* in the test sentence, with a more elliptical expression, such as *a so-and-so*, as given in (55):

¹⁹ In one of the previous studies, children were shown a picture with three farmers and four donkeys. Except a donkey left unfed, a farmer is feeding a donkey in the picture. The test sentence for the study is *Is every farmer feeding a donkey*. The adult interpretation for this test sentence is "Yes", while children usually pointed to the unfed donkey and gave the "No" answer. Children demanded the symmetry between farmers and donkeys.

(55) Background: Every farmer is feeding *a so-and-so*.

Assertion: *a donkey*

Under the assumption that children's negative answer to the test sentence represents their full grammatical competence, the negative judgment of the test sentence must be the correct interpretation. That is, the case that the background does not apply to the assertion is actual outcome. Different from actual outcome, possible outcome is the condition of plausible assent.

Crain *et al.* conducted seven experiments to demonstrate that if sentences with universal quantification are given in appropriate contexts, children's errors in the previous studies will be greatly reduced. From Experiments 2 to 7, the Truth Value Judgment was adopted. Short stories were acted out with toys in front of children and one puppet, Kermit the Frog. At the end of one story, Kermit would say what happened in this story. Children were asked to judge whether Kermit's description of the story was true or false.

Experiment 1 was designed to replicate the previous studies, in which children assigned symmetrical responses to sentences with a universal quantifier. The purpose was to identify a group of children who gave symmetrical responses. Thirty-four children who participated in this experiment were shown pictures corresponding to the Extra Object Condition²⁰ and were asked to give Yes/No answers. Overall, there were fourteen children negating the test sentence most of the time. These fourteen children were identified as the group who preferred the symmetrical interpretation.

Experiment 2 was to examine whether children have the distributive interpretation of the universal quantifier. There were three characters and two kinds of

²⁰ With the test sentence, *Is every farmer feeding a donkey*, the Extra Object in the picture is the unfed donkey.

objects in the protocols for the stories in Experiment 2. One out of the three characters immediately decided one kind of object. The other two considered another kind of object, but later they settled on the same kind of object as the first character did. At the end, “Every so-and-so did such-and-such” was given by Kermit, played by another experimenter. *So-and-so* refers to three characters and *such-and-such* refers to the object that every character finally settled on. Fourteen children who had consistently given symmetrical interpretation in Experiment 1 participated in this experiment. The results of Experiment 2 showed that twelve children accepted all test sentences and that none of the other two children who rejected some test sentences gave a symmetrical interpretation. If children who rejected test sentences had applied symmetry to the interpretation of these sentences, they would have pointed to the extra kind of object that was not been settled by the three characters. Accordingly, children’s interpretation of the universal quantifier was similar to adults’.

Experiment 3 aimed to see if children could produce sentences with a universal quantifier for the distributive interpretation in felicitous contexts. The protocols in Experiment 3 were identical to those in Experiment 2. In order to elicit the target constructions, Kermit added “only one” to sentences “so-and-so did such-and-such” to form test sentences. These test sentences produced by Kermit were incorrect descriptions of the contexts. In these contexts, that every so-and-so did such-and-such was what really happened. If the interviewed child gave a negative answer to one test sentence, the experimenter would ask him what really happened in the story. The production data were elicited while the child was giving a description. The participants in this experiment were the same children in Experiment 2. The results showed that children rejected Kermit’s description 98% of the time. Children replaced “only one” in the test sentences with “every”, “all of”, or specific numbers. Therefore, children could produce sentences with a universal quantifier for the distributive

interpretation as adults did.

The purpose of Experiment 4 was to see if children had the existential wide-scope interpretation of sentences containing a universal quantifier. If children consistently assigned a symmetrical interpretation to sentences with a universal quantifier, they could not assign the wide scope interpretation to an existential quantifier. Experiment 4 was divided into Parts A and B. The test sentences used in Part A contained indefinite NPs in the object position. The protocols were similar to those in Experiments 2 and 3. Three characters chose the same object in contexts. The test sentences were “Every so-and-so did a such-and-such”. If children gave a negative answer to a test sentence and pointed to the other left objects, they did not have the existential wide scope interpretation. Twelve children who had consistently given the symmetrical interpretation in Experiment 1 participated in this experiment. In the results of Part A, these twelve children said “Yes” 92% of the time. This demonstrated that children had access to the wide scope interpretation of an existential quantifier. The test sentences in Part B had indefinite NPs in the subject position. In Part B, there were three characters and only one of them could have all objects in the contexts. The other two characters might have some, but not all. The test sentences were “A so-and-so did every such-and-such”. If children gave a negative answer to a test sentence and pointed to other objects that the other two characters did not have, they did not have existential wide scope interpretation. Six of these twelve children made no errors in all test trials. Another six children rejected the test sentences in some trials. While being asked why they rejected the test sentences, these children pointed to the other two characters that did not have all objects. These children’s reason for their negative judgment was not anticipated by the symmetrical account. In Part B, none of children’s responses accorded with the symmetrical account.

Crain *et al.* propose that children have grammatical competence of syntactic and semantic principles of quantification in UG. In order to demonstrate the truth of the proposal, Crain *et al.* conducted Experiment 5 in which the participants were eleven deaf children who learned American Sign Language (ASL) as their native language. Experiment 5 was to see whether children whose native language was ASL have the distributive interpretation of universal quantification and the wide scope interpretation of existential quantification. The experimental design adopted in this experiment was similar to that used in Experiments 2 to 4. The results showed that children had a high level of accuracy (88.2%) of responding to sentences with quantified interpretations. Therefore, the syntactic and semantic principles of quantification are part of UG and have been operative in children's grammar.

Experiment 6 was to investigate children's interpretations of sentences with *wh*-questions and the universal quantifier, such as (56):

(56) What did every pig buy?

(56) has two interpretations. One is collective reading: what is the particular item bought by every pig. The other is a paired list reading: (56) asks for enumerating the items every pig bought. According to the symmetrical account, children only gave the paired list answer to (56) and the collective interpretation was not available to them. By contrast, Crain *et al.* assume that children should have access to these interpretations in felicitous contexts. In order to investigate a child's understanding of (56), Kermit told the child that he could not remember what really happened by proposing the question (56). In the story, all the pigs bought some particular item, making the collective interpretation available. Besides this particular item, two of these pigs bought some other item, but the other didn't. By putting every pig beside

the items he bought, the paired list reading was available. Four children who had consistently assigned the symmetrical interpretation and five children who had not given the symmetrical interpretation participated in this experiment. The results indicated that four children exhibited a preference for the distributive interpretation and the other five preferred the collective interpretation. The four children were not the same children who had consistently given the symmetrical response.

Experiment 7 was to investigate children's interpretations of two constructions: the relative clause and the conditional sentences. On the symmetrical account, children would take the universal interpretation as primary and would assign similar interpretations to both relative clauses with universal quantification²¹, like (57), and conditional sentences, like (58).

(57) Every man who has a snowplow uses it to push snow.

(58) If a man has a snowplow, then he uses it to push snow.

In Experiment 7, children were given stories that were corresponding to the existential interpretation. If the universal interpretation was the only one available to children, children would reject test sentences, like (57) and (58). Protocols used for these two constructions were exactly the same. The results showed that children accepted the relative clauses much more often than the conditional sentences. This is not expected, based on the symmetrical account.

Crain *et al.* conducted a series of experiments to demonstrate that children indeed have the knowledge of universal quantification. The finding that half of

²¹ Lewis (1975) found that certain adverbs of quantification, such as *always*, *usually*, and *seldom*, could have scope over several indefinite NPs at the same time. Lewis call these adverbs Unselective Binders. Heim (1982) adopted Lewis' observation to analyze relative clauses modifying the preceding universal quantification, such as *Every farmer who owns a donkey feeds it*. According to Heim, the universal quantifier in the sentence unselectively bound both nominals, *farmer* and *donkey*.

children's symmetrical responses resulted from experimental noise is excellent. By incorporating the idea, pragmatic felicity, into their experimental design, children's non-adult responses were greatly reduced. However, the contexts Crain *et al.* introduced were more favorably prone to one of the interpretations that were available to children. This interpretation was an adult or adult-like interpretation. These contexts lead children to give expected answers to the test questions. Furthermore, the experimental design could not make two readings of ambiguous test sentences open to the participants. This experiment design cannot apply to L2 acquisition since both the distributive interpretation and the collective interpretation are available to adults.

2.4 Summary of Chapter Two

In this chapter, I have systematically compared the ambiguity properties of QNPs in different syntactic constructions in English and Chinese. I have discussed three studies on the interpretations of QNPs and two empirical studies of L1 acquisition of QNPs. Aoun and Hornstein (1985) argued that the ECP together with the three binding principles that interpret NPs in A-positions could classify and interpret QPs in A'-positions at LF. Aoun and Li (1989) used the Minimal Binding Requirement, the Scope Principle, and the Constituency Difference, to account for the fact that the interaction of QPs in English sentences differed from that in Chinese sentences. Kuno *et al.* (1999) proposed that the interaction of syntactic, semantic, pragmatic, and idiosyncratic factors could help determine the quantifier scope interpretations of a given sentence. According to their proposal, they developed some principles to interpret QEs in English, Chinese, and Japanese. Lee (1991) examined Chinese-speaking children's acquisition of QNPs and claimed that linearity was a strong principle for scope interpretations in Chinese. Finally, Crain *et al.* (1996) conducted seven experiments to demonstrate that if sentences with universal quantification are given in

appropriate contexts, children's grammatical competence with universal quantification will be elicited. In the next chapter, I will describe my experimental designs and discuss the results of my study.