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Xiao Li

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DEGREELESS COMPARATIVES

by

XIAO LI

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## ABSTRACT OF THE DISSERTATION

Degreeless Comparatives

By Xiao Li

Dissertation Director:  
Roger Schwarzschild

This dissertation is a study of two non-adjectival comparatives in Chinese and Japanese, namely Chinese Differential Verbal Comparatives and Japanese *sugi*-constructions. By examining these two comparative constructions, this work motivates and develops an analysis that does not rely on degrees and scales, but is based on bijections. A bijection is a function  $f$  from set A to set B with the property that every member of A is paired with exactly one member of B, and vice versa.

Chapter 1 describes the background for the bijective analysis. Chapter 2 introduces Chinese Differential Verbal Comparatives (DVCs) and compares them with Chinese adjectival comparatives. Differentials of adjectival comparatives are distinct from those of DVCs in that the former are degree-denoting measure phrases, but the latter are not. Based on this fact, I argue that DVCs and adjectival comparatives are semantically distinct. DVCs denote a comparison of two sets of individuals and events based on bijections; adjectival comparatives describe an ordering relation of two degrees. (Differentials are expressions which describe the difference between two sets in

comparison. For example, in the comparative *John is 3 inches taller than Mary*, the measure phrase *3 inches* is a differential)

Chapter 3 provides another comparative construction which does not rely on degrees and scales for comparisons-- Japanese *sugi*-constructions. In *sugi*-constructions, differentials correspond to Floating Numeral Quantifiers (FNQs), which are VP-adverbs that quantify over sets of individuals. I argue that *sugi*- is an intensional operator, which compares world  $w$  to the closest possible world  $w'$  to  $w$  where the relevant requirements are met. As such, this account follows the possible world analysis of Stalnaker (1968, 1984). Given that in our analysis *sugi*- is not restricted to comparisons of degrees, FNQs can receive a consistent syntactic and semantic analysis in *sugi*- and non-*sugi*-constructions.

Chapter 4 unifies the semantics of Japanese *sugi*- and that of Chinese *duo* under the notion of bijections. I argue that bijections constitute a more fundamental method of comparison than any degree-based analysis of comparatives, because the former compares entities including individuals, events and degrees, and is able to account for a wider range of data than the latter which only compares degrees. I show that when bijections and the degree-based analyses are both applied to comparisons of degrees, their differences are trivial.

Dedication

To My Parents

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## Chapter 1

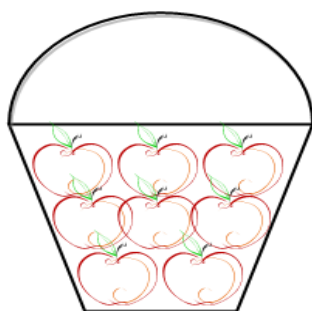
### Introduction

This dissertation studies two non-adjectival comparatives in Chinese and Japanese: Chinese Differential Verbal Comparatives and Japanese *sugi* ‘exceed’-constructions. It argues that these two constructions describe a comparative relation between two sets of individuals based on *bijections*, and as such they entail that the semantics of comparatives *does not* always involve a comparison of degrees. (A bijection or bijective function from set A to set B is a function such that every member of A is paired with exactly one member of B, and vice versa.)

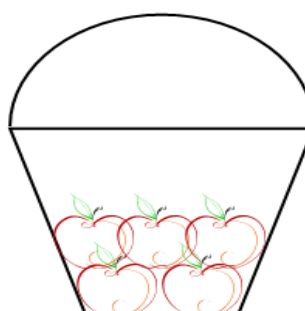
Let us begin by considering the following situation. There are two baskets of apples in (1): Basket A and Basket B. What are the possible ways to decide which basket has more apples?

(1)

**Basket A**



**Basket B**



The most common way is to compare them by counting how many apples there are in each basket. Basket A has 8 apples, and basket B has 5 apples. So we get two numbers: 8 and 5. Since 8 is above 5 on the scale corresponding to the standard ordering on numbers, we arrive at the conclusion that there are more apples in basket A than in basket B.

An alternative way is to take out one apple from one basket and subsequently take another one from the other basket. We continue this action till one basket runs empty. This tells us that the non-empty basket has more apples than the empty one. Given the picture in (1), the non-empty basket would be basket A and the empty basket would be basket B. Thus, we arrive at the same conclusion that there are more apples in basket A than in basket B.

The two approaches described above correspond to two different ways to compare the cardinality (or size) of sets in mathematics: one which uses cardinal numbers and another which uses bijections. Cardinal numbers are numbers used to measure the cardinality (size) of sets. For instance, set  $A = \{a, b, c\}$  has 3 elements, and therefore A has the cardinality of 3, written  $|A| = 3$ . In the first approach, the comparison of two sets of apples is based on a comparison of two cardinal numbers. The cardinality of set A is 8, written  $|A| = 8$ ; the cardinality of set B is 5, written  $|B| = 5$ . The difference between 8 and 5 is 3. This approach is a degree-based approach, as the comparison of two sets of objects comes down to an ordering relation of two degrees (e.g. 8 and 5).

A bijection is a function  $f$  from a set  $X$  to a set  $Y$  with the property that for every  $y$  in  $Y$ , there is an exactly one  $x$  in  $X$  such that  $f(x) = y$ . Assuming  $X$  and  $Y$  are both finite sets, the cardinality (or size) of set  $X$  is equal to the cardinality of set  $Y$  iff there is a bijective function between them; The cardinality of set  $X$  is greater than the cardinality of set  $Y$  iff there is a bijective function from  $Y$  to a proper subset of  $X$ . In the second approach, we compare two sets of apples based on a bijection from  $B$  to a proper subset of  $A$ ,  $A'$ , and the difference between them is a set of elements which belong to set  $A$ , but not to set  $A'$ .

This approach is a non-degree based approach, as the comparison of two sets does not refer to an ordering relation of degrees.

As the degree-based and the non-degree based approaches always yield the same result of comparison, they are in fact intrinsically related: cardinal numbers (or degrees) are defined in terms of bijections (Frege 1884)<sup>1</sup>. However, despite that, there is an important distinction between them, which has to do with the type of difference involved. When we compare two sets of objects by bijections, the difference between them is a set of objects which belong to one set but not the other. In (1), given the non-degree based approach, the difference between the two sets of apples in A and B is a set of apples in A but not in B. But when we compare two sets of objects based on degrees  $d$  and  $d'$ , the difference is a third degree derived from subtracting  $d'$  from  $d$ . In (1), the difference between 8 and 5 is 3.

Different entities, degrees or objects, are referred to or quantified over by different expressions. Degrees are referred to by degree-denoting measure phrases (e.g. 3 or 3 feet); objects are referred to or quantified over by individual expressions (e.g. 3 apples). In this dissertation we argue that degree-denoting and non-degree denoting differentials in comparatives indicate which of the two approaches, the degree-based approach or the non-degree-based approach, underlies the semantics of a given comparative construction.

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<sup>1</sup> In fact, our awareness of bijections might well occur prior to our awareness of the number of the correlated objects, as Frege (1884) observes:

*...if a waiter wishes to be certain of laying exactly as many knives as plates, he has no need to count; all he needs to do is to take care that there is just one knife beside each plate.*

(Translated in Kenny 1995)

Adjectival comparatives describe an ordering relation of two degrees (Seuren 1973, Cresswell 1976, Hellan 1981, Hoeksema 1983, von Stechow 1984, Rullmann 1995, Kennedy 1997, Hackl 2000, Heim 2000, and Schwarzschild and Wilkinson 2002 among others). A simple adjectival comparative sentence such as *A is 4 inches longer than B is* means that the degree  $d$  to which  $A$  is long is greater than the degree  $d'$  to which  $B$  is long, and the difference between  $d$  and  $d'$  is 4 inches. The differential of the comparative *4 inches* is a degree-denoting measure phrase, which describes the difference between the two degrees in comparison.

In the dissertation, we examine two non-adjectival comparatives in Chinese and Japanese, namely Chinese Differential Verbal Comparatives (DVCs) and Japanese *sugi*-constructions. We show that differentials of these two comparatives are non-degree denoting expressions: differentials of Chinese DVCs are DP objects of the preceding verb—*san ge pingguo* ‘3 apples’ (ex.2a) and *Jane Eyre he Pride and Pride and Prejudice zhe liang ben shu* ‘*Jane Eyre* and *Pride and Prejudice* these two books’ (ex.2b); differentials of Japanese *sugi*-constructions are Floating Numeral Quantifiers (FNQs)—*san ko* (ex.3a) and *san satu* (ex.3b). DPs like *san ge pingguo* ‘3 apples’ (ex.2a) and *Jane Eyre he Pride and Pride and Prejudice zhe liang ben shu* ‘*Jane Eyre* and *Pride and Prejudice* these two books’ quantify over a set of objects, and FNQs like *san ko* (ex.3a) and *san satu* (ex.3b) are VP-quantifiers, which quantify over the set of objects denoted by the VP. These differentials indicate that the semantics of DVCs and *sugi*-constructions, unlike that of adjectival comparatives, is based on bijections rather than on comparisons of degrees.

## (2) Chinese Differential Verbal Comparatives (DVC)

- a. Jack bi Jill duo chi-le san ge pingguo.  
 much eat-asp 3 Cl apple

‘Jack’s eating exceeds Jill’s eating by 3 apples.’

- b. Jack bi Jill duo du-le  
 much read-asp

Jane Eyre he Pride and Prejudice zhe 2 ben xiaoshuo.

and this 2 CL novel

‘Jack’s reading exceeds Jill’s reading by two novels: Jane Eyre and Pride and Prejudice.’

(3) Japanese *sugi* ‘exceed’-Constructions

- a. Jack-ga ringo-o san-ko tabe-*sugi*-ta.  
 Jack-nom apple-acc 3-Cl eat-exceed-past

‘Jack ate 3 apples too many.’

- b. Jack-ga hon-o kinoo san-satu yomi-*sugi*-ta.  
 Jack-nom book-acc yesterday 3-Cl read-exceed-past

‘Yesterday, Jack read 3 books too many.’

The rest of the chapter is structured as follows. In section 1.1, we introduce the current degree-based analyses of English adjectival comparatives. In section 1.2, we lay out our assumptions about the non-degree-based approach. In section 1.3, we describe the main ideas of each chapter.

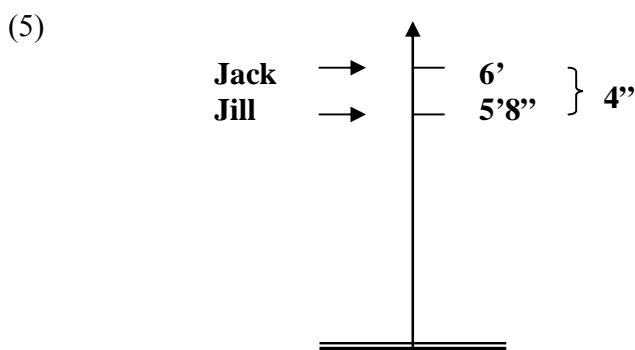


## 1.1 Adjectival Comparatives and Degrees

Most research on comparatives has been centered on adjectival comparatives. Adjectival comparatives in English are marked by the presence of a gradable adjective such as *tall*, and a comparative marker *-er*, as shown in (4a):

- (4) a. Jack is *taller* than Jill is.  
 b.  $\exists d \exists d' [\text{Jack is tall to } d \wedge \text{Jill is tall to } d' \wedge d > d']$

An adjectival comparative like (4a) can be paraphrased as: the degree  $d$  to which Jack is tall is greater than the degree  $d'$  to which Jill is tall. It is true in the following kind of situation: Jack is 6 feet (e.g.  $d = 6$ ), and Jill is 5.8 feet (e.g.  $d' = 5.8$ ).  $d$  is above  $d'$  on the scale of height, therefore the comparative in (4a) is true. This meaning is represented by the figure in (5):



A semantic analysis like above which makes reference to degrees is referred to as a degree-based analysis. It has been discussed in the work of Seuren (1973), Cresswell (1976), Hellan (1981), Hoeksema (1983), von Stechow (1984), Rullmann (1995), Kennedy (1997), Hackl (2000), Heim (2000), and Schwarzschild and Wilkinson (2002) among others. In these analyses, degrees (of type  $\langle d \rangle$ ) are totally-ordered points on a scale of some dimension (e.g. height).

Degrees can be referred to by measure phrases such as *4 inches*, as shown in (6):

(6) Jack is *4 inches* taller than Jill is.

(6) means: the degree  $d$  to which Jack is tall exceeds the degree  $d'$  to which Jill is tall by 4 inches. The measure phrase *4 inches* in (6) is a *differential measure phrase*, which describes the difference between  $d$  and  $d'$  on the scale<sup>2</sup>.

Gradable adjectives (e.g. *tall*) in the degree-based analyses are relations between degrees and individuals (of type  $\langle d, \langle e, t \rangle \rangle$ )<sup>3</sup>. They relate degrees to a set of individuals which possess the property denoted by the adjective to that degree. As degrees are totally ordered on a scale, individuals which gradable adjectives apply to can also be ordered based on the extent to which they possess the property denoted by the adjective. In (7a) below, the gradable adjective *tall* relates the degree *6 feet* on a scale of height to a set of individuals who are tall to (at least) 6 feet. (7a) is true iff Jack is one of the members in the set. In (7b) the gradable adjective *tall* relates some contextually determined standard degree  $d_s$  to a set of individuals who are tall to (at least)  $d_s$  (e.g.  $d_s = 5 \text{ feet}$  if *5 feet* is considered to be the norm for being 'tall'). (7b) is true iff Jack is tall to at least  $d_s$ . Note that as the value of  $d_s$  may vary from context to context, the truth-value of (7b) may also vary according to the context where it is evaluated. Suppose Jack is 6 feet. If  $d_s = 5.9 \text{ feet}$ , (7b) is true; if  $d_s = 6.1 \text{ feet}$ , (7b) is false; if the value of  $d_s$  is undetermined, the truth-value of (7b) is undefined.

- (7) a. Jack is *6 feet* tall.  
 b. Jack is tall.

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<sup>2</sup> In Schwarzschild (2002), measure phrases are predicates of parts of scales (of type  $\langle \langle d, t \rangle, t \rangle$ ). In his analysis, the measure phrase *4 inches* in (6) is predicated of the set of degrees between  $d$  and  $d'$ .

<sup>3</sup> Kennedy (1997, 1999) proposes an alternative semantic interpretation for gradable adjectives. In his analysis, they denote measure functions (of type  $\langle e, d \rangle$ ) from individuals to degrees.

## 1.2 Assumptions

Based on the degree-based analyses of adjectival comparatives above, we adopt the following assumptions in our analysis:

First, we assume that degrees are (totally-ordered) points on a scale. Gradable adjectives denote relations between individuals and degrees (of type  $\langle d, \langle e, t \rangle \rangle$ ).

Second, we assume that gradable transitive verbs (e.g. *like* and *understand*), parallel to gradable adjectives, take an extra degree argument in addition to their standard arguments. They denote functions of type  $\langle e, \langle d, \langle e, t \rangle \rangle \rangle$ . Comparatives with gradable verbs as matrix predicates receive an interpretation parallel to that of adjectival comparatives. For instance, the comparative *Jack likes eating noodles more than Jill does* is paraphrased as: the degree to which Jack likes eating noodles is greater than the degree to which Jill likes eating noodles. In contrast, non-gradable transitive verbs (e.g. *eat* and *read*) denote relations of two individuals (of type  $\langle e, \langle e, t \rangle \rangle$ ).

Further evidence that supports such a distinction between gradable and non-gradable verbs comes from the distribution of degree modifiers (e.g. *hen*) in Chinese. *hen* directly modifies gradable adjectives (ex.8a) and gradable verbs (ex.8b), but it cannot modify non-gradable predicates (ex.8c).

- (8) a. Jack hen gao. **Gradable adjective**  
           very tall  
           ‘Jack is very tall.’
- b. Jack hen xihuan chi miantiao. **Gradable verb**  
           very like eat noodle  
           ‘Jack likes eating noodles a lot.’

- c. \*Jack hen du xiaoshuo. *Non-gradable verb*  
 very read novels

Finally, we assume that the term ‘non-adjectival comparatives’ refers to comparatives with a comparative marker directly marked on non-gradable verbs. The Chinese DVC in (9)(repeated from 2a) is a non-adjectival comparative, because the comparative marker *duo* is directly attached to the non-gradable verb *chi* ‘eat’. Without *duo*, (9) cannot be a comparative, as shown in (10a-b):

(9) Chinese Differential Verbal Comparatives (DVC)

Jack bi Jill *duo* chi-le *san* *ge* *pingguo*.  
 much eat-asp 3 Cl apple

‘Jack’s eating exceeds Jill’s eating by 3 apples.’

- (10) a. \*Jack bi Jill chi-le *san* *ge* *pingguo*.  
 eat-asp 3 Cl apple

b. Jack chi-le san-ge pingguo.  
 eat-asp 3-Cl apple

‘Jack ate 3 apples.’

Likewise, the Japanese *sugi*-construction in (11) (repeated from 3a) is a non-adjectival comparative, because the comparative marker *sugi*- ‘exceed’ is directly marked on the non-gradable verb *tabe* ‘eat’. Without *sugi*-, (11) cannot be a comparative, as shown in (12).

(11) Japanese *sugi*-constructions

Jack-ga ringo-o san-ko tabe-*sugi*-ta.

Jack-nom apple-acc 3-Cl eat-exceed-past

‘Jack ate 3 apples too many.’

(12) Jack-ga ringo-o san-ko tabe-ta.

Jack-nom apple-acc 3-Cl eat-past

‘Jack ate 3 apples.’

Having introduced the background and the assumptions of this work, in the following section we will move on to a more detailed description of each chapter:

## 1.3 Outline

### 1.3.1 Chapter 2

Chapter 2 presents a study of Chinese Differential Verbal Comparatives (DVCs). It provides syntactic and semantic arguments to show that differentials in DVCs (ex. 13) are the same as DP objects in non-comparative counterparts (ex.14).

(13) Chinese Differential Verbal Comparatives (DVCs)

a. Jack bi Jill duo chi-le san ge pingguo.

much eat-asp 3 Cl apple

‘Jack’s eating exceeds Jill’s eating by 3 apples.’

b. Jack bi Jill duo du-le

much read-asp

*Jane Eyre* he *Pride and Prejudice* zhe 2 ben xiaoshuo.

and

this 2 CL novel



### 1.3.2 Chapter 3

Chapter 3 presents a syntactic and semantic analysis of Japanese *sugi*-constructions (ex.16). It shows that differentials in *sugi*-constructions correspond to floating numeral quantifiers (FNQ) in non-*sugi* contexts (ex.17). Following Stalnaker's analysis of counterfactual conditionals (1968, 1984), we argue that *sugi*- describes a comparison between a set of individuals, events or degrees in world  $w$  to that in the closest possible world  $w'$  to  $w$  where the relevant requirements are met. Since *sugi*- in our analysis is not limited to comparisons of degrees, FNQs can receive a consistent syntactic and semantic analysis throughout *sugi*- and non-*sugi*-constructions.

#### Japanese *sugi*-constructions

- (16) a. Jack-ga ringo-o san-ko tabe-sugi-ta.  
 Jack-nom apple-acc 3-Cl eat-exceed-past  
 'Jack ate 3 apples too many.'
- b. Jack-ga hon-o kinoo san-satu yomi-sugi-ta.  
 Jack-nom book-acc yesterday 3-Cl read-exceed-past  
 'Yesterday, Jack read 3 books too many.'
- (17) a. Jack-ga ringo-o san-ko tabe-ta.  
 Jack-nom apple-acc 3-Cl eat-past  
 'Jack ate 3 apples.'
- b. Jack-ga hon-o kinoo san-satu yonda.  
 Jack-nom book-acc yesterday 3-Cl read-past  
 'Yesterday, Jack read 3 books.'

### 1.3.3 Chapter 4

In chapter 4 we aim to achieve two goals. First, we compare the semantics of Chinese DVC to that of Japanese *sugi*-constructions, and show that the semantics of these two comparatives can be unified under the notion of bijections. Second, we compare the bijective approach to the degree approach, and argue that the former is a more general approach to the semantics of comparatives, because the bijective approach can be applied to both adjectival and non-adjectival comparatives, but the degree approach can only be applied to adjectival comparatives.

According to the bijection approach, adjectival comparatives describe a comparative relation between two sets of degrees A and B such that every degree in set A has a degree counterpart in set B, and there are some degrees in set B which do not have degree counterparts in set A. Since the difference between two sets of degrees is necessarily a degree, the bijective approach predicts that differentials of adjectival comparatives are degree-denoting expressions. It follows that the distinction between the bijective approach and the degree approach is trivial when applied to adjectival comparatives, because they do not differ in the analysis of differentials in them.



## Chapter 2

### The Semantics of Chinese Differential Verbal Comparatives

#### 2.1 Introduction

In this chapter, we investigate the semantics of a type of verbal comparative in Chinese, which has been rarely studied in the literature (Cheng 1966<sup>4</sup>). I refer to them as Differential Verbal Comparatives (DVCs). I argue that unlike Chinese adjectival comparatives, DVCs should not be given a degree-based analysis.

Chinese adjectival comparatives have the pattern in (1) (Li and Thompson 1981, Xiang 2003, 2005, Erlewine 2007). They consist of four components: (i) a subject—*Jack*; (ii) a standard of comparison, which is introduced by a *bi* phrase—*bi Jill*; (iii) a bare adjective, which names the dimension of comparison—*gao* ‘tall’ (ex.1a) and *duo* ‘much’ (ex.1b); and (iv) an optional differential, which indicates the difference between the two objects under comparison—*liang yingcun* ‘2 inches’ (ex.1a) and *liang ben* ‘2 Cl’ (ex.1b).

- (1)    

X
---

<i>bi</i> Y
-------------

Predicate of Comparison
-------------------------

(Differential)
----------------
- a.    Jack    *bi*    Jill                    [*gao*]<sub>ADJ</sub>        (*liang yingcun*)  
       Jack                    Jill                    tall                    2        inch  
       ‘Jack is 2 inches taller than Jill is.’
- b.    *zhe dui shu*    *bi*    *na dui shu*    [*duo*]<sub>ADJ</sub>        (*liang ben*).  
       this pile book                    that pile book    much                    2        Cl  
       ‘There are 2 more novels in this pile than in that pile’

<sup>4</sup> Cheng (1966) was the first to observe the pattern of Chinese DVCs, however his description of them is not comprehensive.

Differential Verbal Comparatives have the pattern in (2). They also consist of 4 components: (i) a subject--*Jack*, (ii) a standard of comparison, which is introduced by a *bi* phrase—*bi Jill*, (iii) a non-gradable verb preceded by the morpheme *duo* ‘much’— *duo du*, and (iv) an obligatory differential which is the object of the preceding verb--*liang ben xiaoshuo* ‘2 CL novels’ (ex.2a) and *Jane Eyre he Pride and Prejudice zhe liang ben xiaoshuo* ‘*Jane Eyre* and *Pride and Prejudice* these two novels’ (ex.2b).<sup>5</sup>

(2) Differential Verbal Comparatives

	X		<i>bi</i> Y		<i>duo</i> V <sub>non-gradable</sub>		Differential
a.	Jack		<i>bi</i> Jill		<i>duo</i> du-le		<i>liang ben xiaoshuo.</i>
	Jack		Jill		much read-asp	2	CL novel
	‘Jack read 2 more novels than Jill did.’						
b.	Jack	<i>bi</i>	Jill		<i>duo</i> du-le		
	Jack		Jill		much read-asp		
	<u><i>Jane Eyre he Pride and Prejudice zhe liang ben xiaoshuo.</i></u>						
			and		this 2	CL	novel
	‘Jack exceeded Jill in reading by two novels: <i>Jane Eyre</i> and <i>Pride and Prejudice</i> .’						

<sup>5</sup> Sentences like (i) also have *duo* precede the VP *du xiaoshuo* ‘read novels’. However, they are not considered as differential verbal comparatives, because unlike DVCs, they are not compatible with *bi*-phrases. Moreover, the objects of the verb *du* ‘read’ cannot be interpreted as differentials.

- (i) Jack yinggai *duo* du xiaoshuo, shao du zazhi  
 should much read novels. few read periodicals  
 ‘Jack should read more novels, and less periodicals.’
- (ii) ??Jack yinggai bi Jill duo du xiaoshuo.  
 should much read novel

The differentials of the adjectival comparatives in (1) and those of the DVCs in (2) have different interpretations. Differentials of adjectival comparatives are measure phrases (MPs)<sup>6</sup>, which are traditionally considered as degree-denoting expressions. They refer to degrees (of type  $\langle d \rangle$ ) or a set of sets of degrees (of type  $\langle \langle d, t \rangle, t \rangle$ ). For example, the sentence in (3) means the degree to which Jack is tall is no less than 6 feet.

- (3) Jack 6 *yingchi* gao  
 Jack 6 foot tall  
 ‘Jack is 6 feet tall.’

Differentials of DVCs are non-degree denoting expressions. In (2), the differentials of the DVCs are DPs which refer to individuals (of type  $\langle e \rangle$ ) or a set of sets of individuals (of type  $\langle \langle e, t \rangle, t \rangle$ )<sup>7</sup>. For instance, the sentence in (4a) means Jack read a set of objects, which are two novels. The sentence in (4b) means Jack read two novels, namely *Jane Eyre* and *Pride and Prejudice*. The DP objects--*liang ben xiaoshuo* ‘2 novels’ (ex.4a) and *Jane Eyre he Pride and Prejudice zhe liang ben xiaoshuo* ‘*Jane Eyre* and *Pride and Prejudice* these two novels’ (ex.4b) refer to *individuals* rather than degrees.<sup>8</sup>

<sup>6</sup> The term ‘Measure Phrases’ (MPs) normally applies to the combination of Numeral + Measure words. In my analysis, MP applies to both the combination of Numeral + Measure words such as *liang yingcun* ‘2 inches’ (ex.1a) and the combination of Numeral + Classifier such as *liang ge* ‘2 Cl’ (ex.1b).

<sup>7</sup> I use the term Determiner Phrases (DP) to refer to DPs excluding MPs.

<sup>8</sup> An interesting phenomenon about DVC is that only DPs with quantized reference such as indefinite NP *liang ben xiaoshuo* ‘2 novel’ (ex.2a) or definite NP *Jane Eyre and Pride he Prejudice* (ex.2b) can serve as differentials; DPs with cumulative reference such as bare NP *xiaoshuo* cannot serve as differentials unless they receive a kind reading. For instance, (i) is true in the situation where Jack read {novels, periodicals, essays}, and Jill read {periodicals, essays}. (i) means: novels are the kind of things that Jack read, but Jill did not read. However, my intuition says that even on that reading, (i) is somehow awkward.

- (i) ?Jack bi Jill duo du-le xiaoshuo.  
 much read-asp novels

- (4) a. Jack du-le *liang ben xiaoshuo*.  
 Jack read-asp 2 Cl novel  
 ‘Jack read 2 novels.’
- b. Jack du-le *Jane Eyre* he *Pride and Prejudice* zhe liang ben xiaoshuo.  
 Jack read-asp and this 2 Cl novel  
 ‘Jack read *Jane Eyre* and *Pride and Prejudice* these two novels.’

The standard analyses of adjectival comparatives analyze comparatives in terms of relations between degrees. Differentials in adjectival comparatives are MPs which describe the difference between two degrees (Seuren 1973, Cresswell 1977, von Stechow 1984, Rullmann 1995, Kennedy 1999, and Schwarzschild & Wilkinson 2002 among others). On this view, (1a) says that the degree  $d$  to which Jack is tall exceeds the degree  $d'$  to which Jill is tall. The difference between  $d$  and  $d'$  is 2 inches. However, this analysis cannot be extended to DVCs, because their differentials, unlike those of adjectival comparatives, do not denote degrees.

In this chapter, we propose that DVCs describe a comparative relation between two sets of objects (or events) based on bijective functions. Assuming that set A and set B are both finite,  $f$  is a bijection (or bijective function) from set A to set B if and only if every member of A is paired with exactly one member of B, and vice versa. Set A has the same size as set B if and only if there is a bijection between them. Set A is bigger than set B if and only if there is a bijection from set B to a proper subset of set A. Following the

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Comparing (i) to (ii), bare NP *shu* ‘books’ do not receive a kind reading when it serves as the object of the verb *du* ‘read’ in a non-comparative context.

- (ii) Jack du-le xiaoshuo.  
 read-asp novel  
 ‘Jack read (one or more) novels’

definition of bijections, (2a) means: there is a bijection  $f$  from the set of novels that Jill read (set B) to a proper subset of the set of novels that Jack read (set A), set A'. The difference between A and A' is at least two novels. Given that in this analysis the difference between two sets is individuals rather than degrees, differentials, which describe the difference between two sets in comparison, are predicted to be individual-denoting rather than degree-denoting expressions. Hence, the distinction between differentials in adjectival comparatives and those in DVCs can be explained.

The rest of the chapter is structured as follows. In section 2, I set up the background for our analysis of Chinese comparatives. In section 3, I offer a degree-based account of Chinese adjectival comparatives, and argue that the same analysis cannot be extended to DVCs. In section 4, I propose a new semantics for DVCs which is based on bijective functions. In section 5, I introduce the third type of comparative in Chinese: *adverbial comparatives*, and show that they are semantically distinct from DVCs. Section 6 is a conclusion.

## 2.2 Background

There are two questions about Chinese comparatives that have received most attention in the literature (Liu 1996, Xiang 2003, 2005, Erlewine 2007). One is concerned with the syntactic category of *bi*. Is it like *-er* or *than* in English? The other is concerned with the syntax of the standard of comparison introduced by *bi*. Is it a DP or an elided CP? My answers to these two questions are mostly based on the previous analyses.

### 2.2.1 *bi* as a preposition

There are two main proposals about the syntax of *bi* in Chinese comparatives. Xiang (2005) and Erlewine (2007) argue that *bi* is a functional head: *bi* is a Deg head, like *-er* in English (Xiang 2005) or it is a light verb *v* (Erlewine 2007). Liu (1996), on the other hand, argues that *bi* is a preposition, which forms a prepositional phrase (PP) with the standard of comparison following *bi*. In my analysis, I follow Liu (1996) in assuming that *bi*-phrases are prepositional phrases and adjuncts of comparatives. My assumption is based on the following evidence.

First, unlike *-er* in English comparatives, *bi* is optional in both adjectival comparatives (ex.5a) and DVCs (ex.5b). Assuming that *bi* in (5) is not covertly present, its optional presence in comparatives indicates that it does not have the same syntactic status as the Deg head *-er* in English.<sup>9</sup>

- (5) a. Adjectival Comparatives
- Jack gao  
Jack tall
- (i) ‘Jack is taller (than someone salient in the context).’  
(ii) \*‘Jack is tall.’
- b. Differential Verbal Comparatives
- Jack duo du-le 2 ben xiaoshuo.  
Jack much read-asp 2 Cl novel
- ‘Jack read two more novels’

---

<sup>9</sup> Kennedy pointed out (p.c.) that examples like (5) do not constitute strong evidence against Xiang and Erlewine’s analysis of treating *bi* as a functional head, as *bi* can be covertly present in (5a) and (5b).







‘Jack called to tell every friend.’

- b. Jack da dianhua gaosu-*le* suoyou de pengyou.  
       make phone tell-asp every De friend

‘Jack called and told every friend.’

On the other hand, *bi*-phrases share the same syntactic position as prepositional phrases such as *zai jia* ‘at home’ in (9): they both occur in between the subject and the verb<sup>11</sup>.

- (9) a. Jack [zai jia]<sub>PP</sub> xuexi.  
       at home study

‘Jack studies at home.’

- b. Jack [bi Jill] gao.  
       tall

‘Jack is taller than Jill.’

They are parallel to each other in terms of whether they can bear the aspect marker *le*, as shown in (10):

- (10) a. \*Jack [zai-*le* jia]<sub>PP</sub> xuexi.  
       at-asp home study  
       b. Jack [zai jia]<sub>PP</sub> xuexi-*le*.  
       at home study-asp


‘Jack studied at home.’

---

<sup>11</sup> This argument relies on the assumption that *zai* ‘at’ in (9a) is a preposition.



the degree-argument position of an adjective to the spec of CP—a phenomenon known as comparative sub-deletion. The underlying structure of (13) is provided in (14):

- (14) The table is longer [than  $OP_i$  the door  $d_i$ -wide]<sub>CP</sub>. *wh*-movement
- 

The distinction between phrasal and clausal comparatives in English can be seen in many other aspects. For example, only the clausal complement [Jill was] in (12a), but not the phrasal complement [Jill] in (12b), can be embedded under the verb *think*, which only takes a clausal complement (Hankamer, 1973), as shown in (15):

- (15) a. John is taller than Max thought [Jill was]<sub>CP</sub>.  
 b. \*John is taller than Max thought [Jill]<sub>DP</sub>

Moreover, reflexives may appear in phrasal comparatives, but not in clausal comparatives (Hankamer, 1973), as shown in (16):

- (16) a. \*John cannot be taller than [himself is]<sub>CP</sub>.  
 b. John cannot be taller than [himself]<sub>DP</sub>.

Now let us turn to Chinese and decide whether the adjectival comparatives in (1) are phrasal or clausal. There are two main views. Liu (1996) argues for a clausal analysis of Chinese comparatives. Xiang (2003, 2005) argues for a phrasal analysis. In my analysis, I follow Xiang in assuming that the comparatives in (1) are phrasal based on the following evidence provided by Xiang. Xiang observes that Chinese disallows sub-comparatives like (17a) and comparatives with embedded standards of comparison like (17b) (cf. English counterparts in 13 & 15a).

- (17) a. \*zhuozi      bi      [men      kuan]<sub>CP</sub>      chang  
          table                   door      wide                   long

Intended reading: ‘The table is longer than the door is wide.’

- b. \*John              bi      [Max      renwei      Bill]<sub>CP</sub>      gao  
          John                   Max      think              Bill      tall

Intended reading: ‘John is taller than Max thought Bill is.’

Xiang also argues that the distribution of the adverb *dou* ( $\neq$  *duo* ‘much’) supports the phrasal analysis of Chinese adjectival comparatives. *dou* is traditionally described as a distributor, which distributes over the plural arguments to its left (ex.18) (Lin 1998, Wu 1999, Chen 2004 among others).

- (18) a      tamen ***dou***      xihuan              chi      miantiao  
    like                      eat      noodle

‘They all like eating noodles.’

- b. \*Jack ***dou***      xihuan              chi      miantiao  
    like                      eat      noodle

When a subject is a universally quantified DP such as *mei ge ren* ‘everyone’, the presence of *dou* is obligatory (ex.19a). When an object is a universally quantified DP, *dou* is prohibited unless the object is fronted to the left of *dou* (ex.19b-c).

- (19) a.      mei      ge      ren      ***dou***              xihuan              chi      miantiao.  
          every      Cl      people                      like                      eat      noodle

‘Every one likes eating noodles.’

- b. \*Jack ***dou***      xihuan              mei      ge      tongxue.  
    like                      every      Cl      classmate



Xiang has convincingly shown that adjectival comparatives in Chinese are phrasal rather than clausal. Now let us consider whether DVCs are phrasal or clausal. Take the DVC in (22)(repeated from 2a) as an example. The question becomes: does (22) have the underlying structure in (23a) or in (23b)?

(22) Jack bi Jill *duo* du-le liang ben xiaoshuo.

much read-asp 2 Cl novel

‘Jack read 2 more novels than Jill did.’

(23) a. Phrasal Comparative

Jack bi [Jill]<sub>DP</sub> *duo* du-le liang ben xiaoshuo.

much read-asp 2 Cl novel

b. Clausal Comparative

Jack bi [Jill ~~du~~ ~~xiaoshuo~~]<sub>CP</sub> *duo* du-le liang ben xiaoshuo.

read novels much read-asp 2 Cl novel

First, like adjectival comparatives, DVCs do not allow an embedded standard of comparison, as shown in (24):

(24) \*Jack bi Max renwei Jill *duo* du-le liang ben xiaoshuo.

Jack Max think much read-asp 2 Cl novel

‘Jack read 2 more novels than Max thought Jill did.’

Moreover, DVCs pattern with adjectival comparatives in the distribution of *dou*. When the subject and the standard of comparison of a DVC are universally quantified DPs, *dou* occurs only after the subject, as shown in (25).



## 2.3 The degree-based analyses of Chinese adjectival comparatives

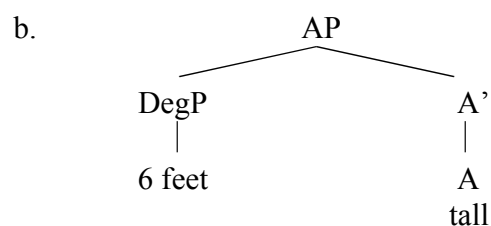
The goal of this section is to sketch out a degree-based semantic analysis of Chinese adjectival comparatives, and show that the same analysis cannot be extended to DVCs. In section 2.3.1, I review two types of degree-based analyses of English adjectival comparatives: the traditional degree-based analyses (Seuren 1973, Cresswell 1977, Hellan 1981, von Stechow 1984, Rullmann 1995 and references therein) and the extended projection analysis (Kennedy 1997, 1999). In section 2.3.2, I offer an analysis of Chinese adjectival comparatives based on Kennedy (1997, 1999). In 2.3.3, I argue that the same account *cannot* be extended to DVCs.

### 2.3.1 The degree-based analyses of English adjectival comparatives

There are two main analyses of the syntax and semantics of gradable adjectives: the standard degree analyses (Seuren 1973, Cresswell 1977, Hellan 1981, von Stechow 1984, Rullmann 1995, and references therein) and the extended projection analysis (Kennedy 1997, 1999).

The standard degree-based analyses of adjectival comparatives assume that gradable adjectives have the syntactic structure in (26b). They take a degree argument DegP in the spec of AP (Bresnan, 1973).

(26) a. Jack is  $[[6 \textit{ feet}]_{\text{DegP}} \textit{ tall}]_{\text{AP}}$ .

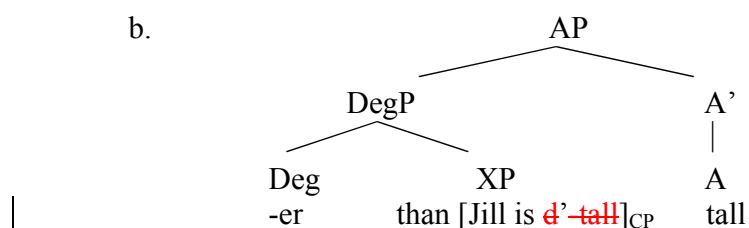




Adjectival comparatives like *Jack is taller than Jill is* have the structure in (27b), where DegP consists of a Deg head *-er* and a XP-- [than Jill is *d'*-tall]<sup>12</sup>. Semantically, gradable adjectives denote relations between degrees and individuals (of type  $\langle d, \langle e, t \rangle \rangle$ ) (ex.28a). *-er* is a degree quantifier (ex.28b), which compares two degrees: one introduced by the matrix clause and the other introduced by the subordinate clause after *than*.

(27) a. Jack is taller than Jill is

b.



(28) a.  $\| \text{tall} \| = \lambda d_d \lambda x_e. [\text{height}(x)(d)]$

b.  $\| \text{er} \| = \lambda D'_{\langle d, t \rangle} \lambda D_{\langle d, t \rangle} \exists d'_d \exists d_d [D'(d') \wedge D(d) \wedge d > d' ]$

c.  $\| \text{DegP} \| = \lambda D_{\langle d, t \rangle} \exists d'_d \exists d_d [D(d) \wedge \text{height}(\text{Jill})(d') \wedge d > d' ]$

d.  $\| \text{Jack is taller than Jill} \| = 1$   
 iff  $\exists d_d \exists d'_d [\text{height}(\text{Jack})(d) \wedge \text{height}(\text{Jill})(d') \wedge d > d' ]$

(28d) says: there is a degree  $d$  to which Jack is tall, and there is another degree  $d'$  to which Jill is tall.  $d$  exceeds  $d'$ .

Though DegP in the standard degree-based analyses has the interpretation of a quantificational expression, unlike any other quantifiers it does not interact with negation, universal quantifiers, or intensional operators<sup>13</sup>. Consider the example in (29) and (30).

<sup>12</sup> The XP is extraposed on PF.

<sup>13</sup> Heim (2000) has a dissenting view. She argues that comparatives interact scopally with intensional operators.

(29) shows that negation interacts with the existentially quantified NP *a movie* scopally;

(30) shows that negation does not interact with DegPs in comparatives scopally.

(29) Jack did not see a movie.

a.  $\neg \exists x [\text{movie}(x) \wedge \text{see}(\text{Jack}, x)] \quad \neg > \exists \quad \checkmark$

b.  $\exists x [\text{movie}(x) \wedge \neg \text{see}(\text{Jack}, x)] \quad \exists > \neg \quad \checkmark$

(30) Jack is not taller than Jill is.

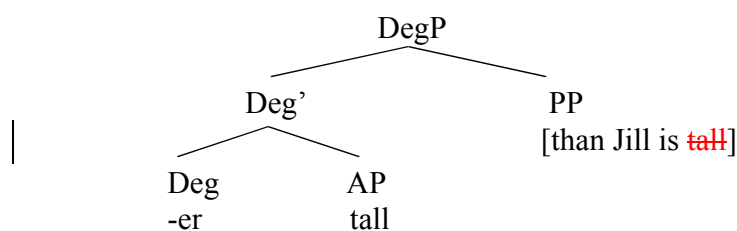
a.  $\neg \exists d_d \exists d'_d [\text{height}(\text{Jack})(d) \wedge \text{height}(\text{Jill})(d') \wedge d > d'] \quad \neg > \exists \quad \checkmark$

b.  $\exists d_d \exists d'_d [\neg \text{height}(\text{Jack})(d) \wedge \text{height}(\text{Jill})(d') \wedge d > d'] \quad \exists > \neg \quad \times$

The sentence in (29) has two readings. When negation scopes over the existential quantifier (ex.29a), (29) means: Jack did not see any movie; when negation scopes under the existential quantifier (ex.29b), it means there is a specific movie which Jack did not see. In the same manner, if DegP interacts with negation, we would expect the comparative in (30) has two readings: one in (30a) with negation over DegP, and the other in (30b) with negation under DegP. (30a) means: there is no degree  $d$  to which Jack is tall, and  $d$  is greater than  $d'$  to which is Jill is tall. (30b) means there is a degree  $d$  to which Jack is not tall, and  $d$  is greater than  $d'$  to which is Jill is tall. However, only (30a), but not (30b), is the available reading to the comparative in (30).

Noticing this special scopal property of DegP, Kennedy (1997, 1999) proposes a novel account where he argues that comparatives do not involve quantification over degrees. In his analysis, gradable adjectives do not take a degree argument; they project into an extended projection of DegP (Abney 1987, Grimshaw 1991), as shown in (31a-b).

- (31) a. Jack is taller than Jill is.



- (32) a.
- $\| \text{tall} \| = \lambda x_e. \text{height}(x)$

b.  $\| \text{-er} \| = \lambda G_{\langle e, d \rangle} \lambda d_d \lambda x_e [G(x) > d]$

c.  $\| \text{Jack is taller than Jill} \| = 1$  iff  $\text{height}(\text{Jack}) > \text{height}(\text{Jill})$

Semantically, gradable adjectives denote measure functions (of type  $\langle e, d \rangle$ ) from individuals to degrees (Bartsch and Vennemann 1973)(ex. 32a). *-er* denotes a function which takes three arguments: a measure function  $G$  denoted by a gradable adjective, a standard degree  $d$  denoted by a PP, and an individual  $x$  (ex.32b). Since *-er* in this analysis is no longer interpreted as a degree quantifier, it does not interact scopally with other quantifiers. Therefore, the contrast between (29) and (30) is explained.

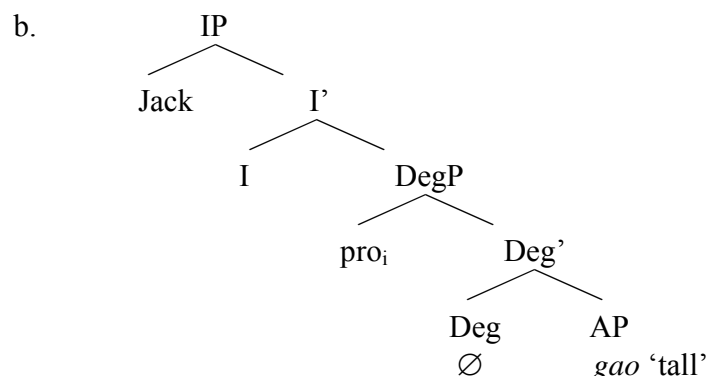
### 2.3.2 The degree-based analyses of Chinese adjectival comparatives

Following Kennedy (1997, 1999), I assume that Chinese bare adjectives denote measure functions from individuals to degrees (of type  $\langle e, d \rangle$ ). They project into an extended projection of DegP before being predicated of a subject. (33a) has the structure in (33b):

- (33) a. Jack gao.

tall

‘Jack is taller than (someone salient in the context).’



(33a) has an implicit standard of comparison, which in (33b) stands in the specifier of DegP. It is occupied by a null pronoun *pro* whose reference is determined by the utterance context. In (33b), the Deg is occupied by a null head  $\emptyset$ , which takes three semantic arguments (34a): (i) a measure function denoted by the adjective *gao* ‘tall’ (34b); (ii) a standard of comparison—*pro* (34b); and (iii) a subject—*Jack*. When the Deg composes with all its semantic arguments, the sentence in (33a) is true iff Jack’s height exceeds *pro*’s height (34f)

$$(34) \quad \text{a. } \|\ [\emptyset]_{\text{Deg}} \|^{\text{g}} = \lambda G_{\langle e,d \rangle} \lambda y_e \lambda x_e [G(x) > G(y)]$$

$$\text{b. } \|\ \text{gao} \|^{\text{g}} = \lambda x_e \text{height}(x)$$

$$\text{c. } \|\ \text{pro}_i \|^{\text{g}} = g(i)$$

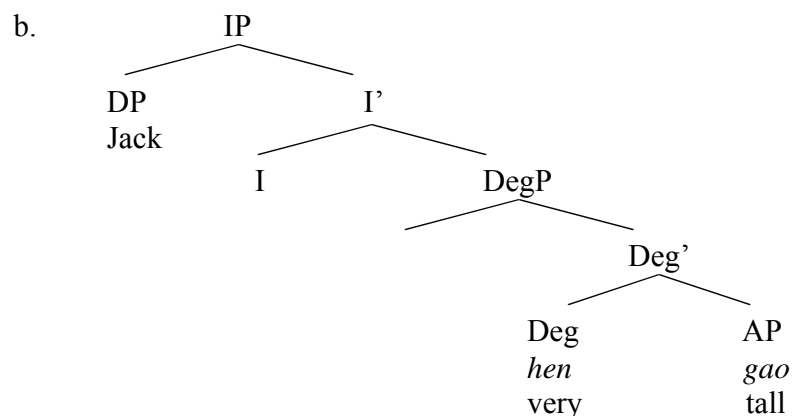
$$\text{d. } \|\ \text{DegP}' \|^{\text{g}} = \lambda y_e \lambda x_e [\text{height}(x) > \text{height}(y)]$$

$$\text{e. } \|\ \text{DegP}_i \|^{\text{g}} = \lambda x_e [\text{height}(x) > \text{height}(g(i))]$$

$$\text{f. } \|\ \text{Jack gao }_i \|^{\text{g}} = 1 \text{ iff height Jack's height exceeds } g(i)\text{'s height.}$$

The null Deg in (33b) can be overtly realized by the degree expression *hen* ‘very’, as shown in (35b).

- (35) a. Jack hen gao  
 Jack tall  
 ‘Jack is tall.’



Assuming that *hen* has the interpretation in (36a), (35a) means: Jack’s height is greater than a contextually determined standard degree  $d_s$  (36c):

- (36) a.  $\| \text{hen} \| = \lambda G_{\langle e, d \rangle} \lambda x_e [G(x) \geq d_s]$   
 b.  $\| \text{gao} \| = \lambda x_e. \text{height}(x)$   
 c.  $\| \text{Jack hen gao} \| = 1$  iff  $\text{height}(\text{Jack}) \geq d_s$

Chinese adjectival comparative in (37a) (repeated from 1a) differs from the comparative in (33a) in having an overt standard of comparison--*bi Jill*, and a differential--*liang yingcun* ‘2 inches’. In order for the Deg to take three arguments: (i) a standard of comparison--*bi Jill*, (ii) an adjective-- *gao* ‘tall’, and (iii) a differential measure phrase-- *liang yingcun* ‘2 inches’, we propose that (37a) has a DegP shell structure in (37b) (Larson 1991, Izvorski 1995, Xiang 2005)<sup>14</sup>:

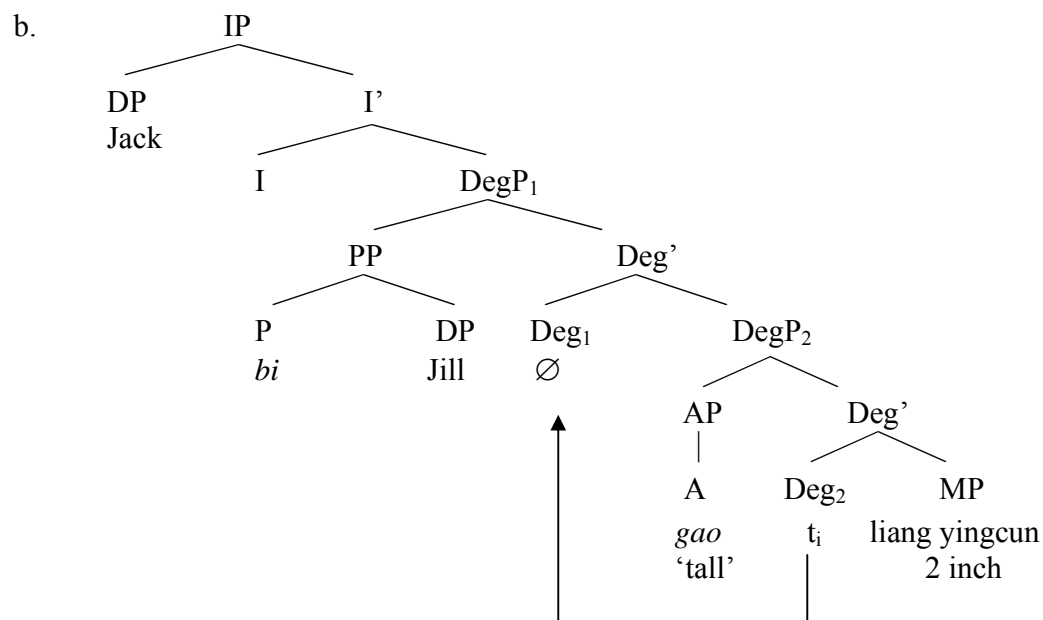
<sup>14</sup> The DegP-shell structure analysis of Chinese adjectival comparatives is also proposed in Xiang (2003, 2005) to account for a special type of adjectival comparative in Chinese, which she refers to as ‘bare comparative’. This is shown in (i) below.

(i) Jack gao Jill liang yingcun.  
 tall 2 inch

(37) a. Jack bi Jill gao liang yingcun.

Jack tall 2 inch

‘Jack is 2 inches taller than Jill.’



(37b) differs from (33b) in having two DegPs: DegP<sub>1</sub> and DegP<sub>2</sub>. The standard of comparison-- *bi Jill* stands in the specifier of DegP<sub>1</sub>; the adjective *gao* ‘tall’ is in the specifier of DegP<sub>2</sub>, and the differential *liang yingcun* ‘2 inches’ is in the complement of DegP<sub>2</sub>. The null Deg  $\emptyset$  moves from Deg<sub>2</sub> to Deg<sub>1</sub> through a head-to-head movement.

Semantically, the Deg has the interpretation in (38a). It takes 4 semantic arguments: (i) a differential  $d$ , (ii) a measure function  $G$ , (iii) a standard of comparison  $y$ , and (iv) a subject  $x$ . When the Deg composes with all its arguments, (37a) is true iff Jack’s height is greater than Jill’s height by at least 2 inches (38c).

---

‘Jack is taller than Jill by 2 inches.’

- (38) a.  $\| \emptyset \| = \lambda d_d \lambda G_{\langle e, d \rangle} \lambda y_e \lambda x_e [G(x) - G(y) \geq d]$   
 b.  $\| \text{gao} \| = \lambda x_e x$ 's height  
 c.  $\| \text{liang yingcun} \| = 2$  inches  
 d.  $\| \text{Jack bi Jill gao liang yingcun} \| = 1$  iff height (Jack) - height (Jill)  $\geq 2$  inches

The comparative in (39)(repeated from 1b) can be explained in a similar fashion. The gradable adjective *duo* ‘much’ in (39) denotes a measure function which maps from  $x$  to  $x$ 's cardinality (40b). The differential *liang ben* denotes a degree 2 (40b). The comparative in (39) is true iff the number of the books in this pile  $d$  exceeds the number of the books in that pile  $d'$  by 2.

- (39) zhe dui shu bi na dui shu [duo]<sub>ADJ</sub> (liang ben).  
 this pile book that pile book much 2 Cl

‘There are 2 more novels in this pile than in that pile’

- (40) a.  $\| \emptyset \| = \lambda d_d \lambda G_{\langle e, d \rangle} \lambda y_e \lambda x_e [G(x) - G(y) \geq d]$   
 b.  $\| \text{duo} \| = \lambda x_e. d$  st.  $d$  is the cardinality of  $x$ .  $= \lambda x_e. |x|$   
 c.  $\| \text{zhe dui shu bi na dui shu duo liang ben} \| = 1$  iff

$$| \text{this pile of books} | - | \text{that pile of books} | \geq 2$$

Note that in (37a) and (39) the differentials are degree-denoting measure phrases: *liang yingcun* ‘2 inches’ (ex.37a) and *liang ben* ‘2 Cl’ (ex.39), which describe the difference between two degrees in comparison. In the following section, we will see that differentials in DVCs *do not* have to be degree-denoting expressions. This presents a non-trivial problem to degree-based analyses of comparatives, because they predict that differentials of comparatives must be degree-denoting expressions.

### 2.3.3 DVCs: a puzzle for the degree-based analyses

In this section, we examine differentials of DVCs from two aspects. Syntactically, we look at their distribution and show that differentials can be either DP objects for transitive verbs or adverbial measure phrases for intransitive verbs. Semantically, we show that *duo* in DVCs can combine with verbs of different aspectual properties, such as states, activities, and achievements. Moreover, we compare differentials that are DP objects to those that are measure phrases, and show there are systematical differences between them.

#### 2.3.3.1 Syntax

*duo* can combine with a transitive verb, a ditransitive verb, and an intransitive verb to form DVCs. When *duo* combines with a transitive verb, the object of the verb is a differential; when *duo* combines with a ditransitive verb, either the direct or the indirect object can be a differential; when *duo* combines with an intransitive verb, an adverbial measure phrase can serve as a differential.

##### ***duo* + a transitive verb**

When *duo* combines with a transitive verb, the object of the verb is interpreted as a differential, as shown in (41) and (42)(repeated from(2)and (4)):

- (41) a. Jack du-le liang ben xiaoshuo.  
 Jack read-asp 2 Cl novel  
 ‘Jack read 2 novels.’
- b. Jack du-le Jane Eyre he Pride and Prejudice zhe liang ben xiaoshuo.  
 Jack read-asp and this 2 Cl novel  
 ‘Jack read *Jane Eyre* and *Pride and Prejudice* these two novels.’



(42) a. Jack bi Jill *duo* du-le liang ben xiaoshuo.  
 Jack Jill much read-asp 2 Cl novel  
 ‘Jack read 2 more novels than Jill did.’

b. Jack bi Jill *duo* du-le  
 Jack Jill much read-asp

*Jane Eyre* he *Pride and Prejudice* zhe liang ben xiaoshuo.

and this 2 CL novel

‘Jack exceeded Jill in reading by two novels: *Jane Eyre* and *Pride and Prejudice*.’

In (41) and (42), the objects of the verb *du* ‘read’ are DPs that denote a set of individuals: *liang ben xiaoshuo* ‘2 novels’ (ex.42a) and *Jane Eyre* he *Pride and Prejudice* zhe *liang be xiaoshuo* ‘*Jane Eyre* and *Pride and Prejudice* these two books.’ (ex.42b). (43) and (44) show that DP objects can denote a set of events and they can also be interpreted as differentials: *liang xiaoshi (de) shu* (ex.44a) and *liang ci dianying* (ex.44b).

(43) a. Jack du-le liang xiaoshi (de) shu.  
 read-asp 2 hour De book

‘Jack read books for 2 hours.’

b. Jack kan-le liang ci dianying  
 watch-asp 2 time movie

‘Jack watched movies twice.’

(44) a. Jack bi Jill *duo* du-le liang xiaoshi (de) shu.  
 read-asp 2 hour De book

‘Jack spent two more hours reading books than Jill did.’

- b. Jack bi Jill **duo** kan-le liang ci dianying  
 watch-asp 2 time movie

‘Jack watched movies two more times than Jill did.’

In serial verb constructions like (45), where there are two VPs--VP<sub>1</sub> and VP<sub>2</sub>, either the object of V<sub>1</sub> or the object of V<sub>2</sub> can be interpreted as a differential. When *duo* precedes V<sub>1</sub>, the object of V<sub>1</sub> is interpreted as a differential (ex.46a); when *duo* precedes V<sub>2</sub>, the object of V<sub>2</sub> is interpreted as a differential (ex.46b).

- (45) a. Jack [qu-le liang ge shangdian]<sub>VP1</sub> [mai jiu]<sub>VP2</sub>.  
 go-asp 2 Cl shops buy wine

‘Jack went to 2 shops to buy wines.’

- b. Jack [qu shangdian]<sub>VP1</sub> [mai-le liang ping jiu]<sub>VP2</sub>.  
 go shops buy-asp 2 bottle wine

‘Jack went to a shop and bought 2 bottles of wine’

- (46) a. Jack [**duo** qu-le liang ge shangdian]<sub>VP1</sub> [mai jiu]<sub>VP2</sub>.  
 go-asp 2 Cl shops buy wine

‘Jack went to 2 more shops to buy wines.’

(It is true in the situation where Jack was planning to go to 3 shops to buy wines, but he went to 5 shops.)

- b. Jack [qu shangdian]<sub>VP1</sub> [**duo** mai-le liang ping jiu]<sub>VP2</sub>.  
 go shops buy-asp 2 bottle wine

‘Jack went to some shop and bought 2 more bottles of wine’

(It is true in the situation where Jack was planning to buy 3 bottles of wine, but he bought 5 bottles.)



- b. Jack bi Jill **duo** gei-le pengyou  
 give-asp friends  
liang ge xinnian liwu  
 2 Cl new year gift

‘Jack gave friends two more new year’s gifts than Jill did.’

***duo* + an intransitive verb**

When *duo* combines with an intransitive verb, an adverbial measure phrase can serve as a differential, as shown in (50) and (51):

- (50) a. Jack zou-le liang xiaoshi.  
 run-asp 2 hour  
 ‘Jack ran 2 hours.’
- b. Jack zou-le liang gongli.  
 run-asp 2 kilometer  
 ‘Jack ran 2 kilometers.’
- (51) a. Jack bi Jill **duo** zou-le liang xiaoshi.  
 much walk-asp 2 hour  
 ‘Jack walked 2 more hours than Jill did.’
- b. Jack bi Jill **duo** zou-le liang gongli.  
 much walk-asp 2 kilometer  
 ‘Jack walked 2 more kilometers than Jill did.’

## 2.3.3.2 Semantics

### 2.3.3.2.1 Aspectual classes

The preceding section has shown that *duo* can combine with verbs of different argument structures to form DVCs. In this section, we show that *duo* can combine with verbs of different aspectual properties, such as activities, achievements, or states.

English verbal predicates can be distinguished, in terms of their aspectual properties, into four basic classes: activities, accomplishments, achievements and states, as shown in (52) (Vendler 1967, Verkuyl 1972, Dowty 1979, etc):

- (52) Activities:                    paint, write, look for  
 Accomplishments:    paint a picture, write a letter, kill  
 Achievements:            find, die, recognize  
 States:                            like, know, have

The four verb classes differ in whether they allow continuous tense, and what kind of duration adverbials they can combine with, as shown in (53) and (54):

- (53) a. Jack painted for an hour/\* in an hour.                    *activity*  
 b. Jack painted a picture \*for an hour/in an hour.            *accomplishment*  
 c. Jack found his keys \*for an hour/in an hour.                *achievement*  
 d. Jack liked his new apartment for a year/\*in a year.        *state*
- (54) a. Jack is painting.    *activity*  
 b. Jack is painting a picture    *accomplishment*  
 c. Jack is \*finding the key.    *achievement*  
 d. Jack is \*owning his new apartment.                              *state*



- (57) a. \*Jack yi-xiaoshi-nei hua-le hua *\*activity*  
           one-hour-within paint-asp picture  
           Lit: ‘\*Jack painted pictures in an hour.’
- b. Jack yi-xiaoshi-nei hua-le yi zhang hua *accomplishment*  
           one-hour-within paint-asp one Cl picture  
           ‘Jack painted a picture in an hour.’
- c. Jack yi-xiaoshi-nei zhao-dao-le ta-de yaoshi. *achievement*  
           one-hour-within find-asp his hey  
           ‘Jack found his keys in an hour.’
- d. \*Jack yi-xiaoshi-nei xihuan-le ta-de xin jia *\*state*  
           one-hour-with like-asp his new home  
           Lit: ‘\*Jack liked his new home in an hour.’
- (58) a. Jack zai-hua hua. *activity*  
           asp-paint picture  
           ‘Jack is painting pictures.’
- b. Jack zai-hua yi zhang hua *accomplishment*  
           asp-paint one Cl picture  
           ‘Jack is painting a picture.’
- c. \*Jack zai-zhao-dao ta-de yaoshi. *\*achievement*  
           asp-find his key  
           Lit: ‘Jack is trying to find his keys.’
- d. \*Jack zai-xihuan ta-de xin jia. *\*state*  
           asp-like his new home

Lit: ‘\*Jack is liking his new apartment.’

*duo* can combine with activity verbs like *du* ‘read’ (59a) or *hua* ‘paint’ (59b), achievement verbs like *zhao-dao* ‘find’ (60a) or *xue-hui* ‘learn’ (60b), and stative verbs like *renshi* ‘know’ (61a) or *hui* ‘be able to/ know’ (61b) to form DVCs.

***duo* + Activity verb**

(59) a. Jack bi Jill duo du-le liang ben xiaoshuo.  
 much read-asp 2 Cl novel

‘Jack read two more novels than Jill did.’

b. Jack bi Jill duo hua-le liang zhang hua.  
 much paint-asp 2 Cl picture

‘Jack painted two more pictures than Jill did.’

***duo* + Achievement verb**

(60) a. Jack bi Jill duo zhao-dao-le liang zhi  
 much find-asp 2 Cl  
 diushi-de yang.  
 missing goat

‘Jack found 2 more missing goats than Jill did.’

b. Jack bi Jill duo xue-hui-le liang yang benshi.  
 much learn-asp 2 Cl skills

‘Jack learned 2 more skills than Jill did.’



***duo* + Stative verb**

(61) a. Jack bi Jill duo renshi ji ge ren.  
 much know several Cl people  
 ‘Jack knows more people than Jill does.’

b. Jack bi Jill duo hui ji men waiyu  
 much know several Cl foreign language  
 ‘Jack knows several more foreign languages than Jill does.’

**2.3.3.2.2 DPs vs. MPs**

In this section, we show that DPs and MPs in non-comparative contexts differ with respect to (i) the modification by the demonstrative *zhe* ‘this’; (ii) the ability to introduce discourse referents which serve as antecedents for the pronouns *ta* ‘it/he/she’ or *tamen* ‘they’, and (iii) the type of *WH* phrase used to ask questions. Differentials in DVCs and those in adjectival comparatives show parallel distinctions, indicating the two are semantically distinct. We will postpone the discussion of adverbial measure phrases like *liang xiaoshi* ‘2 hours’ (ex.51a) and event-denoting DPs like *liang ci dianying* ‘(watching) movies twice’ (ex.44b) to section 3.4.2 and section 3.4.3 respectively.

**Modification by the demonstrative *zhe* ‘this’**

DPs in non-comparative sentences can be modified by the demonstrative *zhe* (ex.62b), but MPs cannot (ex.63b).

(62) a. Jack du-le liang ben xiaoshuo.  
 read-asp 2 Cl novel  
 ‘Jack read these two novels.’

- b. Jack du-le zhe liang ben xiaoshuo.  
 read-asp this 2 Cl novel  
 'Jack read two novels.'
- (63) a. Jack gao liu yingchi  
 tall 6 foot  
 'Jack is 6 feet tall.'
- b. \*Jack gao zhe liu yingchi.  
 tall this 6 foot.

Differentials of DVCs can be modified by the demonstrative *zhe* 'this' (ex.64a), but those of adjectival comparatives cannot (ex.64b).

- (64) a. Jack bi Jill duo du-le zhe liang ben xiaoshuo.  
 much read-asp this 2 Cl novel  
 'Jack exceeded Jill in reading by these two novels.'
- b. \*Jack bi Jill gao zhe liang yingcun.  
 tall this 2 inch

### Discourse referents

DPs in non-comparatives can be antecedents for pronouns *ta* 'it/he/she' or *tamen* 'they' (ex.65b). Measure phrases cannot (ex.66b).

- (65) a. Jack<sub>i</sub> mai-le [liang ben shu]<sub>i</sub>.  
 read-asp 2 Cl book  
 'Jack read these two books.'

- b. tamen<sub>i</sub> dou shi Chomsky xie-de  
 each be write-De

‘They both are written by Chomsky.’

- (66) a. Jack gao [liu yingchi]<sub>i</sub>.  
 tall 6 foot

‘Jack is 6 feet tall.’

- b. ??ta<sub>i</sub>/tamen<sub>i</sub> ye shi Jill de gaodu.  
 It/they too be De height.

‘It is also Jack’s height.’

Differentials of DVCs can serve as antecedents for pronouns *ta* ‘it/he/she’ or *tamen* ‘they’ (ex.67b), but those of adjectival comparatives cannot (ex.68b):

- (67) a. Jack bi Jill duo du-le [liang ben shu]<sub>i</sub>.  
 much read-asp 2 Cl book

‘Jack exceeded Jill in reading by two books.’

- b. tamen<sub>i</sub> dou shi Chomsky xie-de  
 each be write-De

‘They are both written by Chomsky.’

- (68) a. Jack bi Jill gao liu yingcun.  
 tall 6 inch

‘Jack is taller than Jill by 6 inches.’

- b. ??ta<sub>i</sub>/tamen<sub>i</sub> shi yi gen shouzhi de changdu.  
 It/they 1 Cl finger De length

‘It is a finger’s length.’

**WH-phrases**

DP in non-comparatives can be questioned with the *wh*-phrase *shenme* ‘what’ (ex.69b), but not with the *wh*-phrase *duoshao* ‘how many/much’ (ex.69c)<sup>15</sup>. Measure phrases show the opposite pattern. They *cannot* be questioned by the *wh*-phrase *shenme* ‘what’ (ex.70b), but can be questioned with the *wh*-phrase *duoshao* ‘how many/much’ (ex.70c).

(69) a. Jintian xiawu, Jack mai-le liang ben xiaoshuo.  
 today afternoon buy-asp 2 Cl novel  
 ‘This afternoon, Jack bought 2 novels.’

b. Jintian xiawu, Jack bought-le *shenme*?  
 today afternoon buy-asp what  
 ‘What did Jack buy this afternoon?’

c. ??Jintian xiawu, Jack mai-le *duoshao*?  
 today afternoon read-asp how many

(70) a. Jack gao liu yingchi  
 tall 6 foot  
 ‘Jack is 6 feet tall.’

b. Jack gao *duoshao*?  
 tall how much  
 ‘How tall is Jack?’

<sup>15</sup> (69c) is intended to mean ‘How much did Jack buy in the afternoon?’ This question is acceptable in situations where it is known what kind of objects Jack bought. In such a case, we assume that *duoshao* in (59c) is followed by an implicit NP like in (i).

(i) Jintian xiawu, Jack mai-le duoshao [(ben) xiaoshuo]?  
 today afternoon buy-asp how many Cl novel  
 ‘How many novels did Jack buy this afternoon?’

In (i), *duoshao* only questions the measure phrase *liang ben* inside the DP [*liang ben xiaoshuo*] as opposed to the whole DP. The same explanation also applies to (71c).

- c. \*Jack gao shenme?  
tall what

Differentials of DVCs can be questioned with the *wh*-phrase *shenme* ‘what’ (ex.71b), but not with the *wh*-phrase *duoshao* ‘how many/much’ (ex.71c)<sup>16</sup>. Differentials of adjectival comparatives show the opposite pattern. They *cannot* be questioned by the *wh*-phrase *shenme* ‘what’ (ex.72b), but can be questioned with the *wh*-phrase *duoshao* ‘how many/much’ (ex.72c):

- (71) a. Jintian xiawu, Jack bi Jill duo mai-le liang ben xiaoshuo.  
Today afternoon much buy-asp 2 Cl novel  
‘This afternoon, Jack bought two more novels than Jill did.’
- b. Jintian xiawu, Jack bi Jill duo mai-le shenme?  
Today afternoon much buy-asp what  
‘What did Jack exceed Jill in buying?’
- c. ??Jintian xiawu, Jack bi Jill duo mai-le duoshao?  
Today afternoon much buy-asp how much
- (72) a. Jack bi Jill gao liang yingcun.  
tall 2 inch  
‘Jack is taller than Jill by two inches.’
- b. Jack bi Jill gao duoshao?  
tall how much  
‘How much does Jack exceed Jill in height?’

<sup>16</sup> The acceptable version of (71c) should be:

(71c’) Jack bi Jill duo mai-le duoshao dongxi?  
much read-asp much thing  
‘How many more things did Jack exceed Jill in buying?’

See footnote 15.

- c. \*Jack bi Jill gao *shenme?*  
tall what

### 2.3.4 Summary

To summarize, in this section we offered a degree-based analysis to Chinese adjectival comparatives based on Kennedy (1997, 1999). We argued that the same analysis cannot be extended to DVCs, because their differentials, unlike those of adjectival comparatives, are not necessarily degree-denoting expressions. They can be either DP objects for transitive verbs, which denote a set of sets of individuals (of type  $\langle\langle e, t \rangle, t \rangle$ ) or adverbial measure phrases for intransitive verbs, which are event modifiers (of type  $\langle\langle v, t \rangle, \langle v, t \rangle \rangle$ ). In the following section we propose a semantic analysis of DVCs based on bijections.

## 2.4. The semantics of DVCs

The goal of this section is to lay out a semantic analysis of DVCs which is not based on a comparison of degrees, but based on bijections. In section 2.4.1, I introduce the notion of bijections and compare it with that of cardinal numbers; in section 2.4.2, I propose a semantic analysis of DVCs based on bijections; in section 2.4.3, we examine the cross-categorial property of *duo*.

### 2.4.1 Bijections and cardinal numbers

Let us begin by considering the following situation. Suppose we have two jars of jellybeans. How many ways are there to decide which jar has more jellybeans? The most common way is to count the jellybeans in each jar, and compare the numbers we get from

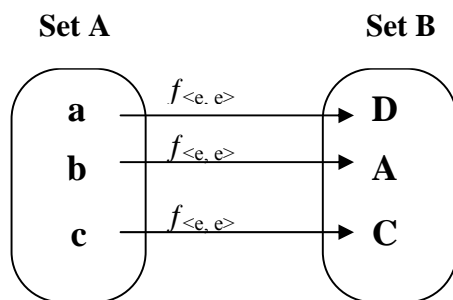
counting them. Given the situation, one jar contains 20 jellybeans, and the other contains 30 jellybeans. We get two numbers: 20 and 30. The difference between these two numbers is 10. So we conclude that one jar has 10 more jellybeans than the other.

An alternative approach would be that we take one jellybean from one jar and correspondingly take another one from the other jar. We continue this action till one jar runs empty. This tells us that the non-empty jar has more jellybeans than the empty one. For the remaining beans in the non-empty jar, we can perform various actions on them; we can count, name, or even eat them. If we count them, we arrive at the same conclusion: one jar has 10 more jellybeans than the other.

These two approaches correspond to two different ways to compare the cardinality (or size) of sets in mathematics: one which uses cardinal numbers and the other which uses bijections. Cardinal numbers are numbers used to measure the cardinality (size) of sets. For instance, set  $A = \{a, b, c\}$  has 3 elements, and therefore  $A$  has the cardinality of 3, written  $|A| = 3$ . In the first approach, we make use of cardinal numbers to make the comparison. We count the jellybeans in each jar, and assign a cardinal number to them. The cardinality of one jar (call it set  $A$ ) is 20, written  $|A| = 20$ ; the cardinality of the other jar (call it set  $B$ ) is 30, written  $|B| = 30$ . We compare the two cardinal numbers 20 and 30. The difference between them is 10.

In the second approach, we make use of bijections to make the comparison. A bijection or a bijective function is a function  $f$  from set  $A$  to set  $B$  with the property that every member of  $A$  is paired with exactly one member of  $B$ , and vice versa. This definition is captured by the diagram in (73):

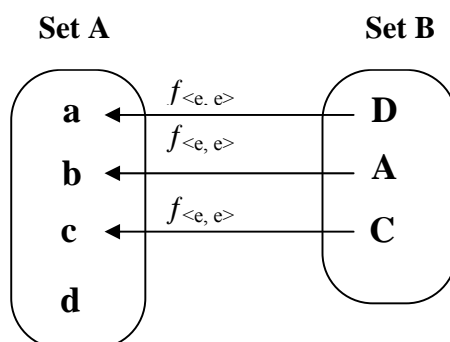
(73)



$f$  is a bijective function from A to B

Assuming that two sets are finite, set A and set B has the same cardinality iff there exists a bijection from set A to set B, as shown in (73). Set A has a greater cardinality than set B iff there is a bijection from set B to a proper subset of set A,  $A'$  as shown in the diagram in (74).

(74)



Based on the definition of bijections, one jar has more jellybeans than the other iff there is a bijection from one jar to a proper subset of the other. The difference between them is jellybeans which belong to one, but do not have counterparts in the other. Note that in this approach, there is no cardinal number or degree involved in the comparison. The difference between the two sets is individuals rather than degrees.



If we assume that DVCs describe a comparison of two sets of objects based on bijections rather than degrees, we can explain why they have differentials distinct from those of adjectival comparatives.

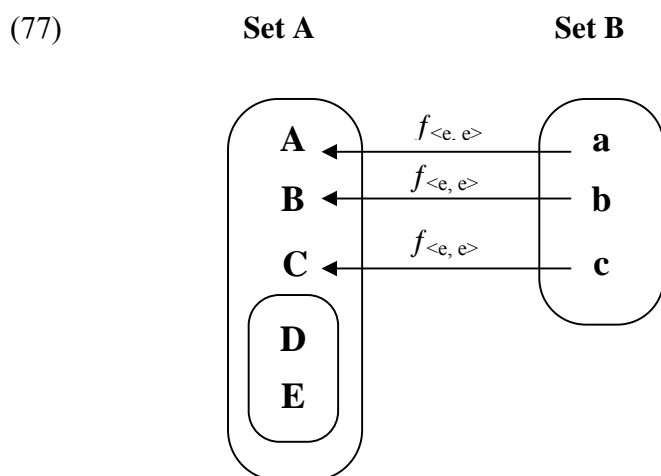
## 2.4.2 The semantics of DVCs

Given our discussion above, we propose that the DVC in (75) has the interpretation in (76).

(75) Jack bi Jill *duo* du-le liang ben xiaoshuo.  
 Jack Jill much read-asp 2 Cl novel  
 ‘Jack read 2 more novels than Jill did.’

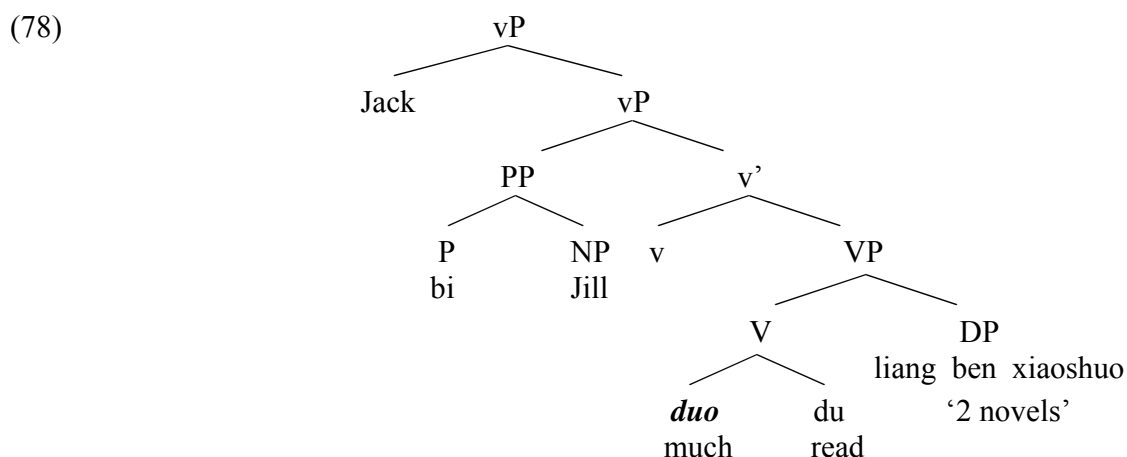
(76) There is a set of objects read by Jack—set A. There is another set of objects read by Jill—set B. There is a *bijective function*  $f_{\langle e, e \rangle}$  from set B to a proper subset of A, A’ such that every element in B is mapped to a unique element in A’, and every element in A’ is mapped to a unique element in B. The difference between A and A’ is 2 novels.

This interpretation is captured by the diagram in (77):



In (77) Jack read {A, B, C, D, E}, and Jill read {a, b, c}. For all the objects that Jill read, Jack read their *f*-counterparts. There are two novels, namely {D, E}, which Jack read, whose counterparts Jill did not read.

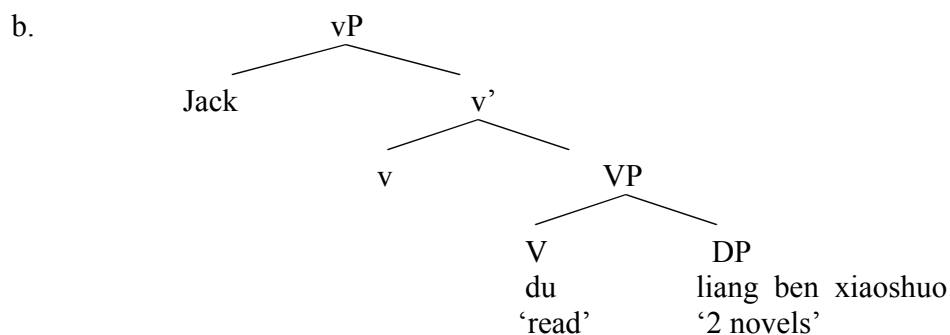
Now let us consider how this meaning is compositionally achieved from the DVC in (75). We assume that (75) has the syntactic structure in (78):



(78) is parallel to the structure of the non-comparative counterpart in (79a) except for two differences: (i) in (78) there is a *bi*-phrase adjoined to vP; and (ii) *duo* forms a constituent with the following verb *du* 'read'.

(79) a. Jack du-le liang ben xiaoshuo.  
 read-asp 2 Cl novel

'Jack read these two novels.'



(80) is a constituency test which shows that *duo* forms a constituent with the following verb, but not with the V-DP. (80a) shows that we can conjoin two sequences of *duo*-V; (80b) shows that we cannot conjoin two sequences of V-DP without reduplicating *duo* ‘much’. This implies that *duo*-V is a constituent, but V-DP is not.

(80) a. Jack bi Jill [*duo* xie-(le)] he [*duo* fa-le]  
 Much write-asp and much publish-asp  
 2 pian lunwen  
 2 Cl papers

‘Jack wrote and published 2 more papers than Jill did.’

b. \*Jack bi Jill *duo* [xie-le 2 pian lunwen]<sub>VP</sub> he  
 much write-asp Cl Paper and  
 [fa-le 2 pian lunwen]<sub>VP</sub>.  
 publish-asp Cl Paper

We further assume that *duo* carries a comparative meaning based on the contrast between (81a) and (81b). (81a) minimally differs from (81b) in the presence of *duo* ‘much’, yet only the former receives a comparative meaning.

(81) a. Jack duo du-le liang ben xiaoshuo.  
 much read-asp 2 Cl novel

‘Jack read two more novels.’

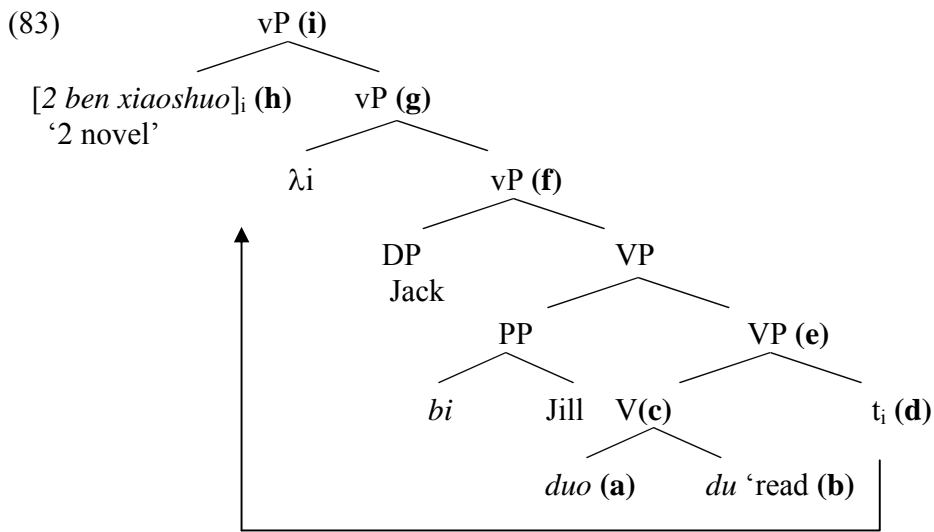
b. Jack du-le liang ben xiaoshuo.  
 read-asp 2 Cl novel

‘Jack read two novels.’

Based on our discussions above, we propose that *duo* in the DVC in (75) has the interpretation in (82). It takes four semantic arguments: (i) a function  $P$  denoted by the verb following *duo*-- *du* ‘read’; (ii) an individual  $k$  which describes the difference between two sets in comparison-- *2 ben xiaoshuo* ‘2 Cl novel’; (iii) an individual  $y$ , denoted by the standard of comparison--*Jill*; and (iv) an individual  $x$  denoted by the subject—*Jack*. When *duo* combines with its four arguments, it describes a comparison between two sets of objects based on a bijective function  $f$ .

$$(82) \quad || \text{duo} || = \lambda P_{\langle e, \langle e, t \rangle \rangle} \lambda k_e \lambda y_e \lambda x_e. \exists f_{\langle e, e \rangle} [f \text{ is a bijective function} \wedge P(k)(x) \wedge \forall z_e. [P(z)(y) \rightarrow [P(f(z))(x) \wedge f(z) \cap k = \emptyset]]]$$

The compositional semantics of (75) is provided in (83) and (84):



$$(84) \quad \text{a. } || \text{duo} || = \lambda P_{\langle e, \langle e, t \rangle \rangle} \lambda k_e \lambda y_e \lambda x_e. \exists f_{\langle e, e \rangle} [f \text{ is a bijective function} \wedge P(k)(x) \wedge \forall z_e. [P(z)(y) \rightarrow [P(f(z))(x) \wedge f(z) \cap k = \emptyset]]]$$

$$\text{b. } || \text{du} || = \lambda m_e \lambda n_e. \text{read}(m)(n)$$

$$\text{c. } || \text{duo du} || = \lambda k_e \lambda y_e \lambda x_e. \exists f_{\langle e, e \rangle} [f \text{ is a bijective function} \wedge \text{read}(k)(x) \wedge \forall z_e. [\text{read}(z)(y) \rightarrow [\text{read}(f(z))(x) \wedge f(z) \cap k = \emptyset]]]$$

$$\text{d. } || t_i ||^g = g(i)$$

- e.  $\| \text{duo du } t_i \|_g = \lambda y_e. \lambda x_e. \exists f_{\langle e, e \rangle} [f \text{ is a bijective function} \wedge \text{read}(g(i))(x) \wedge \forall z_e. [\text{read}(z)(y) \rightarrow [\text{read}(f(z))(x) \wedge f(z) \cap g(i) = \emptyset]]]$
- f.  $\| \text{Jack bi Jill duo du-le } t_i \|_g = \exists f_{\langle e, e \rangle} [f \text{ is a bijective function} \wedge \text{read}(g(i))(\text{Jack}) \wedge \forall z_e. [\text{read}(z)(\text{Jill}) \rightarrow [\text{read}(f(z))(\text{Jack}) \wedge f(z) \cap g(i) = \emptyset]]]$
- g.  $\| \text{VP} \| = \lambda t_e. \exists f_{\langle e, e \rangle} [f \text{ is a bijective function} \wedge \text{read}(t)(\text{Jack}) \wedge \forall z_e. [\text{read}(z)(\text{Jill}) \rightarrow [\text{read}(f(z))(\text{Jack}) \wedge f(z) \cap t = \emptyset]]]$
- h.  $\| 2 \text{ ben xiaoshuo} \| = \lambda P_{\langle e, t \rangle}. \exists x_e [ * \text{novel}(x) \wedge P(x) \wedge |x| \geq 2 ]$
- i.  $\| \text{Jack bi Jill duo du-le } 2 \text{ ben xiaoshuo} \| = 1 \text{ iff}$   
 $\exists f_{\langle e, e \rangle} \exists x_e [f \text{ is a bijective function} \wedge * \text{novel}(x) \wedge |x| \geq 2 \wedge \text{read}(x)(\text{Jack}) \wedge \forall z_e. [\text{read}(z)(\text{Jill}) \rightarrow [\text{read}(f(z))(\text{Jack}) \wedge f(z) \cap x = \emptyset]]]$

The differential *liang ben xiaoshuo* ‘2 novels’ denotes a set of sets of individuals which are novels, and whose cardinality is 2 (ex.83h). The last line in (84i) says: there is a bijective function  $f$  such that for each object  $z$  that Jill read, Jack read  $z$ ’s  $f_{\langle e, e \rangle}$ -counterpart. There is an individual  $x$  such that Jack read  $x$ , and  $x$  does not intersect with  $f(z)$ .  $x$  consists of at least two atomic parts, each of which is a novel.

The DVC in (85) (repeated from 2b) can be explained in the same fashion. It means that for each object that Jill read, Jack read its counterpart. There are two novels which Jack read, whose counterparts Jill did not read. They are *Jane Eyre* and *Pride and Prejudice*. The differential DP *Jane Eyre he pride prejudice zhe 2 ben xiao shuo* ‘*Jane Eyre* and *Pride and Prejudice* these two books’ denotes an individual  $x$  which consists of *Jane Eyre* and *Pride and Prejudice*.

(85) Jack bi Jill duo du-le

much read-asp

*Jane Eyre* he *Pride and Prejudice* zhe 2 ben xiaoshuo.

and

this 2 CL novel

‘Jack exceeded Jill in reading by two novels: Jane Eyre and Pride and Prejudice.

DVCs not only compare two sets of individuals, they also compare two sets of events. The example in (86) (repeated from 44a) describes a comparison of two sets of reading events, one whose agent is Jack and the other whose agent is Jill. The difference between the two sets is a set of events of reading novels which last for 2 hours.

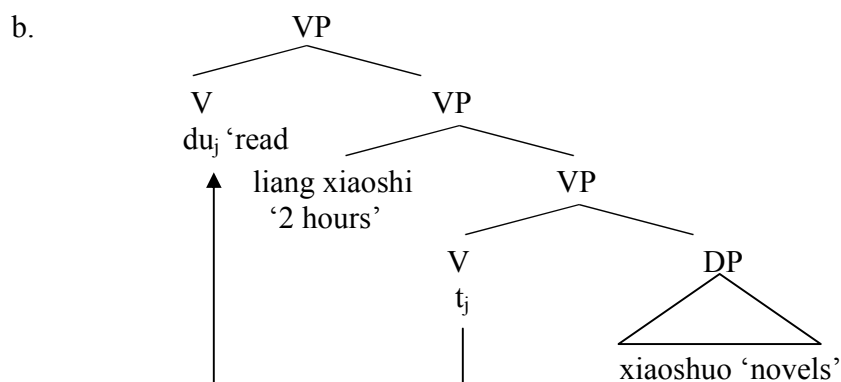
(86) Jack bi Jill *duo* du-le liang xiaoshi (de) xiaoshuo.  
 much read-asp 2 hour De novel

‘Jack spent two more hours reading novel than Jill did.’

The differential in (86) is expressed by the DP *liang xiaoshi (de) xiaoshuo* ‘(reading) novels for 2 hours’. It has the structure in (87b) when occurring in a non-comparative sentence like (87a) (Huang 1994, Yang 2001). In (87b), the measure phrase *liang xiaoshi*, modifies the VP *du xiaoshuo* ‘read novels’.

(87) a. Jack du-le liang xiaoshi (de) xiaoshuo.  
 read-asp 2 hour De novel

‘Jack read books for two hours.’



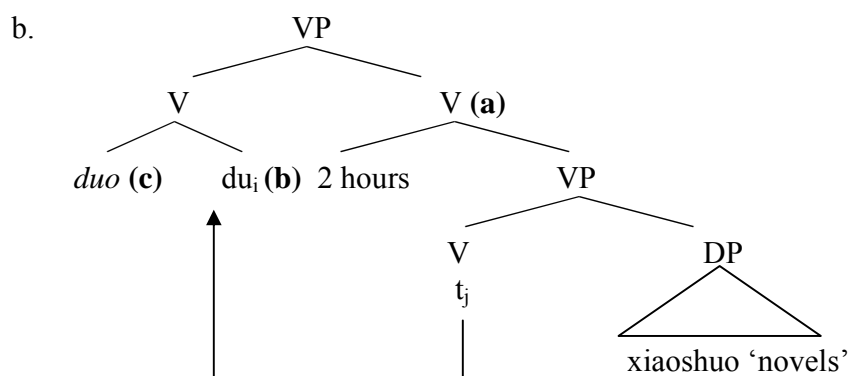
Following Yang (2001), I assume that the moved verb *du* ‘read’ in (87b) has to be semantically reconstructed. The VP [*liang xiaoshi t<sub>i</sub> xiaoshuo*] has the interpretation in

(88), which describes a relation between an individual  $x$  and an event  $e$  such that  $x$  is the agent of  $e$  and  $e$  is an event of reading novels for 2 hours.

(88)  $\parallel$  liang xiaoshi (de) xiaoshuo  $\parallel = \lambda x_e. \lambda e_v. [\text{Agent}(e) = x \wedge \text{reading novels}(e) \wedge |e| = 2 \text{ hours}]$

Assuming that (87b) represents the right syntax for *liang xiaoshi (de) shu*, the DVC in (89a) then has the structure in (89b), parallel to (87b):

(89) a. Jack bi Jill **duo** du-le liang xiaoshi (de) shu.  
 much read-asp 2 hour De book  
 ‘Jack spent two more hours reading books than Jill did.’

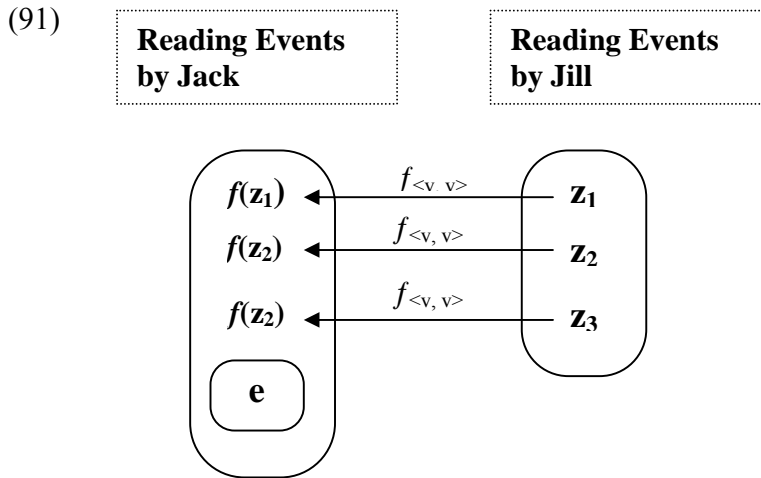


In (89b), the phrase *liang xiaoshi (de) xiaoshuo* assumes the same interpretation as in (88)(ex.90a). The verb *du* ‘read’ following *duo* denotes a relation between a reading event  $e$  and an individual  $x$  such that  $x$  is the agent of  $e$  (ex.90b)<sup>17</sup>. *duo* has the interpretation in (90c). It takes 4 semantic arguments: (i) the function  $P$  denoted by the following verb; (ii) the differential  $k$ ; (iii), the standard of comparison  $y$ ; and (iv) the subject  $x$ . (90c) differs from (82) in the type of the argument  $P$  and  $k$  that *duo* takes.

<sup>17</sup> We assume that in the DVC in (89), the verb following *duo* is interpreted both in its base position (inside the differential), and the moved position. This differs from Yang’s original proposal in (87b).

- (90) a.  $\| \text{VP} \| = \lambda x_e. \lambda e_v [ \text{Agent}(e) = x \wedge \text{reading novels}(e) \wedge |e| = 2 \text{ hours} ]$
- b.  $\| \text{du 'read'} \| = \lambda x_e. \lambda e_v [ \text{Agent}(e) = x \wedge \text{reading}(e) ]$
- c.  $\| \text{duo} \| = \lambda P_{\langle e, \langle v, t \rangle \rangle}. \lambda k_{\langle e, \langle v, t \rangle \rangle}. \lambda y_e. \lambda x_e. \exists f_{\langle v, v \rangle} \exists e_v [ f \text{ is a bijective function} \wedge k(x)(e) \wedge \forall z_v. [ P(y)(z) \rightarrow [ P(x)(f(z)) \wedge f(z) \cap e = \emptyset ] ] ]$
- d.  $\| \text{Jack bi Jill duodu le liang xiaoshi (de) xiashuo} \| = 1 \text{ iff}$   
 $\exists f_{\langle v, v \rangle} \exists e_v [ f \text{ is a bijective function} \wedge \text{reading novels.}(e) \wedge |e| = 2 \text{ hours}$   
 $\wedge \text{Agent}(e) = \text{Jack} \wedge \forall z_v. [ [\text{reading}(z) \wedge \text{Agent}(z) = \text{Jill}] \rightarrow$   
 $[ [\text{reading}(f(z)) \wedge \text{Agent}(z) = \text{Jack}] \wedge f(z) \cap e = \emptyset ] ] ]$

(90d) says: there is a bijective function  $f$  such that for every event  $z$ , if  $z$  is a reading event performed by Jill, there is a counterpart reading event  $f(z)$  performed by Jack. There is an event  $e$  such that the agent of  $e$  is Jack and  $e$  is reading novels for 2 hours.  $e$  does not intersect with  $f(z)$ . This reading is captured by the diagram in (91):



In (91) we compare two sets of reading events, and the difference between the two sets comes out as an event of reading novels. Our analysis predicts that (92a) (repeated from 89a) is true in the following situation in (92b), where both Jack and Jill did some reading, and only Jack, but not Jill, read novels:



(92) a. Jack bi Jill *duo* du-le liang xiaoshi (de) xiaoshuo.  
 much read-asp 2 hour De novel

‘Jack spent two more hours reading novels than Jill did.’

b. Last night, Jack spent 1 hour reading his textbook, 2 hours reading National Geographic, and 2 hours reading novels before he went to sleep. Jill spent 1 hour reading her textbook, 2 hours reading Vogue before she went to sleep.

Given the situation, Jack spent 5 hours reading his text book, National Geographic magazine, and novels; Jill spent 3 hours reading her textbook and Vogue. Our analysis predicts that (92a) is true in (92b), because (92a) means for every reading event Jill did, there is a counterpart reading event that Jack did: the event of Jill reading her textbook corresponds to the event of Jack reading his textbook, and the event of Jill reading the magazine Vogue corresponds to the event of Jack reading the magazine National Geographic. There is an event of reading novels, which Jack did, whose counterparts Jill did not do. My intuition says that (92a) is indeed true in (92b).

Finally, let us examine the DVC in (93) (repeated from 44b), which compares the cardinalities of two sets of events of watching movies. Following the analysis, (93) means that for every event of Jill watching movies, there is a counterpart event of Jack watching movies. There are two events of Jack watching movies, for which there is no counterpart for Jill.

(93) Jack bi Jill duo kan-le liang ci dianying  
 much watch-asp 2 time movie

‘Jack watched movies twice more than Jill did.’

To conclude, in this section we proposed an analysis of DVCs based on bijections. This analysis analyzes differentials of DVCs on a par with their counterparts in non-comparative contexts. This way, it captures the syntactic and semantic parallel between them. In the following section, we examine the cross-categorial property of *duo*: it modifies intransitive, transitive, and ditransitive verbs.

### 2.4.3 *duo* as a ‘cross-categorial’ modifier

The interpretations we proposed for *duo* in (82) and (90c), repeated in (94a-b), are designed to account for DVCs where *duo* is combined with a transitive verb like *du* ‘read’. These interpretations are incompatible with DVCs where *duo* is combined with a ditransitive or an intransitive verb. In either case, *duo* calls for a new semantics that are compatible with the denotation of the following verb. In this section, we lay out the semantics of *duo* when it combines with different sorts of verbs.

(94) a. *duo* in (82)

$$\| \text{duo} \| = \lambda P_{\langle e, \langle e, t \rangle \rangle} \lambda k_e \lambda y_e \lambda x_e. \exists f_{\langle e, e \rangle} [f \text{ is a bijective function} \wedge P(k)(x) \wedge \forall z_e. [P(z)(y) \rightarrow [P(f(z))(x) \wedge f(z) \cap k = \emptyset]]]$$

b. *duo* in (90c)

$$\| \text{duo} \| = \lambda P_{\langle e, \langle v, t \rangle \rangle} \lambda k_{\langle e, \langle v, t \rangle \rangle} \lambda y_e \lambda x_e. \exists f_{\langle v, v \rangle} \exists e_v [f \text{ is a bijective function} \wedge k(x)(e) \wedge \forall z_v. [P(y)(z) \rightarrow [P(f(z))(x) \wedge f(z) \cap e = \emptyset]]]$$

#### ***duo* + ditransitive verbs**

The DVCs in (95), repeated from (49), are examples where *duo* combines with the ditransitive verb *gei* ‘give’.

- (95) a. Jack bi Jill duo gei-le liang ge pengyou  
 much give-asp 2 Cl friends  
 xinnian liwu  
 new year gift  
 ‘Jack gave two more friends new year’s gifts than Jill did.’
- b. Jack bi Jill duo gei-le pengyou  
 much give-asp friends  
liang ge xinnian liwu  
 2 Cl new year gift  
 ‘Jack gave friends two more new year’s gifts than Jill did.’

In (95), *gei* ‘give’ takes two objects, but only one of them is allowed to be interpreted as a differential. This object can be either an indirect object (ex.95a), or a direct object (ex.95b)<sup>18</sup>. Let us take a look at the meaning of *duo* in (95a-b) respectively.

In (95a), *duo* has to take 5 arguments. They are in sequence: the function *P* denoted by the ditransitive verb *gei* ‘give’, the individual *k* denoted by the indirect object—*liang ge pengyou* ‘2 friends’, the individual *k*’ denoted by the direct object *xinnian liwu* ‘New Year’s gifts’, the individual *y* denoted by the standard of comparison—*Jill*, and finally the individual *x* denoted by the subject *Jack*. We have the interpretation of *duo* in (96):

<sup>18</sup> In DVC with ditransitive verbs, indefinite objects are more likely to be interpreted as differentials than definite objects. Sentences in (i) are somehow hard to interpret, because both the direct and the indirect objects are indefinite or definite at the same time.

- (i) a. ??Jack bi Jill duo gei-le Mary Jane Eyre.  
 much give-asp  
 b. ?? Jack bi Jill duo gei-le liang ge pengyou liang ben xiaoshu.  
 much give-asp 2 Cl friend 2 Cl novel



Measure phrases are cross-categorial: they can occur in different contexts, and have different semantic interpretations. The measure phrases *liang xiaoshi* ‘2 hours’ and *liang gongli* ‘2 kilometers’ in the adjectival domain (ex.99), and those in the verbal domain as in (100) are semantically distinct. The former denotes a degree 2 (of type  $\langle d \rangle$ ) on a scale of temporal or spatial length; the latter are event modifiers (of type  $\langle \langle v, t \rangle, \langle v, t \rangle \rangle$ )<sup>19</sup>, which range from a set of events to a set of events that temporarily last for *two hours* (ex.100a), or to a set of events that spatially extends to 2 kilometers (ex.100b).

- (99) a. zhe chang bisai chang liang xiaoshi ***Adj + Measure Phrase***  
 this Cl competition long 2 hours  
 ‘This competition is 2 hours long.’
- b. zhe tiao lu chang liang gongli  
 this Cl road long 2 kilometer  
 ‘This road is 2 kilometers long.’
- (100) a. Jack pao-le liang xiaoshi. ***V + Measure Phrase***  
 run-asp 2 hour  
 ‘Jack ran 2 hours.’
- b. Jack pao-le liang gongli.  
 run-asp 2 kilometer  
 ‘Jack ran 2 kilometers.’

Differentials of the DVCs in (98) are parallel to the adverbial measure phrases in the non-comparative sentences in (100) in that they both occur after intransitive verbs.

<sup>19</sup> Dowty (1979), Moltmann (1991), Larson (2003), and Morzycki (2004) have different analyses for measure phrases in the verbal domain.



lasts for 2 hours. There is a bijective function  $f$  such that for every event  $z$  in which Jill ran, there is a  $f$ -counterpart of  $z$  in which Jack ran.  $f(z)$  does not intersect with  $e$ .

To summarize, in this section we laid out the interpretations of *duo* when it combines with a transitive, a ditransitive and an intransitive verb. These readings differ from each other in the type of the function  $P$  denoted by the verb following *duo*, and the type of the object which is interpreted as a differential. Despite these differences, they share one fundamental property, that is, their meanings are constructed in such a way that they all describe a comparison between two sets of individuals or events in terms of a bijective function  $f$ , and the expression that is interpreted as a differential has the same denotation as it does in a non-comparative context.

#### 2.4.4 Summary

In this section, we motivated a non-degree analysis of DVCs to account for the distinctions between their differentials and those in adjectival comparatives. We argued that *duo* in DVCs is a cross-categorial modifier; its semantic interpretation varies with respect to the type of the verbal predicate it combines with.

One might wonder at this point whether DVCs are adverbial comparatives parallel to their English counterparts (ex.103b). In such a case, *duo* in DVCs is an adverb just like *much* in English (assuming in (103b) that *more* is composed of the comparative morpheme *-er* and the adjective/adverb *much*).





- (104) a. 

DP	V-de	Adverb	
Jack	pao-de	hen	kuai.
	run-De	very	fast

  
 ‘Jack runs very fast.’
- b. 

DP	V	DP <sub>obj</sub>	V-de	Adverb	
Jack	du	shu	du- <i>de</i>	hen	duo.
Jack	read	book	read-De	very	much

  
 ‘Jack reads books a lot.’

The examples in (104) can be turned into *Adverbial Comparatives*. They have two patterns: one with intransitive verbs (ex.105) and the other with transitive verbs (ex.107). Let us begin with the pattern in (105), where adverbial phrases are adjoined to intransitive verbs. (105) has 4 components: (i) a clausal subject CP<sub>1</sub>, consisting of a DP<sub>1</sub> and V<sub>1</sub>-*de*; (ii) a clausal standard of comparison CP<sub>2</sub>, consisting of a DP<sub>2</sub> and V<sub>2</sub>-*de*; (iii) a bare adverb and (iv) an optional differential.

- (105) 

DP <sub>1</sub> V <sub>1</sub> -de	bi	DP <sub>2</sub> V <sub>2</sub> -de	Adverb	(Differential)	
------------------------------------	----	------------------------------------	--------	----------------	--
- a. 

[Jack zou-de] <sub>CP1</sub>	bi	[Jill pao-de] <sub>CP2</sub>	(hai)	kuai	yixie.
walk-De		run-De	(even)	fast	some

  
 ‘Jack walks even a little faster than Jill runs.’
- b. 

[ta shuo-de] <sub>CP1</sub>	bi	[ta chang-de] <sub>CP2</sub>	haoting.		
he talk-De		he sing-De	pleasant to listen		

  
 ‘He talks more pleasantly than he sings.’  
 (an idiom, which means: he sweat talks.)



- b. [Jack qi ma qi-de]<sub>CP1</sub> bi [Jill qi niu qi-de]<sub>CP2</sub>  
 ride horse ride-De ride cow ride-De  
 kuai yixie.  
 fast some

‘Jack rides a horse a little faster than Jill rides a cow.’

The comparatives in (107a) and (107b) can undergo different levels of ellipsis. (107a) has identical [VP<sub>1</sub> V<sub>1-de</sub>] and [VP<sub>2</sub> V<sub>2-de</sub>]—*qi ma qi-de* ‘ride horse ride-De’; (107b) has identical [V<sub>1-de</sub>] and [V<sub>2-de</sub>]—*qi-de* ‘ride-de’. If we elide [VP<sub>1</sub> V<sub>1-de</sub>] or [VP<sub>2</sub> V<sub>2-de</sub>] in (107a), we have (108a) and (108b).

- (108) a. [Jack ~~qi~~—~~ma~~—~~qi-de~~]<sub>CP1</sub> bi [Jill qi ma qi-de]<sub>CP2</sub>  
 ride horse ride-de ride horse ride-De  
 kuai yixie.  
 fast some

‘Jack rides a horse a little faster than Jill does.’

- b. [Jack qi ma qi-de]<sub>CP1</sub> bi [Jill ~~qi~~—~~ma~~—~~qi-de~~]<sub>CP2</sub>  
 ride horse ride-de ride horse ride-de  
 kuai yixie.  
 fast some

‘Jack rides a horse a little faster than Jill does.’

If we elide either [V<sub>1-de</sub>] or [V<sub>2-de</sub>] in (107b), we have (109a) and (109b):

- (109) a. [Jack qi ma ~~qi-de~~<sub>CP1</sub> bi [Jill qi niu qi-de]<sub>CP2</sub>  
 ride horse ride-de ride cow ride-de  
 kuai yixie.  
 fast some  
 ‘Jack rides a horse a little faster than Jill rides a cow.’
- b. [Jack qi ma qi-de]<sub>CP1</sub> bi [Jill qi niu ~~qi-de~~<sub>CP2</sub>  
 ride horse ride-De ride cow ride-de  
 kuai yixie.  
 fast some  
 ‘Jack rides a horse a little faster than Jill rides a cow.’

Adverbial comparatives assume the form in (110), if neither VP<sub>1</sub> and VP<sub>2</sub> nor V<sub>1</sub> and V<sub>2</sub> are identical. (110) has four components: a clausal CP<sub>1</sub> consisting of a DP<sub>1</sub> and VP<sub>1</sub>, a clausal standard of comparison CP<sub>2</sub>, consisting of a DP<sub>2</sub> and VP<sub>2</sub>; (iii) a bare adverb, and (iv) an optional differential.

- (110) DP<sub>1</sub> VP<sub>1</sub> bi DP<sub>2</sub> VP<sub>2</sub> Adverb (Differential)  
 (qu niuyue), [cheng huoche]<sub>CP1</sub> bi [kai che]<sub>CP2</sub> kuai yixie  
 (go New York) take train drive car fast some  
 To go to New York, taking train is faster than driving.

To summarize, in this section we have described three patterns of Chinese adverbial comparatives in (105), (107), and (110). Given the three patterns, it is easy to see that adverbial comparatives, different from adjectival comparatives and DVCs, are clausal comparatives. In the following section, we show that there are more differences between adverbial comparatives and DVCs.

### 2.5.2 DVCs ≠ Chinese adverbial comparatives

Adverbial comparatives differ from DVCs in the following aspects. First, while most adverbs are allowed in adverbial comparatives, only a restricted number of adverbs are allowed in DVC constructions. To my knowledge, there are only four of them: *duo* ‘much/many’, *shao* ‘little/few’, *zao* ‘early’ and *wan* ‘late’, as shown in (111).

- (111) a. Jack bi Jill ***duo*** du-le liang ben xiaoshuo.  
 much read-asp 2 Cl novel  
 ‘Jack read 2 more novels than Jill did.’
- b. Jack bi Jill ***shao*** du-le liang ben xiaoshuo.  
 much read-asp 2 Cl novel  
 ‘Jack read 2 less novels than Jill did.’
- c. Jack bi Jill ***zao*** lai-le 20 fenzhong.  
 early come-asp minute  
 ‘Jack arrived 20 minutes earlier than Jill.’
- d. Jack bi Jill ***wan*** lai-le 20 fenzhong.  
 late come-asp minute  
 ‘Jack came 20 minutes later than Jill did.’

Other adverbs like *kuai* ‘fast’ or *man* ‘slow’ cannot be used to form DVCs, as shown in

(112):

- (112) a. \*Jack bi Jill ***kuai*** du-le zhe liang ben xiaoshuo.  
 fast read-asp this 2 Cl novel  
 Intended meaning: ‘Jack read these 2 novels faster than Jill did.’

- b. \*Jack bi Jill *man* du-le zhe liang ben xiaoshuo.  
 slow read-asp this 2 Cl novel

Intended meaning: ‘Jack read these 2 novels slower than Jill did.’

The examples in (112) have to be expressed in the form of adverbial comparatives as in (113a) and (113b):

- (113) a. Jack bi Jill du zhe liang ben xiaoshuo  
 read this 2 Cl novel  
 du-de *kuai*.  
 read-de fast.

‘Jack read these two novels faster than Jill did.’

- a. Jack bi Jill du zhe liang ben xiaoshuo  
 read this 2 Cl novel  
 du-de *man*.  
 read-de slow.

‘Jack read these two novels slower than Jill did.’

Second, unlike the adjective *duo* in (114) and the adverb *duo* in (115), *duo* in DVCs *cannot* be modified by any degree modifier, indicating its semantics is not related to degrees (ex.116).

- (114) a. Jack you *hen duo* (de) xiaoshuo. **Adjectival *duo***  
 have very much De novel

‘Jack has a lot of novels.’

- b. canjia huiyi de ren *hen duo*.  
 attend conference De people very much

‘There are a lot of people attending this conference.’

- (115) Jack du shu du-de *hen duo.* **Adverbial duo**  
 read book read-De very much

‘Jack read books a lot.’

- (116) \*Jack *hen duo* du-le zhe ben shu. **duo in DVCs**  
 very much read-asp this Cl book

Intended meaning: ‘Jack read this book a lot.’

Finally, differentials of adverbial comparatives can only be measure phrases (ex.117), parallel to those of adjectival comparatives, but differentials of DVCs do not have to be measure phrases (ex.118).

(117) Adverbial Comparatives<sup>22</sup>

- a. ?Jack bi Jill du shu du-de duo liang xiaoshi.  
 read book read-De much 2 hours

‘Jack spent two more hours reading books than Jill did.’

- b. ?Jack bi Jill kan dianying kan-de duo liang ci.  
 watch movie watch-De much 2 time

‘Jack watched movies twice more than Jill did.’

(118) Differential Verbal Comparatives

- a. Jack bi Jill duo du-le liang xiaoshi (de) shu.  
 much read-asp 2 hour book

‘Jack spent two more hours reading books than Jill did.’

<sup>22</sup> To most native speakers I consulted with, the adverbial comparatives in (117) sound a bit awkward compared to the DVC in (118). The intuition here is that it is more common to use DVC rather than adverbial comparatives to express differentials that are related to individuals or events.

b. Jack bi Jill duo kan-le liang ci dianying  
 much watch-asp 2 Cl movie

‘Jack watched movies twice more than Jill did.’

Based on the comparison above, we can safely conclude that adverbial comparatives are distinct from DVCs. In the following section, we show that the pattern of adverbial comparatives is parallel to that of adjectival comparatives, and as such the former can be given a degree-based analysis.

### 2.5.3 The semantics of Chinese adverbial comparatives

Adverbial comparatives and adjectival comparatives share a similar pattern. Comparing the pattern of adjectival comparatives in (119) to that of adverbial comparatives in (120), they differ in whether the subject and the standard of comparison are clausal. Adjectival comparatives have a phrasal subject and a phrasal standard of comparison; adverbial comparatives have a clausal subject and a clausal standard of comparison.

(119) Adjectival comparatives

DP <sub>1</sub>		<i>bi</i> DP <sub>1</sub>		Adjective		(Differential)
-----------------	--	---------------------------	--	-----------	--	----------------

Jack bi Jill gao liang yingcun.

Jack Jill tall 2 inch

‘Jack is 2 inches taller than Jill is.’



## (120) Adverbial comparatives

CP <sub>1</sub>		bi CP <sub>2</sub>		Adverb		(Differential)
[Jack du shu du-de ] <sub>CP1</sub>	bi	[Jill du shu du-de] <sub>CP2</sub>				
read book read-De		read book read-De				
		duo liang xiaoshi.				
		much 2 hours				

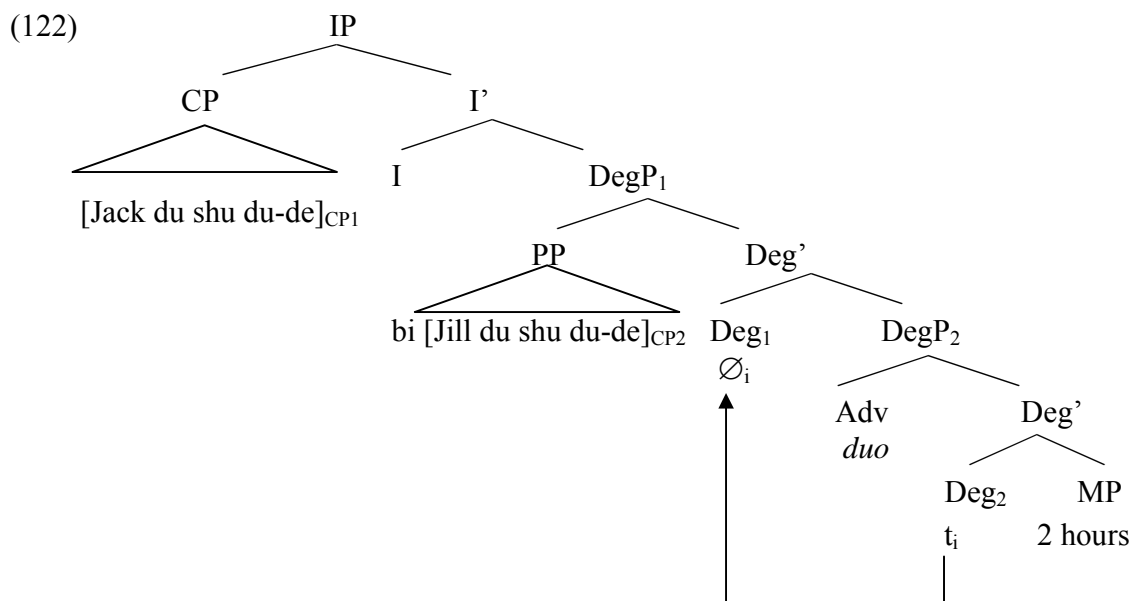
‘Jack read books more than Jill did.’

Given the similarity, we propose that the adverbial comparative in (121a), which is derived from (121b) through eliding [V<sub>1</sub>-de], has the syntactic structure in (122).

(121) a.	Jack	bi	Jill	du	shu	du-de	duo	liang	xiaoshi.	
					read	book	read-De	much	2	hours

‘Jack read books more than Jill did.’

b.	[Jack	<del>du</del>	<del>shu</del>	<del>du-de</del>	] <sub>CP1</sub>	bi	[Jill	du	shu	du-de] <sub>CP2</sub>
								read	book	read-De
								read	book	read-De
								duo	liang	xiaoshi.
								much	2	hours



The structure in (122) is similar to that of adjective comparatives in (37b) in that they both involve a DegP shell structure. In (122), the head Deg takes three syntactic arguments: (i) a standard of comparison—*bi* [Jill du shu du-de]<sub>CP2</sub>, (ii) an adverb—*duo*, and a differential measure phrase *liang xiaoshi* ‘2 hours’.

Semantically, adverbial comparatives can be also interpreted in a similar way as adjectival comparatives, except for the following two differences. First, *duo* ‘much’ in adjectival comparatives denotes a measure function from individual  $x$  to the cardinality of  $x$  (of type  $\langle e, d \rangle$ ), but in adverbial comparatives it denotes a measure function from a set of events  $E$  to a degree  $d$  such that  $d$  is the duration of  $E$  (ex.123a). Second, Deg  $\emptyset$  in adjectival comparatives compares two degrees derived from applying a measure function to two sets of individuals. In adverbial comparatives,  $\emptyset$  compares two degrees derived from applying a measure function to two sets of events. (ex.123b). In (122), the subject CP<sub>1</sub> denotes a set of events of Jack reading books (ex.123c), and the standard of comparison CP<sub>2</sub> denotes a set of events of Jill reading books (ex.123d). When  $\emptyset$



### **2.5.4 Summary**

To summarize, in this section we described the patterns of adverbial comparatives and contrasted them with the patterns of adjective comparatives and DVCs. We argued that adverbial comparatives have a semantic interpretation similar to that of adjectival comparatives, but distinct from that of DVCs.

## **2.6 Conclusion**

In this chapter, we discussed three types of Chinese comparatives: DVCs, adjectival comparatives and adverbial comparatives. We argued that DVCs, unlike adjectival and adverbial comparatives, should not be given a degree-based analysis, because their differentials, unlike those of adjectival and adverbial comparatives, are not degree-denoting expressions. Based on this evidence, we motivated an analysis of DVCs based on bijections. In our analysis, differentials in DVCs receive a consistent syntax and semantics as their counterparts in non-comparative contexts.

## Chapter 3

### The Semantics of *sugi-* in Japanese\*

#### 3.1 Introduction

Japanese has an intransitive verb *sugi-* ‘to pass, to exceed’ (ex.1). It attaches to other verbs or adjectives and adds an excessive meaning (ex.2) (Nakanishi 2004a, b).

- (1)           Simekiri-ga     *sugi*-ta.  
                   Deadline-nom   exceed-past  
                   ‘Deadline has passed.’
- (2)    a.     Kono   sukaato-ga   naga-*sugi*-ru.  
                   this   skirt-nom    long-exceed-present  
                   ‘This skirt is too long.’
- b.     John-ga     ne-*sugi*-ta.  
                   John-nom    sleep-exceed-past  
                   ‘John slept too much.’

When measure phrases such as *san inchi* ‘3 inches’ (ex.3a) and *san jikan* ‘3 hours’ (ex.3b) are used in *sugi*-constructions, they can be interpreted as differentials which describe the difference between two degrees in comparison. For instance, (3a) means that the length of this skirt  $d$  exceeds by 3 inches some contextually determined standard  $d_s$ . (3b) means that the duration of the time that John slept  $d$  exceeds some contextually determined standard  $d_s$  by 3 hours.

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\*I would like to thank my informants Ken Hiraiwa, Koichi Nishitani, Koji Kawahara, Sachie Kotani and Shigeto Kawahara for the discussion of the Japanese data.

- (3) a. Kono sukaato-ga *san inchi* naga-*sugi*-ru.  
 this skirt-nom 3 inch long-exceed-present  
 ‘This skirt is 3 inches too long.’
- b. John-ga *san jikan* ne-*sugi*-ta.  
 John-nom 3 hour sleep-exceed-past  
 ‘John slept 3 hours too long.’

What is interesting about *sugi*-constructions is that when Floating Numeral Quantifiers (FNQs) occur in *sugi*-constructions, they can also be interpreted as differentials, as shown in (4) (Nakanishi 2004a, b).

- (4) a. John-ga [**hon san-satu**]-o kinoo yomi-*sugi*-ta. Non-FNQ  
 John-nom book 3-CL-acc yesterday read-exceed-past  
 ‘John over-read (the) 3 books yesterday.’
- b. John-ga [**hon**]-o kinoo **san-satu** yomi-*sugi*-ta. FNQ  
 John-nom book-acc yesterday 3-CL read-exceed-past  
 (i) ‘John over-read (the) 3 books yesterday.’  
 (ii) ‘John overdid the reading by 3 books yesterday’

In (4a) *san-satu* ‘3 CL’ is a post-nominal modifier of the NP *hon* ‘book’; in (4b) it is a FNQ, which is separated from the host NP *hon* ‘book’ by the temporal adverb *kinoo* ‘yesterday’. While both (4a) and (4b) receive the interpretation: ‘John over-read (the) 3 books yesterday’, (4b) receives an additional interpretation, which is more salient: ‘Yesterday John overdid the reading by 3 books’. In this reading, the FNQ *san-satu* ‘3 CL’ is a differential which describes the difference between the actual reading and the required reading.

FNQs in non-*sugi*-contexts like *san-satu* ‘3 CL’ in (5b) are not degree-denoting expressions, unlike measure phrases. They are VP-adverbs and quantifiers, which quantify over sets of individuals denoted by VPs (Fukushima 1991, Junker 1990, and Kobuchi-Philip 2003, 2007).

- (5) a. John-ga [hon san-satu]-o kinoo yonda. Non-FNQ  
 John-nom book 3-CL-acc yesterday read-past  
 ‘John read 3 books yesterday.’
- b. John-ga [hon]-o kinoo san-satu yonda. FNQ  
 John-nom book-acc yesterday 3-CL read-past  
 ‘John read 3 books yesterday.’

Therefore, we have two types of differentials in *sugi*-constructions: degree-denoting measure phrases and non-degree denoting FNQs. The standard degree-based analyses of comparatives analyze comparatives as a comparison of degrees. They predict that differentials in comparatives must be degree-denoting expressions, e.g., measure phrases. This raises a series of questions: how should we analyze FNQs in *sugi*-constructions? Should we treat them as a type of measure phrase, or as VP quantifiers like in non-*sugi* contexts? If we analyze FNQs in *sugi*-constructions as VP-adverbs and quantifiers, what is the semantics of *sugi*-?

This chapter aims to provide answers to the above questions. We assume that FNQs have the same syntax and semantics in *sugi*- and non-*sugi*-constructions. Based on this assumption, we propose that *sugi*- is an intensional operator which compares a set of individuals, events or degrees in the actual world to that in the closest possible world to the actual world where the relevant requirements are met. We show that the ambiguity of

(4b) results from a choice between two syntactic structures, each of which is associated with a different scope relation between *sugi-* and *san-satu* ‘3 CL’. When *san-satu* scopes below *sugi-*, the first reading arises, and when *san-satu* scopes above *sugi-*, the second reading arises. (4a) is only related to one syntactic structure, where the whole DP *hon san-satu* ‘book 3 CL’ resides below *sugi-*.

This chapter is structured as follows. Section 3.1 is an introduction. In section 3.2, I lay out the major syntactic and semantic assumptions for my analysis. In section 3.3, I describe the meaning of *sugi-*, and use it to explain the contrast between (4a) and (4b). In section 3.4, I review a previous analysis of *sugi-* by Nakanishi (2004a, b), and compare my analysis to hers. In section 3.5, I discuss an asymmetry between subject-oriented FNQs and object-oriented FNQs in *sugi*-sentences. Section 3.6 is a conclusion.

## **3.2 The Syntactic and semantic assumptions**

### **3.2.1 The syntax and semantics of the FNQ**

I assume that FNQs in *sugi*-constructions have the same syntax and semantics as in non-*sugi* constructions. Syntactically FNQs in Japanese are base-generated vP or VP adverbs. Semantically, they are quantified expressions<sup>23</sup>.

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<sup>23</sup>Miyagawa (1989) has a different syntactic analysis of FNQ; Fukushima (1991), McClure (1999), and Nakanishi (2003, 2004b, 2007) have different semantic analyses of FNQ. The differences between these analyses do not matter here.



### 3.2.1.1 The syntax of the FNQ

FNQs receive different analyses depending on the syntactic position of their host NPs. FNQs whose host NPs are subjects are referred to as Subject-oriented FNQs (ex.6a) and those whose host NP are objects are referred to as Object-oriented FNQs (ex.6b).

#### (6) Subject-oriented FNQ

- a. **Gakusei-ga** kinoo **san-nin** sono miitingu-ni sankasi-ta.  
 student-nom yesterday 3-Cl that meeting-in participate-past  
 ‘Three students participated in that meeting yesterday.’

(Nakanishi 2004)

#### Object-oriented FNQ

- b. John-ga **hon-o** kinoo **san-satu** yonda.  
 John-nom book-acc yesterday 3-Cl read-past  
 ‘John read 3 books yesterday.’

(From Ken Hiraiwa p.c.)

Subject-oriented and object-oriented FNQs represent two different kinds of adverbs (Kobuchi-Philip 2003, 2007). Subject-oriented FNQs are sentential adverbs (vP adverbs). They can be coordinated with sentential adverbs such as *tashikani* ‘certainly’ (ex. 7a), and *kotogotoku* ‘entirely’ (ex.7b). Object-oriented FNQs are VP adverbs. They can be coordinated with VP-adverbs such as *kireini* ‘cleanly’ (ex.8a) and *sude-de* ‘bare hand-with’ (ex.8b).

- (7) a. **Shoonin-ga**, [**san-nin**] katsu [tashikani] sono jiko-o mokugekishita.  
 Witness-nom 3-Cl and certainly the accident-acc witnessed  
 FNQ Adv  
 ‘Three witnesses witnessed the accident for certain.’
- b. **Terorisuto-ga**, [**juu-nin**] katsu [kotogotoku] taihos-are-ta  
 terrorist-nom 10-Cl and entirely arrest-pass-past  
 FNQ Adv  
 ‘All ten terrorist were arrested.’
- (8) a. Mary-ga **raamen-o**, [**san-bai**] katsu [kireini] tairageta.  
 Mary-nom soup-acc 3-Cl and cleanly ate up  
 FNQ Adv  
 ‘Mary ate up three bowls of soup noodles completely.’
- b. John-ga **ita-o**, [**go-mai**] katsu [sude-de] watta.  
 John-nom plank-acc 5-Cl and bare hand-with split  
 FNQ Adv  
 ‘John split five planks bare handedly just now.’

(Kobuchi-Philip 2003)

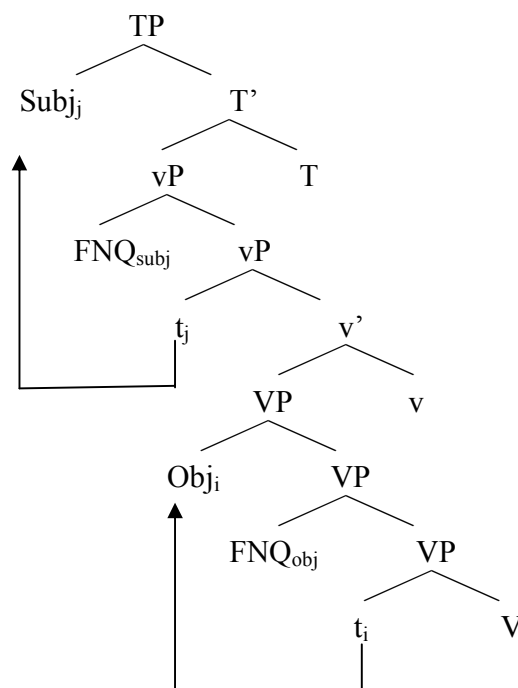
Subject-oriented and object-oriented FNQs also differ in whether they can be part of a VP cleft (Nakayama and Koizumi 1991, Fujita 1994). Subject-oriented FNQs and sentential adverbs *cannot* be clefted along with a VP (ex.9b), but object-oriented FNQs and manner adverbs can (ex.10b):

- (9) a. **Kodomotachi-ga**, **go-nin**/tashikani piza-o tabeta  
 Children-nom 5-Cl certainly pizza-acc ate  
 FNQ/ Adv  
 ‘Five children ate pizza./Children certainly ate pizza.’
- b. \***Kodomotachi-ga** shita-no-wa  
 children-nom did-comp-top  
 [**go-nin**/tashikani piza-o taberu-koto]-dat-ta.  
 5-Cl certainly pizza-acc eat-comp-cop-past  
 ‘What children did was (\*five/\*certainly) eat pizza.’
- (10) a. John-ga **piza-o**, **ni-mai**/isoide tabeta.  
 John-nom pizza-acc 2-Cl hurriedly ate  
 FNQ/ Adv  
 ‘John ate two slices of pizza./John ate pizza in a hurry.’
- b. John-ga shita-no-wa [**piza-o ni-mai**/isoide taberu-koto]-da-tta.  
 John-nom did-comp-top pizza-acc 2-Cl hurriedly eat-comp-cop-past  
 FNQ/ Adv  
 ‘What John did was eat two slices of pizza/ what John did was eat pizza in a hurry.’

(Kobuchi-Philip 2003)

Based on the evidence of coordination (ex.7-8) and VP-cleft (ex.9-10), Kobuchi-Philip concludes that subject-oriented FNQs are base-generated vP- adverbs, parallel to *tashikani* ‘certainly’ and *kotogotoku* ‘entirely’; object-oriented FNQs are base-generated VP-adverbs, parallel to *isoide* ‘hurriedly’. Their syntax is shown in the structure in (11):

(11)



(Kobuchi-Philip 2003)

In (11), the subject-oriented FNQ is adjoined to the  $vP$  node, and the object-oriented FNQ is adjoined to the  $VP$  node. The subject NP is moved from the spec  $vP$  to the spec TP to create a c-commanding relation between the subject-oriented FNQ and the subject trace. The object NP is also moved to adjoin to the  $VP$  to create a c-commanding relation between the object-oriented FNQ and the object trace. The three elements--the FNQ, host NP and traces, are co-indexed.

The co-indexation of the FNQ, host NP and traces is due to a special constraint described by Doetjes (1997) as a licensing condition for the occurrence of any floating quantifiers (FQs). It says: FQs must govern the traces created by the movement of their host NPs, as shown in (12):

(12)  $[XP \quad FQ_i \quad [XP \dots t_i \dots]]$  (XP is generally VP)

This constraint of co-indexation explains the agreement relation between the FQ and the host NP in languages like French and German, as shown in (13) and (14):

## (13) French

a. \***Elles** sont **tous** allées à la plage.

They(f) have all(m) gone to the beach

‘They (the woman) all went to the beach.’

b. **Elles** sont **toutes** allées à la plage.

They(f) have all(f) gone to the beach

## (14) German

a. Peter hat seinen **Freunden** **allen/\*alle** ein buch gegeben.

Peter has his friends(Dat) all(Dat)/all (Acc) a book given

‘Peter gave all of his friends a book.’

b. Peter hat seine **Freunde** **\*allen/alle** gesehen.

Peter has his friends (Acc) all(Dat)/all (Acc) seen

‘Peter has seen all of his friends.’

(Doetjes 1997)

In (13), the French FQ *tous* ‘all’ agrees with its host NP in gender. In (14) the German FQ *alle* ‘all’ agrees with its host NP in case. Assuming that the relation of co-indexation induces an agreement in phi-features, the agreement between the FQ and the host NP in French and German can be explained.

### 3.2.1.2 The semantics of the FNQ

#### 3.2.1.2.1 The distributive reading of the FNQ

It has often been observed that in Japanese, FNQs are associated with a distributive reading (ex. 15) (Terada 1990, Kitagawa and Kuroda 1992, Kato 1997, Sasaki Alam 1997, Ishii 1998, Nakanishi 2003, 2004b, Kobuchi-Philip 2003, 2007).

- (15) a. [Gakusei san-nin]<sub>NP</sub>-ga sono mise-de terebi-o katta. Non-FNQ  
 Students 3-Cl - nom the store-at tv-acc bought  
 ‘Three students bought a TV set at the store.’
- b. Gakusei-ga sono mise-de, san-nin terebi-o katta. FNQ  
 Student-nom the store-at 3-Cl tv-acc bought  
 ‘Three students (each) bought a TV set at the store.’

(Kobuchi-Philip 2003)

(15b) minimally differs from (15a) in the position of *san-nin* ‘3 Cl’, and they have different truth conditions. (15a) is true in the following three situations: (i) three students together bought a TV set (a collective reading); (ii) some of the students each bought a TV set while others bought a TV set together (a partially collective reading); (iii) each of the three students bought a TV set (a distributive reading). (15b) is true only in the third situation where three students *each* bought a TV set. Therefore, non-FNQs are ambiguous between a collective reading, a partially collective reading, and a distributive reading. FNQs have only one reading, a distributive reading.

The distinction between FNQs and non-FNQs is clear in (16) where the predicate is *korosi* ‘kill’.

- (16) a. [Gakusei san-nin]-ga kinoo Peter-o korosi-ta.  
 [student three-CL]-nom yesterday Peter-acc kill-past  
 ‘Three students killed Peter yesterday.’
- b. ?? Gakusei-ga kinoo san-nin Peter-o korosi-ta.  
 student-nom yesterday three-CL Peter-acc kill-past

(Kobuchi-Philip 2003)

The non-FNQ *san-nin* is compatible with *korosi* ‘kill’ (ex.16a) because the sentence can receive a collective reading: ‘Yesterday 3 students together killed Peter.’ The FNQ *san-nin* is pragmatically incompatible with *korosi* ‘kill’ (ex.16b), because the only reading that (16b) has is ‘3 students *each* killed Peter yesterday.’

### 3.2.1.2.2 Kobuchi-Philip (2003, 2007)

Various semantic analyses have been proposed to capture the association between FNQs and their distributive readings (Fukushima 1991, Junker 1990, Nakanishi 2003, and Kobuchi-Philip 2003, 2007). In this section we review Kobuchi-Philip (2003, 2007)’s analysis.

Kobuchi-Philip argues that FNQs and non-FNQs are quantified expressions, where the quantifier is a numeral and the two semantic arguments are a classifier and a NP or a vP predicate. In the non-FNQ example [*Gakusei san-nin*]<sub>NP</sub> ‘3 students’ in (17a), *san* is a quantifier, which takes two arguments: the classifier *nin* and the NP *gakusei* ‘student’. In the FNQ example [*san nin terebi-o kata*]<sub>vP</sub> ‘3 (students) bought a TV set’ in (17b), *san* is still a quantifier, which takes two arguments: the classifiers *nin* and the vP *terebi-o katta* ‘TV bought’. This is shown in (18).

- (17) a. [**Gakusei san-nin**]<sub>NP</sub> -ga sono mise-de terebi-o katta. Non-FNQ  
 Students three-Cl - nom the store-at tv-acc bought  
 ‘Three students bought a TV set at the store.’
- b. **Gakusei-ga** sono mise-de, **san-nin** terebi-o katta. FNQ  
 Student-nom the store-at 3-Cl tv-acc bought  
 ‘Three students (each) bought a TV set at the store.’

(18)

		Quantifier	1 <sup>st</sup> Argument	2 <sup>nd</sup> Argument
a.	Non-FNQ	san 3	nin Cl	[gakusei] <sub>NP</sub> student
b.	FNQ	san 3	nin Cl	[terebi-o katta] <sub>VP</sub> TV bought

Let us begin with the pattern in (18b). Kobuchi-Philip proposes that the numeral *san* ‘3’ has the interpretation in (19). It takes 3 arguments: the property argument  $C$  denoted by a classifier, the property argument  $P$  denoted by a NP or vP, and an individual argument  $x$ . (19) has 3 conjuncts. The first conjunct says that  $K$  is a set of objects, which is contained in the intersection of the classifier denotation and the predicate denotation. The second conjunct says that the number of elements contained in  $K$  must be no less than 3. The last conjunct says that the supremum generated by the elements in  $K$  is identified with an object  $x$ .<sup>24</sup>

$$(19) \quad || 3 || = \lambda C_{\langle e, t \rangle} \lambda P_{\langle e, t \rangle} \lambda x_e \exists K_{\langle e, t \rangle} [K \subseteq (C \cap P) \wedge |K| \geq 3 \wedge \sqcup K = x]$$

Where  $C$  = classifier denotation and  $P$  = predicate denotation.

<sup>24</sup> A supremum which is generated by a set of individual students, for example  $\{a, b, c\}$ , is a sum  $a \sqcup b \sqcup c$ . ‘ $\sqcup$ ’ is a sum operator which creates sums by combining (joining) an object or sum, with another object or sum.



A classifier denotes a set of atomic individuals. For instance, *nin* classifies human beings. It denotes a set of atomic *nin* individuals, as shown in (20a). The vP predicate *terebi-o katta* ‘TV bought’ denotes a set of individuals who bought TVs, as shown in (20b):

- (20) a.  $\| \textit{nin} \| = \lambda x_e [\textit{nin}'_{AT}(x)] = \textit{nin}'_{AT}$   
 b.  $\| \textit{terebi-o katta} \| = \lambda z_e \textit{terebi-o katta}'(z) = \textit{terebi-o katta}'$

When the numeral *san* ‘3’ combines the classifier denotation in (20a) and the vP denotation in (20b), the result is in (21). It is a function true of  $x$ , just in case  $x$  is the sum of 3 or more atomic *nin* individuals who are TV-buyers.

- (21)  $\| \textit{san nin terebi-o katta} \| =$   

$$\lambda x_e \exists K_{\langle e,t \rangle} [K \subseteq (\textit{nin}'_{AT} \cap \textit{terebi-o katta}') \wedge |K| \geq 3 \wedge \sqcup K = x]$$

In (18b), the host NP *gakusei* ‘student’ is assumed to be modified by a null determiner  $\emptyset$  (ex.22a). They form a DP  $[\emptyset \textit{gakusei}]_{DP}$ , and has the interpretation in (22b).

- (22) a.  $\| \emptyset \| = \lambda P_{\langle e,t \rangle} \lambda Q_{\langle e,t \rangle} \exists y [P(y) \wedge Q(y)]$   
 b.  $\| \emptyset \textit{gakusei} \| = \lambda Q_{\langle e,t \rangle} \exists y [\textit{gakusei}'(y) \wedge Q(y)]$

When the vP predicate  $[\textit{san-nin terebi-o katta}]_{vP}$  in (21) composes with the host DP  $[\emptyset \textit{gakusei}]_{DP}$ , the sentence in (17b) receives the interpretation in (23):

- (23)  $\| \emptyset \textit{gakusei san nin terebi-o katta} \| =$   

$$\exists y [\textit{gakusei}'(y) \wedge \exists K_{\langle e,t \rangle} [K \subseteq (\textit{nin}'_{AT} \cap \textit{terebi-o katta}') \wedge |K| \geq 3 \wedge \sqcup K = y]]$$

(23) says: there is a set  $K$  which is a subset of the set of individual people who bought TVs. The number of the elements of  $K$  is no less than 3. The supremum of  $K$  is  $y$  which has the property of being students. The distributive reading associated with FNQs results from intersecting the denotation of a classifier with that of a vP predicate. Since a

classifier denotes a set of atomic individuals, its intersection with other sets must be atomic as well, yielding ditributivity.

Comparing *san* ‘3’ in the non-FNQ to *san* ‘3’ in the FNQ, they differ in the second argument that *san* ‘3’ takes. *san* ‘3’ in the non-FNQ composes with a classifier denotation and a NP denotation (ex.24a), and the result is a function true of  $x$ , just in case  $x$  is the sum of 3 or more atomic *nin* individuals who are students, as shown in (24b):

- (24) a.  $\| \text{gakusei} \| = \lambda z_e. \text{gakusei}'(z) = \text{gakusei}'$   
 b.  $\| \text{gakusei san nin} \| = \lambda x_e \exists K_{\langle e,t \rangle} [K \subseteq (\text{nin}'_{AT} \cap \text{gakusei}') \wedge |K| \geq 3 \wedge \cup K = x]$

Assuming that  $[\text{gakusei san-nin}]_{NP}$  is modified by a null determiner  $\emptyset$ ,  $[\emptyset \text{gakusei san nin}]_{DP}$  thus has the interpretation in (25b).

- (25) a.  $\| \emptyset \| = \lambda P_{\langle e,t \rangle} \lambda Q_{\langle e,t \rangle} \exists y [P(y) \wedge Q(y)]$   
 b.  $\| \emptyset \text{gakusei san nin} \| = \lambda Q_{\langle e,t \rangle} \exists y$   
 $[\exists K_{\langle e,t \rangle} [K \subseteq (\text{nin}'_{AT} \cap \text{gakusei}') \wedge |K| \geq 3 \wedge \cup K = y] \wedge Q(y)]$

When (25b) combines with the VP  $[\text{terebi-o katta}]_{VP}$  ‘tv bought’, the sentence in (17a) receives the interpretation in (26):

- (26)  $\| \emptyset \text{gakusei san nin terebi-o katta} \| =$   
 $\exists y [\exists K_{\langle e,t \rangle} [K \subseteq (\text{nin}'_{AT} \cap \text{gakusei}') \wedge |K| \geq 3 \wedge \cup K = y] \wedge \text{terebi katta}'(y)]$

(26) says: there is a set  $K$  which is a subset of the set of individual students. The number of the elements of  $K$  is no less than 3. The supremum of  $K$  is  $y$  which has the property of being TV buyers. The sentence in (26) is ambiguous between a distributive, a partially collective and a collective reading, because, although the logical representation in (26) describes a distributive reading, a re-analysis may apply to  $\cup K$  in this to yield a partially collective or a collective reading (see details in Kobuchi-Philip 2006).

### 3.2.2 The syntax of *sugi-*

The form of [V-*sugi*] is traditionally analyzed as a type of V<sub>1</sub>-V<sub>2</sub> compound which has the structure in (27): the accusative NP is the object of V<sub>1</sub>. V<sub>2</sub> takes V<sub>1</sub> and its object as its complement (Koizumi 1998).

(27) [... [... Obj V<sub>1</sub>] V<sub>2</sub>]

V<sub>2</sub> in V<sub>1</sub>-V<sub>2</sub> compounds can be either a raising verb or a control verb. If V<sub>2</sub> is a raising verb, the sentence is ambiguous between two readings: one with the object scoping above V<sub>2</sub> and the other with the object scoping below V<sub>2</sub> (ex.28a). If V<sub>2</sub> is a control verb, the sentence only receives one interpretation, in which the object scopes above V<sub>2</sub> (ex. 28b).

- (28) a. John-ga ringo-dake-o tabe-hazime-ta. V<sub>1</sub>- V<sub>raising</sub>  
 John-nom apple-only-acc eat-start-past  
 i. only > start (it is only apples that John started to eat)  
 ii. start > only (it is eat only apples that John started to do)
- b. John-wa ringo-dake-o tabe-wasure-ta. V<sub>1</sub>- V<sub>control</sub>  
 John-top apple-only-acc eat-forget-past  
 i. only > forget (Among many things John was supposed to eat, it is only apples that he forgot to eat.)  
 ii. \* forget > only

(Koizumi 1998)

With the test, Koizumi shows that *sugi-* is a raising verb, because V<sub>1</sub>-*sugi* is ambiguous between two readings, each of which has a different scope between *sugi-* and the object:

(29) John-wa niku-dake-o tabe-sugi-ta.

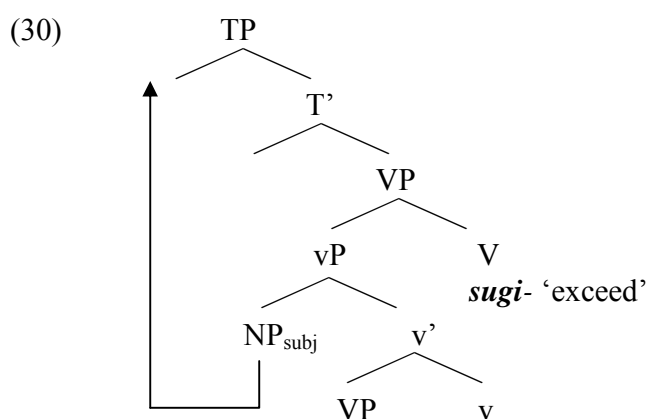
John-top meat-only-acc eat-exceed-past

i. only > sugi (Among many things John ate, it is only meat that he overate)

ii. sugi > only (For too long time, John ate nothing but meat)

(Koizumi 1998)

Therefore, *sugi*-constructions have the structure in (30), where *sugi* takes a sentential complement vP and creates a VP. The subject of the vP is raised to the spec of TP to receive a nominative case. (Sugioka 1985, Kageyama and Yumoto 1997, and Koizumi 1998):



### 3.2.3 Summary

To summarize, in this section we reviewed the syntactic and semantic assumptions in our analysis of *sugi*-. These assumptions are recapped in (31):

(31) *Syntax*:

a. Japanese FNQs are base-generated adverbs: subject-oriented FNQs are vP-adverbs, and object-oriented FNQs are VP adverbs.

b. *sugi*- is a raising verb, which takes a vP-complement.

*Semantics:*

- c. FNQs are quantified expressions, where numerals are quantifiers and classifiers provide a domain of quantification.

In the following section, we propose a semantic analysis of *sugi-* which, when combined with these assumptions, explains the differences between (4a) and (4b).

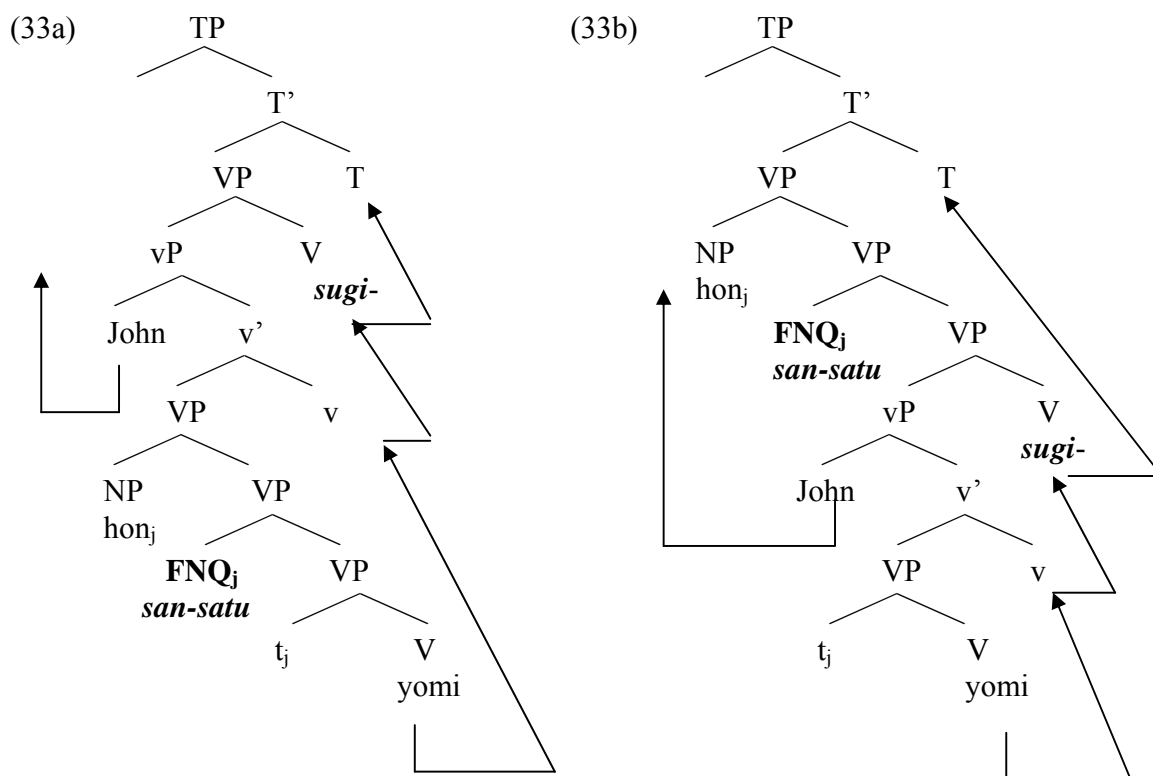
### 3.3 The analysis of *sugi-* constructions

#### 3.3.1 The syntax

We propose that (32a) (repeated from 4a) and (32b) (repeated from 4b) are syntactically distinct. (32a) has one syntactic structure, while (32b) has two.

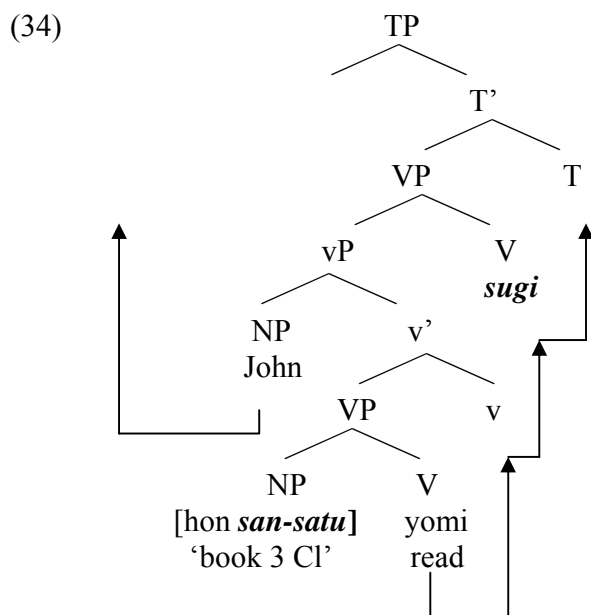
- (32) a. John-ga [hon san-satu]-o kinoo yomi-*sugi*-ta. Non-FNQ  
 John-nom book three-CL-acc yesterday read-exceed-past  
 ‘John over-read (the) 3 books yesterday.’
- b. John-ga [hon]-o kinoo san-satu yomi-*sugi*-ta. FNQ  
 John-nom book-acc yesterday 3-CL read-exceed-past  
 (i) ‘John over-read (the) 3 books yesterday.’  
 (ii) ‘John overdid the reading by 3 books yesterday.’

Given the assumptions of the syntax of the FNQ, *san-nin* ‘3 CL’ in (32b) is an object-oriented FNQ and a VP-adverb. *sugi-* is a raising verb, which takes a vP complement and creates a VP. These two assumptions predict that (32b) is ambiguous between the structure in (33a) and the structure in (33b). (33a) and (33b) is identical in every aspect except the position of the FNQ *san-satu*. In (33a) *san-nin* is adjoined to the VP below *sugi-*, while in (33b), it is adjoined to the VP above *sugi*.



The diagrams in (33a) and (33b) represent the two syntactic structures of (32b). To achieve the right surface order, the subject NP *John* needs to raise from the spec vP to the spec TP. The verb *yomi* ‘read’ also has to undergo a number of successive head-to-head movements till it reaches the head of the TP.

The syntactic structure of (32a) is given in (34):



(34) differs from the structures in (33a-b) in the position of *san-satu*. *san-satu* in (34) is a post-nominal modifier; it forms a constituent with the NP *hon* ‘book’, and resides in the object position below *sugi-*.

In the following section, we will show how the semantic ambiguity of (32b) is derived from the two structures we proposed in (33). We argue that when *san-nin* is below *sugi-* (ex.33a), (32b) receives the interpretation: ‘John over-read (the) 3 books.’ When *san-nin* is above *sugi-* (ex.33b), it receives the interpretation: ‘John overdid the reading by 3 books.’ The structure in (34) has *san-nin* below *sugi-*, and it receives the reading: ‘John over-read (the) 3 books.’

### 3.3.2 The semantics

In this section we focus on the interpretations of the structures proposed in (33) and (34). In section 3.3.2.1, we argue that *sugi-* has an intensional meaning based on the fact that *sugi-*sentences can be paraphrased in terms of counterfactual conditionals. In section 3.3.2.2, we review Stalnaker's analysis of counterfactual conditionals. In Section 3.3.2.3 we lay out the derivations of the structures in (33) and (34). In Section 3.3.2.4 we consider the meaning of *sugi-* in various contexts.

#### 3.3.2.1 The intensionality of *sugi-*

*sugi-*constructions, like *too-*constructions in English (Meier 2003, Hacquard 2005, 2006 and references therein), have a comparative meaning. The interpretation of (32a) -- 'John over-read (the) three books' means: there are three books which John read more than he should have. (32b) has an additional interpretation: 'John overdid the reading by three books.' It means: John read more than he should have by three books. Both of these two interpretations entail that John violated some reading requirement, and they can be paraphrased by counterfactual conditionals in (35a-b)<sup>25</sup>:

- (35) a. If John had met the reading requirement, he would have done less reading of the three books.
- b. If John had met the reading requirement, he would have read three books less.

If we remove *sugi-*, the comparative meaning disappears. This is shown by (36).

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<sup>25</sup> von Stechow (1984) noted that *too-*constructions in English have the meanings of conditionals. For instance, 'This pack is at least fifty kilos too heavy to lift' means: If one could lift this pack, then it would be at least 50 kg less heavy than it actually is.



- (36) a. John-ga    **hon-o**    kinoo    **san-satu** yonda.  
           John-nom    book-acc    yesterday    3-Cl    read-past  
           ‘John read 3 books yesterday.’
- b. John-ga    [**hon san-satu**] -o    kinoo    yonda.  
           John-nom    book    3-Cl    -acc    yesterday    read-past  
           ‘John read 3 books yesterday.’

Based on (35) and (36), we propose that *sugi-* is an intensional operator which compares the actual world  $w$  to the closest possible world  $w'$  to the actual world where the relevant requirements are met. As such, our analysis of *sugi-* follows the possible world analysis of Stalnaker (1968, 1984). In the following section, we will review his analysis of counterfactual conditionals.

### 3.3.2.2 Interlude: the semantics of counterfactual conditionals

There are two prominent analyses of counterfactual conditionals in the literature: Stalnaker (1968, 1975, 1984), and Lewis (1973). We adopt Stalnaker (1968, 1984) in our analysis of *sugi-*.

Stalnaker’s analysis of counterfactual conditionals is based on the following test which is referred to as the Ramsey test (Stalnaker 1968).

*First add the antecedent (hypothetically) to your stock of beliefs; second, make whatever adjustments are required to maintain consistency (without modifying the hypothetical belief in the antecedent); finally, consider whether or not the consequent is then true.*

(37) If kangaroos had no tails, they would topple over.

(37) is an example of a counterfactual conditional, where the antecedent is *kangaroos had no tails*, and the consequent is *they would topple over*. According to the Ramsey test, we add the antecedent to our stock of beliefs. It turns out that the antecedent contradicts what we know about kangaroos. So we adjust our knowledge by modifying those beliefs which contradict the antecedent, and then evaluate the truth-value of the consequent – *they topple over* with respect to the adjusted stock of beliefs. If the consequent follows, (37) is true; otherwise it is false.

In formalizing the test, Stalnaker makes use of possible world semantics. His formal semantic apparatus includes the following elements:  $\langle M, R, f \rangle$ <sup>26</sup>.  $M$  is the set of all possible worlds;  $R$  is an accessibility relation among worlds.  $f$  is a selection function, which takes a proposition and a possible world as arguments and yields a possible world as its value. The propositional argument is the antecedent of counterfactual conditionals-- $A$ . The world argument  $\alpha$  is the world with respect to which the truth-value of a conditional is evaluated. We will refer to  $\alpha$  as the base world.

The possible world selected by the selection function  $f$  cannot be just any world. It must be the world which minimally differs from  $\alpha$ , where the antecedent is true. Assuming that the selection function establishes a total ordering of all possible worlds with respect to some base world, if world  $A$  is more similar to the base world than world  $B$  is, then we say that world  $A$  is *closer* to the base world than world  $B$  is. The world that

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<sup>26</sup> I left out from Stalnaker's system the element  $\lambda$ , which is an absurd world—the world in which contradictions and all their consequences are true.

bears the most resemblance to the base world is referred to as the *closest* possible world to the base world, and it is always the base world itself.

Summing up, the truth-conditions of counterfactual conditionals in Stalnaker's analysis can be formalized in (38):

(38) A counterfactual conditional  $A \square \rightarrow B$  is true in  $\alpha$  iff B is true in  $f(A, \alpha)$ :

a.  $f(A, \alpha) = \alpha$ , if A is true in  $\alpha$ .

b.  $f(A, \alpha) = w$ , if A is not true in  $\alpha$ .  $w$  is the closest world to  $\alpha$  where A is true.

(38a) says that  $f$  selects the base world as its value if the antecedent  $A$  is true in the base world. (38b) says that if the antecedent  $A$  is not true in the base world, then the selection function will select the *closest* possible world to the base world where the antecedent is true (or the closest  $A$ -world).

To see how (38) works for counterfactual conditionals, let us look at (39). (39a) is an example of counterfactual conditionals. (39b) provides the facts true in the base world where (39a) is evaluated. Suppose the base world is world  $\alpha$ .

(39) a. If it were not raining this morning, I would have walked to school.

b. I either drive to school when it is raining, or walk to school when it is not raining. It was raining this morning, so I drove to school.

Given the situation in (39b), (39a) is an intuitively correct statement in  $\alpha$ . According to Stalnaker's analysis in (38), the selection function  $f$  in (39) takes two arguments: (i) the base world  $\alpha$ , and (ii) the antecedent  $A$ -- '*it wasn't raining this morning*'.  $f$  yields as its value the closest possible world to  $\alpha$  where the antecedent—*it wasn't raining this*

*morning* holds. Suppose (40) contains all the accessible worlds from  $\alpha$  given by  $R$ . Let us decide which one is the value of  $f(A, \alpha)$ .

(40)  $w_a$  — It was raining this morning. I drove to school.

$w_b$  — It was not raining this morning. I walked to school.

$w_c$  — It was not raining this morning. I drove to school.

$w_a$  is a world where the antecedent fails, so it cannot be the value of  $f(A, \alpha)$ .  $w_b$  is closer to  $\alpha$  than  $w_c$  is, because given (39b), there are only two likely situations: I drive to school when it is raining or walk to school when it is not raining. The world where I walk to school on a sunny day is more likely and hence closer to  $\alpha$  than the world where I drive to school. So we conclude from comparing the three worlds in (40) that  $w_b$  is the closest possible world to  $\alpha$  where the antecedent is true. Since the consequent-- *I walked to school* is true in  $w_b$ , (38) correctly predicts that (39a) is true in  $\alpha$ .

Having Stalnaker's analysis in mind, let us turn to an important assumption in his analysis—the Uniqueness Assumption (41)<sup>27</sup>. Given that  $f$  is a function, for any pair of arguments  $\langle A, \alpha \rangle$ , there must be a unique value  $w$  for  $f(A, \alpha)$  such that  $w$  is the closest possible world to  $\alpha$  where  $A$  is true.  $f \langle A, \alpha \rangle$  is undefined if there is no  $A$ -world that is closer to  $\alpha$  than any other  $A$ -world. This assumption is referred to as the Uniqueness Assumption as shown in (41):

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<sup>27</sup> Here we leave aside the discussion of another important assumption in Stalnaker's analysis—the Limit assumption, as it is not particularly related to our analysis of *sugi*-. The limit Assumption: For every possible world  $i$  and nonempty proposition  $A$ , there is at least one  $A$ -world minimally different from  $i$ .

(41) **The Uniqueness Assumption**

For every possible world  $\alpha$  and proposition  $A$  there is at most one world minimally different from  $\alpha$  where  $A$  is true.

As we will see below, the uniqueness assumption is too strong an assumption for an analysis of counterfactual conditionals, because there can be more than one closest possible world to the base world where an antecedent is true. Stalnaker's analysis predicts that in such a case, the selection function  $f$  is undefined and there is no truth value for the conditional, but our intuition says there is a truth-value. Consider the example in (42) based on the examples in Quine (1982:23).

(42) If Bizet and Verdi had been compatriots, Bizet would or would not have been Italian.

(42) is a counterfactual conditional, whose antecedent contradicts the fact that Bizet and Verdi had different nationalities: Bizet was French, and Verdi was Italian. Assuming that  $\alpha$  is the actual world, our intuition says that (42) is true in  $\alpha$ .  $f(A, \alpha)$  in Stalnaker's system comes out as undefined, because there is more than one world minimally different from  $\alpha$  where the antecedent—'*Bizet and Verdi are compatriots*' is true. This is demonstrated in (43):

(43)  $w_a$  — Bizet and Verdi are compatriots. Bizet is Italian. Verdi is Italian...  
 $w_b$  — Bizet and Verdi are compatriots. Bizet is French. Verdi is French...  
 $w_c$  — Bizet and Verdi are compatriots. Bizet and Verdi are Chinese...

Suppose (43) contains all the possible worlds accessible from  $\alpha$  by  $R$ .  $w_a$  is as similar to  $\alpha$  as  $w_b$  is, because they both satisfy the antecedent and there is only one difference between

$w_a/w_b$  and  $\alpha$ . In  $w_a$ , Bizet is an Italian rather than a French; in  $w_b$ , Verdi is a French rather than an Italian.  $w_c$  is less similar to  $\alpha$  than  $w_a$  and  $w_b$ , because there are two differences between  $w_c$  and  $\alpha$ : Bizet is a Chinese rather than a French, and Verdi is a Chinese rather than an Italian. We conclude from comparing the three possible worlds in (43) that  $w_a$  and  $w_b$  are the *closest* possible worlds to the actual world where Bizet and Verdi are compatriots, and  $w_c$  is further away from  $\alpha$  than  $w_a$  and  $w_b$  are.

One way to solve the problem posed by conditionals like (42) is to resort to the method of *supervaluations* (van Fraassen 1969). Suppose there are as many selection functions as there are *closest* possible worlds to the base world where an antecedent holds. Each selection function selects one of the closest possible worlds as its value. A counterfactual conditional is *supertrue* iff the consequence is true in *all* the closest antecedent-worlds; it will be *superfalse* iff the consequent is false in all the closest antecedent-worlds; it is *neither true nor false* iff the consequence is true in some of the closest antecedent-worlds, but false in others.

Therefore, in the counterfactual conditional in (42),  $w_a$  and  $w_b$  are selected by two selection functions  $f_a$  and  $f_b$ , such that  $f_a(A, \alpha) = w_a$  and  $f_b(A, \alpha) = w_b$ , where  $A$  is the antecedent--*Bizet and Verdi are compatriots*, and  $\alpha$  is the actual world. Since the consequent of (42) -- *Bizet would or would not have been Italian* is true in both  $w_a$  and  $w_b$ , (42) is *supertrue*. By appealing to supervaluations, Stalnaker's analysis correctly captures the truth-value of (42).

In the following section, we will incorporate Stalnaker's analysis of counterfactual conditionals into the semantics of *sugi-*. We will see that the method of supervaluations also plays a role in capturing the truth-value of *sugi*-sentences (in section 2.3.2.4).

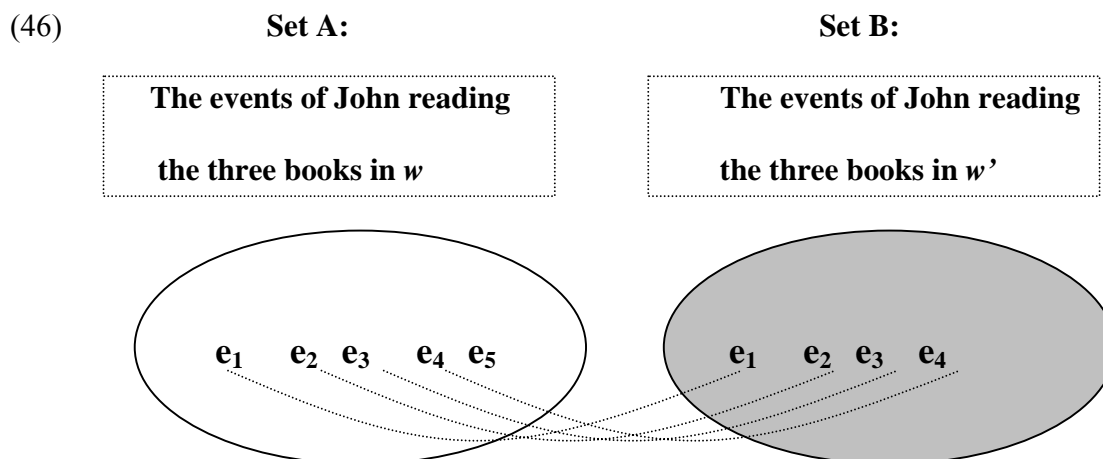
### 3.3.2.3 The semantics of *sugi-*

In section 3.3.2.1, we showed that the *sugi*-sentences in (44) can be paraphrased in terms of the counterfactual conditionals in (45).

- (44) a. John-ga [hon san-satu]-o kinoo yomi-*sugi*-ta. Non-FNQ  
 John-nom book three-CL-acc yesterday read-exceed-past  
 'John over-read (the) 3 books yesterday.'
- b. John-ga [hon]-o kinoo san-satu yomi-*sugi*-ta. FNQ  
 John-nom book-acc yesterday 3-CL read-exceed-past  
 (i) 'John over-read (the) 3 books yesterday.'  
 (ii) 'John overdid the reading by 3 books yesterday.'
- (45) a. If John had met the reading requirement, he would have done less reading of the three books.
- b. If John had met the reading requirement, he would have read three books less.

Following Stalnaker's analysis of counterfactual conditionals, (45a) means that in a closest possible world  $w'$  to the actual world  $w$  where John met the reading requirement, he did less reading of the three books than he did in the actual world; (45b) means that in a closest possible world  $w'$  to the actual world  $w$  where John met the reading requirement, he read three books less than he did in the actual world. (45a) compares the set of *events* of John reading 3 specific books in  $w$  to that in  $w'$ , and the former is greater than the

latter. (46b) compares the set of *objects* that John read in  $w$  to that in  $w'$ , and the former exceeds the latter by 3 books. The comparative relations described in (45a) and (45b) are captured by the diagrams in (46) and (47) respectively:

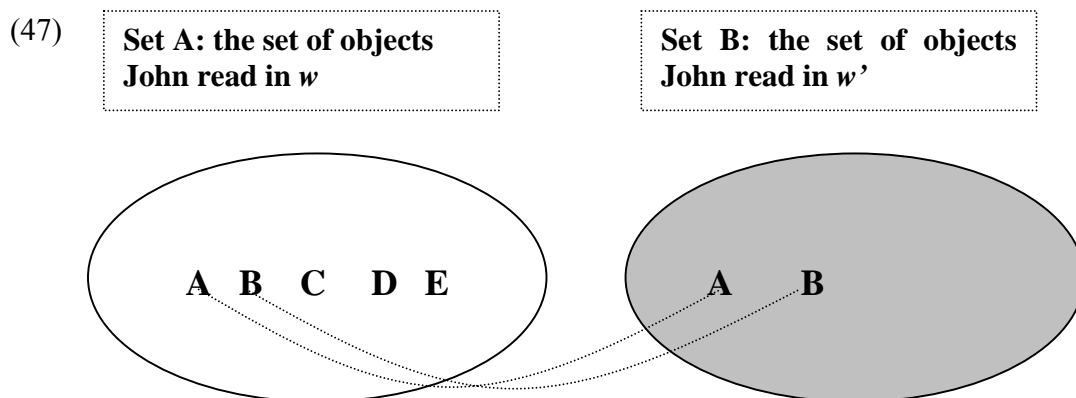


In (47), Set A has all the events of John reading 3 books in  $w$ — $\{e_1, e_2, e_3, e_4, e_5\}$ . Set B has all the set of events of John reading the same 3 books in the closest possible world  $w'$  to the actual world where John met the reading requirement— $\{e_1, e_2, e_3, e_4\}$ <sup>28</sup>. Comparing set A to set B, for every event in B, there is counterpart event in A. There are some events in A which do not have counterpart events in B.

The comparative relation described in (45b) is captured by the diagram in (47):

<sup>28</sup> According to Counterpart Theory (Lewis 1983), no entity can exist in different possible worlds. Rather than saying  $x$  exists in both world  $w$  and world  $w'$ , we say  $x$  exists in  $w$ , and the counterpart of  $x$ , or  $x'$ , exists in  $w'$ . Following this theory, the set of events in B are  $\{e'_1, e'_2, e'_3, e'_4\}$  such that  $e'_1$  is a counterpart of  $e_1$ ,  $e'_2$  is a counterpart of  $e_2$ ,  $e'_3$  is a counterpart of  $e_3$  etc. The same thing can be said about the diagram in (47). In (47), the set of objects in B are  $\{A', B'\}$  such that  $A'$  is a counterpart of  $A$ , and  $B'$  is a counterpart of  $B$ . In this Chapter, we will adopt a notation that does not distinguish  $x$  and  $x$ 's counterpart. There will be more discussion about the counterpart relation in Chapter 4 when we compare the interpretation of *sugi-* with Chinese *duo*.





In (47), Set A contains all the objects John read in the actual world  $w$ —{A, B, C, D, E}; B contains all the objects John read in the closest possible world  $w'$  to the actual world  $w$  where John met the reading requirement — {A, B}. For each object that John read in  $w'$ , he read its counterpart in  $w$ . There are 3 books, namely {C, D, E}, which John read in  $w$ , whose counterparts John did not read in  $w'$ .

Based on the interpretations above, we propose that *sugi-* takes 3 semantic arguments: a world argument  $w$ , a property argument  $P$  denoted by  $vP$ , and an individual argument  $x$  which describes the difference between the two sets of objects or events in  $w$  and  $w'$ . This interpretation is shown in (48):

$$(48) \ || \text{ sugi-} \|^g = \lambda w_s \lambda P_{\langle s, \langle \tau, t \rangle \rangle} \lambda x_\tau \exists w'_s [w' \text{ is the closest possible world to } w \text{ where } g(r) \text{ is true} \wedge [P(w)(x) \wedge \neg P(w')(x)] \wedge \forall z_\tau [P(w')(z) \rightarrow P(w)(z)]]$$

The domain of type  $\tau$  includes individuals, events and degrees.  $r$  is a variable ranging over propositions, and  $g(r)$  is a proposition which must be true according to the requirements. When *sugi-* combines with the first two arguments--  $w$  and  $P$ , the result is a set of individuals (or events, or degrees)  $x$  such that  $P$  is true of  $x$  in  $w$ , but  $P$  is not true of  $x$  in  $w'$ . For all  $z$  such that if  $P$  is true of  $z$  in  $w'$ ,  $P$  is also true of  $z$  in  $w$ .

Given Stalnaker's analysis of counterfactual conditionals in (38),  $w'$  is a value derived from applying a selection function  $f$  to the two arguments: (i) the base world  $w$  and (ii) the antecedent  $A$ —*the relevant requirements are met*.  $f$  is a contextually determined variable, whose reference is assigned by the assignment function  $g$ . The meaning of *sugi-* in (48) is restated in (49):

$$(49) \quad \llbracket sugi_{-r,f} \rrbracket^g = \lambda w_s \lambda P_{\langle s, \langle \tau, t \rangle \rangle} \lambda x_\tau. \exists w'_s$$

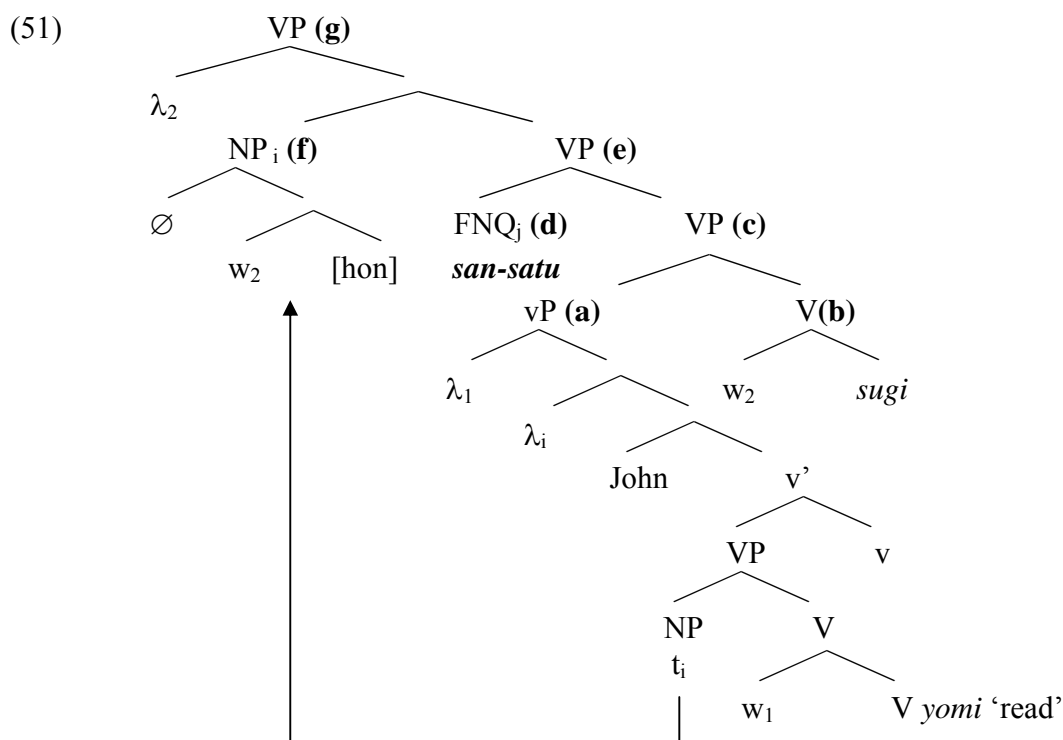
$$[g(f)(g(r), w) = w' \wedge [P(w)(x) \wedge \neg P(w')(x)] \wedge \forall z_\tau [P(w')(z) \rightarrow P(w)(z)]]$$

With the meaning of *sugi-* in (49), let us examine the ambiguity of (50) (repeated from (4b)). (50) has two readings, each of which is related to a distinct syntactic structure. The salient reading of (50)—‘John overdid the reading by three books yesterday.’ is associated with the structure in (51) (repeated from 33b), where the FNQ *san-satu* is attached to the VP above *sugi-*.

(50) John-ga [hon]-o kinoo san-satu yomi-sugi-ta. FNQ  
 John-nom book-acc yesterday 3-CL read-exceed-past

(i) ‘John over-read (the) three books yesterday.’

(ii) ‘John overdid the reading by three books yesterday.’



Following Percus (2000), I assume that nouns and verbs select for a world argument  $w$  (of type  $\langle s \rangle$ ) besides their standard arguments.<sup>29</sup>  $w$ , like a covert pronoun, is a variable present in syntax and is subject to certain binding conditions like in (52):

(52) Generalization X: the world argument that a verb selects for must be coindexed with the nearest  $\lambda$  above it.

$\lambda$  is a variable abstractor which is inserted at each clausal level to bind variables inside the clause. Following the constraint in (52), there are two  $\lambda$  abstractors in (51) which bind world variables  $w_1$  and  $w_2$ .  $\lambda_1$  in the vP binds the world variable  $w_1$  selected by the verb *yomi* 'read', and  $\lambda_2$  in the matrix clause binds the world variable  $w_2$  selected by the noun *hon* 'read' and the verb *sugi*- 'read'. Besides  $\lambda_1$  and  $\lambda_2$ , there is  $\lambda_i$  in the vP, which binds the trace  $t_i$  left by the NP movement.

<sup>29</sup>Proper names such as *John* have world-independent semantic values. They do not take world arguments.

In (51), the  $vP$  denotes a property of the objects that John read. When the  $vP$  combines with *sugi-*, the result is a set of objects that John read in  $w_I$  but not in the closest possible world to  $w_I$  where the relevant reading requirements are met (53c). As the FNQ *san-satu* and the host NP *hon* are above *sugi-*, they indicate that the set of objects denoted by  $[vP-sugi]$  is a set of books, which has the cardinality of at least 3. When  $[vP-sugi]$  composes with the semantics of the FNQ *san-satu* (53d) and the NP *hon* ‘book’ (53f), we arrive at the interpretation of (53g)<sup>30</sup>.

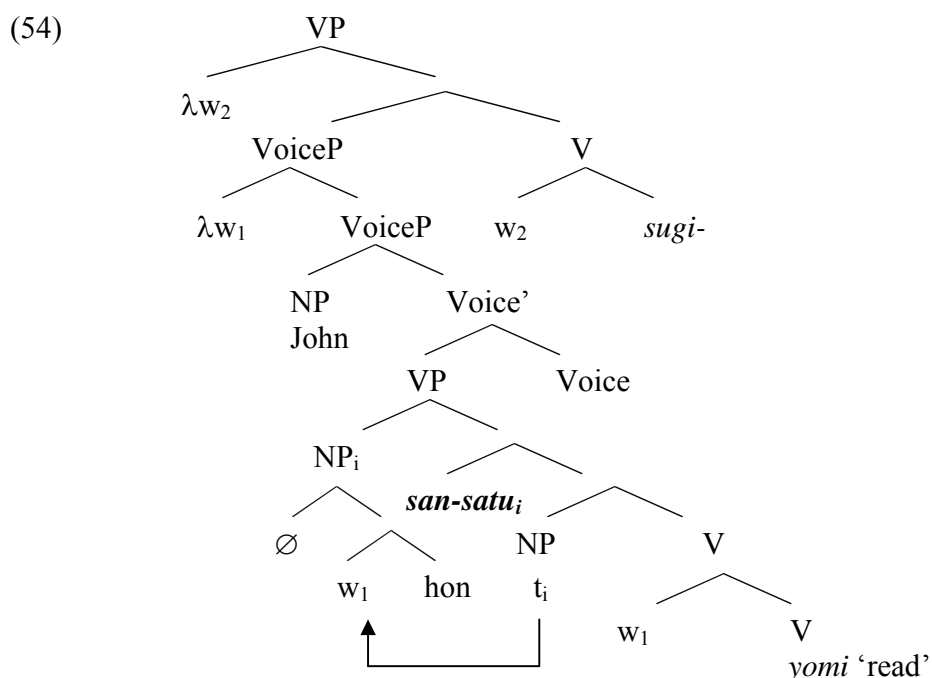
- (53) a.  $\|vP\| = \lambda w_1 \lambda t \text{yomi}(w_1)(t)(\text{John})$
- b.  $\|sugi-_{rf}\|^g = \lambda w_s \lambda P_{\langle s, \langle e, t \rangle \rangle} \lambda x_e$   
 $\exists w'_s [g(f)(g(r), w) = w' \wedge [P(w)(x) \wedge \neg P(w')(x)] \wedge \forall z_e [P(w')(z) \rightarrow P(w)(z)]]$
- $\|w_2 sugi-_{rf}\|^g = \lambda P_{\langle s, \langle e, t \rangle \rangle} \lambda x_e$   
 $\exists w'_s [g(f)(g(r), w_2) = w' \wedge [P(w_2)(x) \wedge \neg P(w')(x)] \wedge \forall z_e [P(w')(z) \rightarrow P(w_2)(z)]]$
- c.  $\|vP sugi-_{rf}\|^g = \lambda x_e \exists w'_s [g(f)(g(r), w_2) = w' \wedge$   
 $[yomi(w_2)(x)(\text{John}) \wedge \neg yomi(w')(x)(\text{John})] \wedge$   
 $\forall z_e [yomi(w')(z)(\text{John}) \rightarrow yomi(w_2)(z)(\text{John})]]$
- d.  $\|san-satu\| = \lambda P_{\langle e, t \rangle} \lambda y_e$   
 $\exists K_{\langle e, t \rangle} [K \subseteq (\lambda u_e \exists v_e [satu'(v) \wedge u \bullet [] v] \cap P) \wedge |K| \geq 3 \wedge \cup K = y]$
- e.  $\|san-satu vP sugi-_{rf}\|^g = \lambda y_e \exists K_{\langle e, t \rangle} [K \subseteq (\lambda u_e \exists v_e [satu'(v) \wedge u \bullet [] v] \cap$   
 $\lambda x_e \exists w'_s [g(f)(g(r), w_2) = w' \wedge [yomi(w_2)(x)(\text{John}) \wedge \neg yomi(w')(x)(\text{John})] \wedge$   
 $\forall z_e [yomi(w')(z)(\text{John}) \rightarrow yomi(w_2)(z)(\text{John})]] \wedge |K| \geq 3 \wedge \cup K = y]$
- f.  $\|\emptyset\|^g = \lambda P_{\langle e, t \rangle} \lambda Q_{\langle e, t \rangle} \exists y_e [P(y) \wedge Q(y)]$   
 $\|\text{hon}\|^g = \lambda w_s \lambda x_e \text{hon}'(w)(x)$   
 $\|\emptyset \text{hon}\|^g = \lambda Q_{\langle e, t \rangle} \exists y_e [\text{hon}'(w_2)(y) \wedge Q(y)]$
- g  $\|hon san-satu vP sugi-_{i}\|^g =$   
 $\lambda w_2 \exists y_e [\text{hon}'(w_2)(y) \wedge \exists K_{\langle e, t \rangle} [K \subseteq (\lambda u_e \exists v_e [satu'(v) \wedge u \bullet [] v] \cap$   
 $\lambda x_e \exists w'_s [g(f)(g(r), w_2) = w' \wedge [yomi(w_2)(x)(\text{John}) \wedge \neg yomi(w')(x)(\text{John})] \wedge$   
 $\forall z_e [yomi(w')(z)(\text{John}) \rightarrow yomi(w_2)(z)(\text{John})]] \wedge |K| \geq 3 \wedge \cup K = y]$

<sup>30</sup> Following Kobuchi-Philip (2003), I assume that the host noun *hon* ‘book’ in (53f) is modified by a null determiner which has the meaning of ‘some’.

$$\begin{aligned}
&= \lambda w \exists y_e [\text{hon}'(w_2)(y) \wedge \exists K_{\langle e, t \rangle} [K \subseteq (\lambda u_e \exists v_e [\text{satu}'(v) \wedge u \bullet [] v] \cap \\
&\quad \lambda x_e. \exists w'_s [g(f)(g(r), w) = w' \wedge [\text{yomi}(w)(x)(\text{John}) \wedge \neg \text{yomi}(w')(x)(\text{John})] \wedge \\
&\quad \forall z_e [\text{yomi}(w')(z)(\text{John}) \rightarrow \text{yomi}(w)(z)(\text{John})]) \wedge |K| \geq 3 \wedge \sqcup K = y]
\end{aligned}$$

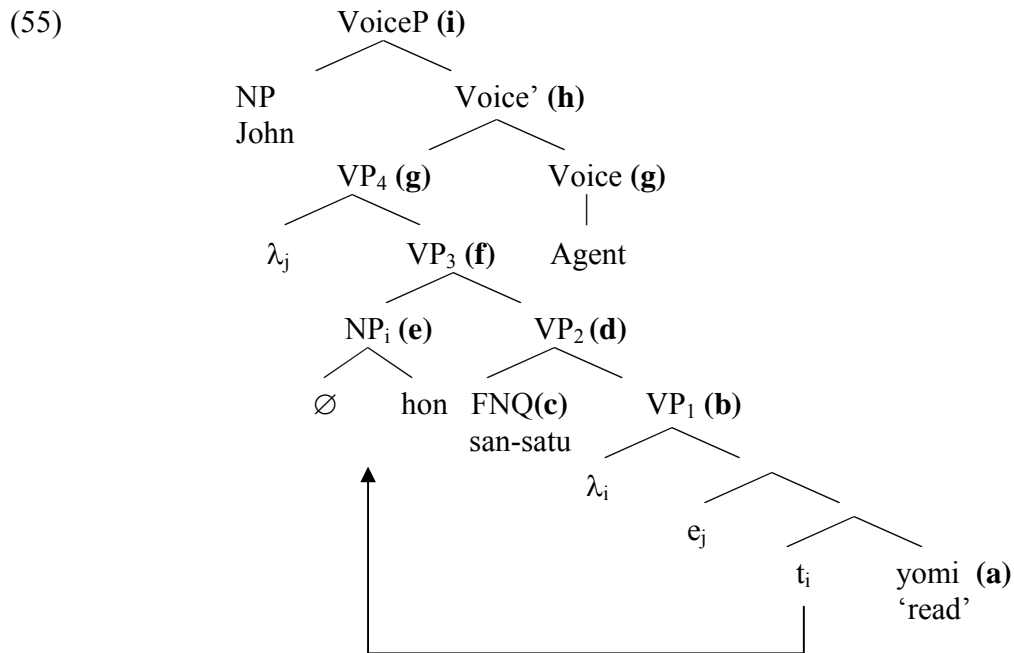
(53g) denotes a proposition which is true in  $w$  iff there is a set of objects  $K$  which is a subset of the intersection of the set of atomic *satu'* objects and the set of objects that John read in  $w$ , but not in the closest possible world to  $w$  where the relevant requirements are met. For all  $z$  such that if John read  $z$  in  $w'$ , he also read  $z$  in  $w$ . The number of the elements in  $K$  is at least 3 and the supremum of  $K$  is  $y$  which has the property of being books.

(50) has a non-salient interpretation—‘John over-read (the) three books’. This reading is related to the structure in (54) (repeated from 33a):



(54) differs from (51) in the position of the FNQ *san-satu*. In (54), *san-satu* is attached to the VP below *sugi* rather than the VP above *sugi*-. Following Kratzer (1996), I assume

that the VoiceP in (54), repeated in (55), denotes a set of events (of type  $\langle v, t \rangle$ )<sup>31</sup>. It has the compositional semantics in (56):



- (56)
- a.  $\| \text{yomi} \| = \lambda x_e \lambda e_v [\text{yomi}(x)(e)]$
  - b.  $\| \text{VP}_1 \| = \lambda t_e [\text{yomi}(t)(e)]$
  - c.  $\| \text{san-satu} \| = \lambda P_{\langle e, t \rangle} \lambda y_e \exists K_{\langle e, t \rangle} [K \subseteq (\lambda u_e \exists v_e [\text{satu}'(v) \wedge u \bullet \prod v] \cap P) \wedge |K| \geq 3 \wedge \cup K = y]$
  - d.  $\| \text{VP}_2 \| = \lambda y_e \exists K_{\langle e, t \rangle} [K \subseteq (\lambda u_e \exists v_e [\text{satu}'(v) \wedge u \bullet \prod v] \cap \lambda t_e [\text{yomi}(t)(e)]) \wedge |K| \geq 3 \wedge \cup K = y]$
  - e.  $\| \emptyset \text{ hon} \| = \lambda Q_{\langle e, t \rangle} \exists y_e [\text{hon}'(y) \wedge Q(y)]$
  - f.  $\| \text{VP}_3 \| = \exists y_e [\text{hon}'(y) \wedge \exists K_{\langle e, t \rangle} [K \subseteq (\lambda u_e \exists v_e [\text{satu}'(v) \wedge u \bullet \prod v] \cap \lambda t_e [\text{yomi}(t)(e)]) \wedge |K| \geq 3 \wedge \cup K = y]$
  - g.  $\| \text{VP}_4 \| = \lambda e_v \exists y_e [\text{hon}'(y) \wedge \exists K_{\langle e, t \rangle} [K \subseteq (\lambda u_e \exists v_e [\text{satu}'(v) \wedge u \bullet \prod v] \cap \lambda t_e [\text{yomi}(t)(e)]) \wedge |K| \geq 3 \wedge \cup K = y]$
  - h.  $\| \text{Agent} \| = \lambda x_e \lambda e_v [\text{Agent}(x)(e)]$

<sup>31</sup> Syntactically, VoiceP is the same as vP.

- i.  $\| \text{Voice}' \| = \lambda x_e \lambda e_v [\text{Agent}(x)(e) \wedge \exists y_e [\text{hon}'(y) \wedge \exists K_{\langle e, t \rangle} [K \subseteq (\lambda u_e \exists v_e [\text{satu}'(v) \wedge u \bullet \prod v] \cap \lambda t_e [\text{yomi}(t)(e)]) \wedge |K| \geq 3 \wedge \sqcup K = y]]]$
- j.  $\| \text{VoiceP} \| = \lambda e_v [\text{Agent}(\text{John})(e) \wedge \exists y_e [\text{hon}'(y) \wedge \exists K_{\langle e, t \rangle} [K \subseteq (\lambda u_e \exists v_e [\text{satu}'(v) \wedge u \bullet \prod v] \cap \lambda t_e [\text{yomi}(t)(e)]) \wedge |K| \geq 3 \wedge \sqcup K = y]]]$

(56j) says: there is a set of events  $e$  whose agent is John. The intersection of the set of objects read in the event  $e$  and the set of atomic *satu'* objects is  $K$ . The number of the elements in  $K$  is at least 3 and the supremum of  $K$  is  $y$  which has the property of being books. Simply put, (56j) denotes a set of events of John reading at least 3 atomic books.

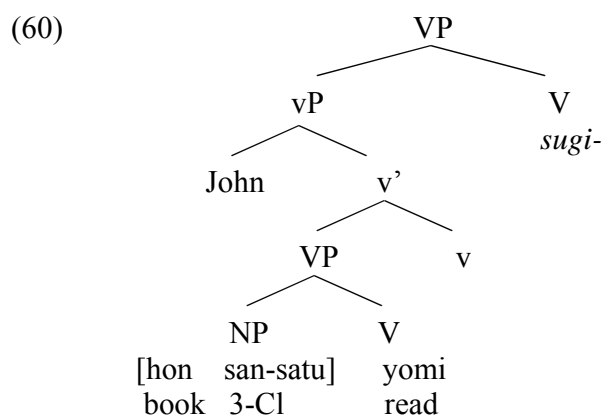
If we add a world variable  $w_1$  to (55)(c.f. 51 and 52), the VoiceP denotes a property of the events of John's reading at least 3 books in  $w_1$ . When it combines with  $[w_2 - \text{sugi}]$ , the result is a set of reading events  $e$  which John did in  $w_2$ , but *not* in the closest possible world  $w'$  to  $w_2$  where the relevant requirements are met. For any event of John's reading the three books in  $w'$ , there is a counterpart reading event in  $w_2$ . Assuming that the variable  $e$  is existentially closed and  $w_2$  is the actual world, the sentence '*John-ga hon-o san-satu yomi-sugi-ta*' is true under the reading 'John over-read (the) three books yesterday' iff there is a set of events of John reading at least three books in the actual world  $w$ , but *not* in the closest possible world  $w'$  to  $w$  where he met the relevant reading requirements. For every reading event that John did in  $w'$ , he did its counterpart in  $w$ . In (55), as the FNQ *san-satu* and the host NP *hon* are both adjoined to the VP below *sugi-*, they cannot be interpreted as differentials.

Comparing (54) to (51), one might wonder what makes the VoiceP in (54) denote a property of events, but the vP in (51) denote a property of individuals? The answer has to do with the different positions that the FNQ *san-satu* is attached to in the structure. In (51) *san-satu* is adjoined to the VP above *sugi-*. The host NP *hon<sub>i</sub>* moves to c-command *san-*

*satu*, and leaves an object trace  $t_i$  bound at the vP. The vP in (51) denotes *a property of individuals* read by John (53a). In (54) *san-satu* is adjoined to the VP below *sugi-*. The host NP  $hon_i$  moves to c-command *san-satu*, and leaves an object trace  $t_i$  bound at the VP inside the VoiceP. When the VP composes with the FNQ *san-satu* and the host NP *hon*, the result is a *set of events* of reading at least 3 atomic books (56g). Therefore, it is the position of the FNQ and host NP that determines where the object trace  $t_i$  gets bound in the structure, which in turn determines the interpretations of the vP and the VoiceP in (51) and (54).

We conclude from (51) and (54) that the ambiguity of (50) can be explained as a scope ambiguity between *sugi-* and the FNQ: when the FNQ is below *sugi-*, the first reading arises; when the FNQ is above *sugi-*, the second reading arises. Given this generalization, it is easy to see why (59) (repeated from 4a) has only one reading, which is the same as the one derived from the structure in (54). That is, the syntactic structure of (59), as shown in (60), is similar to (54) in having *san-satu* below *sugi-*.

- (59) John-ga [hon san-satu]-o kinoo yomi-sugi-ta. Non-FNQ  
 John-nom book three-CL-acc yesterday read-exceed-past  
 ‘John over-read (the) three books yesterday.’





To summarize, in this section we proposed a semantic interpretation for *sugi-* which, when combined with the interpretation of FNQ, accounts for the semantic difference between (59) (also repeated from 4a) and (50) (repeated from 4b). In the following section, we show that our analysis of *sugi* captures the truth-value of *sugi*-sentences in a wider range of contexts.

### 3.3.2.4 Scenarios

We consider 5 scenarios in this section. In scenario 1-3, we show that our interpretation of *sugi-* works with different kinds of amount requirements in contexts. Scenario 1 is a situation where the amount requirement refers to a specific number. Scenario 2 and 3 describe situations where the amount requirement refers to a range of numbers.

In scenario 4, we discuss the pragmatic ambiguity of *sugi*-sentences. The truth-value of *sugi*-sentences varies according to which world we consider as the closest possible world  $w'$  to the actual world  $w$  where the requirements are met.

In scenario 5, we consider a situation where the amount requirement is not explicit in the context, but is entailed by an identity requirement. (For example, an identity requirement like ‘Everyone must read *Jane Eyre*, and *Pride and Prejudice* *only*’ entails the amount requirement ‘Everyone must read 2 novels’.

#### Scenario 1

Let us consider the truth-value of (61a) in world  $w$  where (61b) is true. In (61b), the amount requirement refers to a specific number.

- (61) a.     John-ga       syoosetu-o     san-satu       yomi-sugi-ta.  
           John-nom    novel-acc     3-Cl           read-exceed-past  
           ‘John over-did the reading by three novels.’

- b. In the final exam of an intensive reading class, the professor selected 5 English novels, and required each student to read *exactly* 2 novels from the set. This way, each of them would have some fresh materials that he had not yet seen in the exam. John violated this rule by reading all the 5 novels.

According to our analysis of *sugi-*, (61a) compares the set of novels John read in  $w$  to that in the closest possible world  $w'$  to  $w$  where he met the reading requirement. The difference between them includes 3 novels, as shown in (62):

- (62) a. The novels John read in  $w$ : {A. B. C. D. E}  
 b. The novels John read in the closest possible world  $w'$  to  $w$  where he met the reading requirement:  
 $w_1'$ : {A. B},  $w_2'$ : {A, C},  $w_3'$ : {A, D},  $w_4'$ : {A, E},  $w_5'$ : {B, C},  $w_6'$ : {B, D},  $w_7'$ : {B, E},  $w_8'$ : {C, D},  $w_9'$ : {C, E},  $w_{10}'$ : {D, E}

(62a) says John read all the assigned novels in  $w$ , namely {A. B. C. D. E}. (62b) says there are ten closest possible worlds  $w'$  to  $w$  where John met the reading requirement and read only 2 out of the 5 assigned novels:  $w_1'$ -  $w_{10}'$ .

Recall our previous discussion of the uniqueness assumption in Stalnaker's analysis. (63b) describes a situation where this assumption fails, as there is more than one closest possible world to the base world where the requirement is met. Following the analysis of supervaluations, we assume that there are 10 distinct selection functions such that  $f_n(A, w) = w_n'$ , where A is the antecedent — *John read 2 out of the 5 assigned novels*;  $w$  is the base world, and  $n$  ranges from 1 to 10. No matter which function that the context picks for  $f$ , (62a) is *true*, because for all the novels that John read in  $w_n'$ , he also read them in

$w$ , and there are 3 novels which John read in  $w$ , but not in  $w_n'$ . Therefore, our analysis correctly predicts (62a) to be *supertrue* in  $w$  where (62b) is true.

### Scenario 2

In scenario 2, we describe a situation where the amount requirement refers to a range of numbers, as shown in (63b):

- (63) a.     John-ga       hon-o        san-satsu     kari-sugi-ta.  
               John-nom    book-acc    3-Cl         borrow-exceed-pst  
               ‘John borrowed 3 books too many.’

(From Shigeto Kawahara p.c)

- b.     Jeffers library has the rule that one can only check out *at most* 5 books a time. John checked out 8 books.

According to the native speakers’ intuition, (63a) is true in world  $w$  where (63b) is true. The closest possible worlds to  $w$  where John met the requirement are the worlds  $w'$  where John checked out exactly 5 out of the 8 books that he checked out from the library in  $w$ . The worlds where John checked out less than 5 books are more different, and distant from  $w$  than  $w'$ , assuming that differences are measured by the number of books. Comparing  $w'$  to  $w$ , for every book that John borrowed in  $w'$ , he also borrowed it in  $w$ . There are 3 books which John borrowed in  $w$ , but not in  $w'$ . Therefore, our analysis of *sugi-* correctly predicts (63a) to be *supertrue* in  $w$  where (63b) is true.

### Scenario 3

In Scenario 3, we show that the range of numbers specified in an amount requirement must contain an upper bound. Let us compare the situation in (64b) to the one in (63b):

(64) a. John-ga hon-o san-satsu kari-sugi-ta.  
 John-nom book-acc 3-Cl borrow-exceed-pst

‘John borrowed 3 books too many.’

(From Shigeto Kawahara p.c)

b. Jeffers library has the rule that one must check out *at least* 5 books a time.  
 John checked out 8 books.

(64b) differs from (63b) in that the library has changed its rule from ‘one can check out *at most* 5 books’ to ‘one must check out *at least* 5 books.’ That is, instead of talking about the *maximal* number of books that one can check out from the library, the requirement in scenario 3 specifies the *minimal* number of books that one must check out from the library. According to the native speakers’ intuition, (64a) is false in the world  $w$  where (64b) is true.

Now let us consider whether our analysis captures this intuition. The closest possible world  $w'$  to  $w$  where John met the requirement is the world  $w$  where John checked out 8 books, because in  $w$  John met the requirement of checking out at least 5 books. Since  $w'$  and  $w$  are the same world, there is no difference between them. Our analysis predicts that (64a) is *superfalse* in  $w$  where (64b) is true.

#### Scenario 4

In our analysis, *sugi-* compares the base world  $w$  to the closest possible worlds  $w'$  to  $w$  where the relevant requirements are met. To find out which world is the closest possible world  $w'$ , we need to order all the possible worlds based on how much they differ from the base world  $w$ . So, the question arises: how do we measure the differences among possible worlds? In the previous scenarios, we conducted the measurement based on the standards provided by the contexts. For instance, in scenario 2, we measured the differences in terms of the number of books, e.g., a world where John borrowed 5 books is considered to be less different and closer to the base world than a world where he borrowed 4 books.

However, the standards may not always be explicit in contexts. If a context is ambiguous about what standards we use to compare possible worlds, it is likely that we will have different orderings of worlds, and hence different truth-values of *sugi*-sentences. In (65-66), we will look at such a situation where the truth-value of the *sugi*-sentences in (65) are pragmatically ambiguous<sup>32</sup>.

- (65) a. John-ga tamago-o ni-ko kai-sugi-ta.  
 John-nom egg-acc 2-Cl buy-exceed-pst  
 ‘John bought 2 eggs too many.’
- b. John-ga tamago-o rok-ko kai-sugi-ta.  
 John-nom egg-acc 6-Cl buy-exceed-pst  
 ‘John bought 6 eggs too many.’

(From Shigeto Kawahara p.c)

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<sup>32</sup> Thanks to Roger Schwarzschild for bringing this example to my attention.

(66) Mary doesn't know that eggs are only sold in multiples of 6, 12, 18, etc. One day she wanted to bake a cake. She asked John to buy some eggs, but no more than 10. John came home with 12 eggs.

(66) describes a situation where there are two requirements. One is an *amount requirement* set up by Mary: John must buy no more than 10 eggs. The other is an *egg-selling requirement* implicit in the context — eggs must be sold in multiples of 6. The intuition about the truth-values of (65a) and (65b) is that they vary according to what requirements are taken into consideration. If we are *only* concerned with Mary's amount requirement, then (65a) is true and (65b) is false in  $w$  where (66) is true. If we are concerned with both Mary's amount requirement and the egg-selling requirement, then (65a) is false and (65b) is true in  $w$ .

This pragmatic ambiguity of (65) is captured by the contextually determined free variable  $r$  in our semantics of *sugi-* below (repeated from 49).

(49)  $\|sugi_{-r,f}\|^g = \lambda w_s \lambda P_{\langle s, \langle \tau, t \rangle \rangle} \lambda x_\tau. \exists w'_s$

$$[g(f)(g(r), w) = w' \wedge [P(w)(x) \wedge \neg P(w')(x)] \wedge \forall z_\tau [P(w')(z) \rightarrow P(w)(z)]]$$

If  $g(r)$  refers to the proposition that John must buy no more than 10 eggs, then  $f(g(r), w)$  selects the world  $w'$  where John bought exactly 10 eggs as the closest possible world to  $w$  where  $g(r)$  is true. A world where John bought less than 10 eggs is more different and distant from  $w$  than  $w'$ . In such a case, (65a) is true, but (65b) is false in  $w$ . On the other hand, if  $g(r)$  refers to both the proposition that John must buy no more than 10 eggs and the proposition that eggs must be sold in multiples of 6, then  $f(g(r), w)$  selects the world  $w'$  where John bought 6 eggs as the closest possible world to the actual world  $w$  where

$g(r)$  is true, as a world where John failed to buy eggs in multiples of 6 fails to satisfy  $g(r)$ .

In that case, (65a) is false, but (65b) is true in  $w$ .

### Scenario 5

In scenario 5, we look at a situation where there is an identity requirement, which entails an amount requirement, as shown in (67b):

(67) a.     John-ga       syoosetu-o     san-satu       yomi-sugi-ta.  
           John-nom    novel-acc     3-Cl         read-exceed-past  
           ‘John read 3 novels too many.’

- b.     In the final exam of an intensive reading class, the professor required each student to read {A, **B**, **C**} only. John read {**B**, **C**, D, E, F, G}.

The identity requirement in (67b) specifies the identity of the novels that every student must read, namely {A, B, C}. This identity requirement entails the presence of an amount requirement, which is every student must read exactly 3 novels. In a world  $w$  where (67b) is true, John violated the identity requirement by failing to read the required book {A}, and he violated the amount requirement by reading more than he is allowed to. If we only compare the number of novels that John read, which is 6, to the number of novels that he should have read, which is 3, we would expect that (67a) to be true in  $w$ , but it is not.

Comparing (67b) to (68b), (68b) differs from (67b) in the set of novels that John read in  $w$ . In (68b), John read all the required novels {A, B, C} and the prohibited novels {D, E, F}. The intuition is (68a) is *true* in  $w$  where (68b) is true.

- (68) a. John-ga syoosetu-o san-satu yomi-sugi-ta.  
 John-nom novel-acc 3-Cl read-exceed-past  
 ‘John read 3 novels too many.’
- b. In the final exam of an intensive reading class, the professor required each student to read {A, B, C} only. John read {A, B, C, D, E, F}.

(68) shows that *sugi-* can be used in situations where there is an identity requirement, but only under certain conditions. That is, the identity requirement must be satisfied, while the amount requirement entailed by the identity requirement must be violated. In our analysis of *sugi-* in (49), the satisfaction of the identity requirement is captured by the last conjunct, which says: for all  $z$  such that  $P$  is true of  $z$  in  $w'$ ,  $P$  is also true of  $z$  in  $w$ .

$$(49) \quad || \textit{sugi-}_{r,f} ||^g = \lambda w_s \lambda P_{\langle s, \langle \tau, t \rangle \rangle} \lambda x_\tau.$$

$$\exists w'_s [g(f)(g(r), w) = w' \wedge [P(w)(x) \wedge \neg P(w')(x)] \wedge \forall z_\tau [P(w')(z) \rightarrow P(w)(z)]]$$

Turn back to the situation described in (67b). The closest possible world  $w'$  to  $w$  where John met the reading requirement is the world where he only read {A, B, C}. Comparing  $w'$  to  $w$  where he read {B, C, D, E, F, G}, there are 4 novels, namely {D, E, F, G}, which John read in  $w$  but not in  $w'$ , and there is 1 novel that John read in  $w'$ , but not in  $w$ , namely {A}. Our semantics of *sugi-* predicts (67a) to be false in  $w$  because it is not the case that for all the novels John read in  $w'$ , he also read them in  $w$ .<sup>33</sup>

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<sup>33</sup> *sugi-* may *presuppose* the satisfaction of the identity requirement, as people might feel that (67a) is ‘neither true nor false’ according to (68b). If *sugi-* presupposes the satisfaction of the identity requirement, then it has the semantics in (49’), where the last conjunct of (49’) becomes a presupposition carried by *sugi-*:

$$(49') \quad || \textit{sugi-}_{r,f} ||^g = \lambda w_s: \exists w'_s [g(f)(g(r), w) = w' \wedge \forall z_\tau [P(w')(z) \rightarrow P(w)(z)]] \\ \lambda P_{\langle s, \langle \tau, t \rangle \rangle} \lambda x_\tau. \wedge [P(w)(x) \wedge \neg P(w')(x)]$$



Given the situation described in (68b), the closest possible world  $w'$  to  $w$  where John met the reading requirement is the world where he only read  $\{A, B, C\}$ . Comparing  $w'$  to  $w$  where he read  $\{A, B, C, D, E, F\}$ , there are 3 novels, namely  $\{D, E, F\}$ , which John read in  $w$  but not in  $w'$ . For all the novels John read in  $w'$ , he also read them in  $w$ . Our semantics of *sugi-* predicts (68a) to be true in  $w$  where (68b) is true.

### 3.3.3 Summary

To summarize, in this section we have achieved three goals:

First, we analyzed the syntax of (4a-b)(repeated below), and argued that their semantic difference is due to their syntactic difference: (4b) is syntactically ambiguous, and (4a) is not.

- (4) a. John-ga [hon san-satu]-o kinoo yomi-*sugi*-ta. Non-FNQ  
 John-nom book 3-CL-acc yesterday read-exceed-past  
 ‘John over-read (the) 3 books yesterday.’
- b. John-ga [hon]-o kinoo san-satu yomi-*sugi*-ta. FNQ  
 John-nom book-acc yesterday 3-CL read-exceed-past  
 (i) ‘John over-read (the) 3 books yesterday.’  
 (ii) ‘John overdid the reading by 3 books yesterday’

Second, we proposed a semantic analysis of *sugi-*, which, when combined with our syntactic proposal and an independently motivated analysis of FNQs, explains the difference between (4a) and (4b). We argued that the semantic ambiguity of (4b) can be explained as a scope ambiguity between the FNQ and *sugi-*: when the FNQ scopes over

*sugi-*, they can be interpreted as differentials; when the FNQ scopes below *sugi-*, they cannot. (4a) has one structure, where the non-FNQ scopes below *sugi-*.

Finally, we showed that our analysis of *sugi-* not only explains the difference between (4a) and (4b), it also captures the truth-value of *sugi-*sentences in a wide range of scenarios (in section 2.3.2.4).

In the following section, we will consider an alternative analysis of *sugi-* proposed by Nakanishi (2004a, b), and compare her analysis to our own.

### 3.4. A degree-based analysis of *sugi-*

Nakanishi (2004a, b) proposes a semantic interpretation of *sugi-* based on the degree-based analyses of comparatives. She assumes that FNQs in *sugi-*constructions are not VP-adverbs but a type of measure phrase. Based on this assumption, she argues that *sugi-* is a degree quantifier, which compares two degrees. In section 3.4.1, we look at her proposal; in section 3.4.2, we compare her analysis with our own.

#### 3.4.1 A degree-based analysis of *sugi-* (Nakanishi 2004a, b)

Nakanishi (2004a, b) observes the contrast between (69a) and (69b): the *sugi-*sentence with the FNQ *san-satu* in (69b) and the one with the non-FNQ *san-satu* in (69a) receive different interpretations<sup>34</sup>.

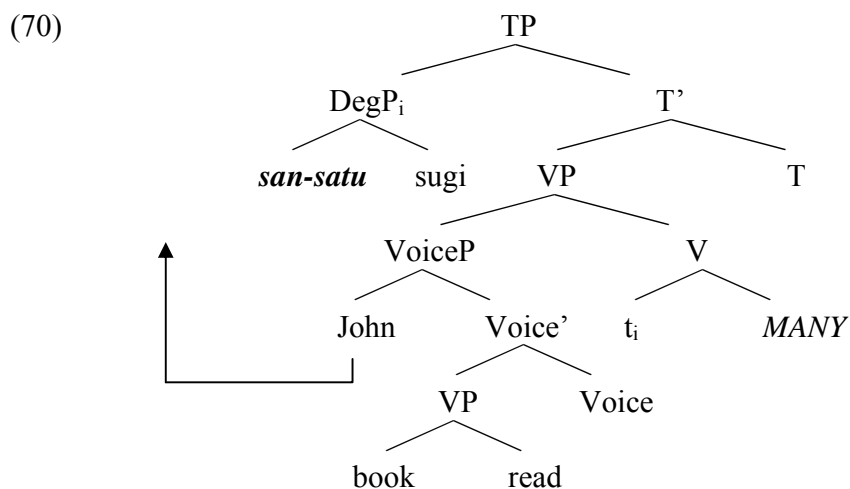
- (69) a. John-ga [hon]-o kinoo san-satu yomi-*sugi*-ta. FNQ  
           John-nom book-acc yesterday 3-CL read-exceed-past  
           ‘John overdid the reading by 3 books.’

<sup>34</sup> Nakanishi puts aside the non-salient reading that (70a) has: ‘John over-read (the) three books’.

- b. John-ga [hon san-satu]-o kinoo yomi-sugi-ta. Non-FNQ  
 John-nom book three-CL-acc yesterday read-exceed-past  
 ‘John over-read (the) 3 books yesterday.’

Following the standard degree-based analyses of comparatives, she proposes that *sugi-* is a degree operator which compares two degrees. She assumes that the FNQ in *sugi-* constructions is a type of degree-denoting measure phrase which describe the two degrees in comparison. In (69a) *sugi-* compares the degree  $d$  of John’s reading books to a contextually determined standard degree  $C$ . The difference between  $d$  and  $C$  by 3. In (69b), *sugi-* compares the degree  $d$  of John reading 3 specific books to a contextually determined standard degree  $C$ .  $d$  is greater than  $C$ . Therefore, the semantic difference between (69a) and (69b) is attributed to whether *sugi-* takes a FNQ as its differential argument: in (69a) it does; in (69b) it does not.

Let us look at some details of her analysis. Nakanishi proposes that (69a) has the syntactic structure in (70). She argues that *sugi-* is a complex predicate which can be decomposed into two parts: (i) a DegP consisting of a Deg--*sugi-* and its optional differential argument -- *san-satu*, and (ii) an implicit *MANY*, which contributes the degree argument over which *sugi-* quantifies (cf. In English adjectival comparatives, gradable adjectives contributes the degree argument over which the comparative head *-er* quantifies).



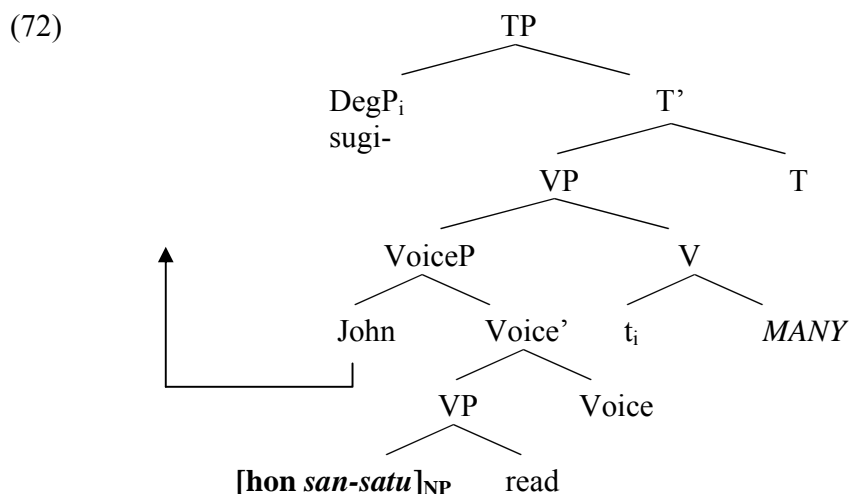
With the presence of *MANY*, (71) can be interpreted in a similar way as adjectival comparatives. Assuming that verbs take an event argument, VoiceP denotes a set of events of John reading books in (71a). *MANY* relates that set of reading events to a degree  $d$  in (71b). The value of the degree  $d$  is based on the number of the books that John read. *sugi*- ‘exceed’ compares  $d$  to a contextually determined standard degree  $C$  in (71c). The difference between the two degrees  $d$  and  $C$  is 3, which is expressed by the FNQ *san-satu* in (71d).

- (71) a.  $\text{VoiceP} = \lambda e_v \exists x [\text{Agent}(e)=j \wedge *book(x) \wedge *read(x,e)]$   
 b.  $\| \text{MANY} \| = \lambda d_{\langle d \rangle} . \lambda e_{\langle v, t \rangle} . \mu(e) = d$   
 c.  $\| \text{sugi} \| = \lambda d . \lambda D_{\langle d, t \rangle} . \text{MAX}(D) - C = d$   
 d.  $\max \{d: \exists e \exists x [\text{Ag}(e)=j \wedge *book(x) \wedge *read(x,e) \wedge \mu(h(e))=d]\} - C = 3$ <sup>35</sup>

(69b) has the structure in (72), which differs from (70) in that the non-FNQ *san-satu* forms a constituent with the NP *hon* ‘book’, and they together serve as the object of the verb *yomi* ‘read’. Semantically, the VoiceP in (72) denotes a set of events of John’s

<sup>35</sup>  $h$  is a homomorphism which maps from one domain to the other. For example, in (72d)  $h$  maps from the domain of events to the domain of individuals. The degree of John’s reading events is based on the number of books that he read.

reading the 3 books. *MANY* relates that set of reading events to a degree  $d$ . Since *sugi-* in (72) does not have a differential argument, the sentence in (69b) means that the degree of the events of John reading the 3 books is greater than a contextually determined standard degree  $C$ .



In her analysis, Nakanishi does not discuss about how the value of  $C$  is determined by the context, but given our previous discussion on the intensionality of *sugi-*, it is not hard to see that  $C$  is a degree whose value is determined by a counterfactual like (73):

(73) If John had met the reading requirement, he would have read  $C$ -books.

$C$  in (73) is the number of books that John read in the closest possible world to the base world where he met the reading requirements. If we factor how the value of  $C$  is determined into Nakanishi's analysis, the truth-conditions of (69a) can be restated as: (69a) is true in  $w$  iff the number of books that John read in  $w$  exceeds by 3 the number of books that he read in the closest possible world  $w'$  to  $w$  where he met the reading requirements.

### 3.4.2 A comparison with Nakanishi (2003)

So far we have seen two types of analyses of *sugi-*: our analysis in (74a) and Nakanishi's analysis in (74b):

(74) a. Our interpretation of *sugi-*:

$$\begin{aligned} \|\textit{sugi-}_{r,f}\|^g &= \lambda w_s \lambda P_{\langle s, \langle \tau, t \rangle \rangle} \lambda x_\tau. \\ \exists w'_s [g(f)(g(r), w) = w' \wedge [P(w)(x) \wedge \neg P(w')(x)] \wedge \forall z_\tau [P(w')(z) \rightarrow P(w)(z)]] \end{aligned}$$

b. Nakanishi's interpretation of *sugi-*:

$$\|\textit{sugi-}\| = \lambda d. \lambda D_{\langle d, t \rangle}. \textit{MAX}(D) - C = d$$

In (74a), the domain of type  $\tau$  includes individuals (of type  $\langle e \rangle$ ), events (of type  $\langle v \rangle$ ) and degrees (of type  $\langle d \rangle$ ). It means: *sugi-* compares two sets of individuals, events, or degrees in  $w$  and the closest possible world  $w'$  to  $w$  where the requirements are met. In (74b), *sugi-* only compares two degrees: one in  $w$  and the other in the closest possible world  $w'$  to  $w$  where the requirements are met. The distinction between these two analyses comes down to a distinction of whether or not comparatives must be based on comparisons of degrees: Nakanishi's analysis certainly assumes that they must do, but our analysis does not. In this section, we will compare our analysis to Nakanishi's, and show that the former better captures the semantics of *sugi-*.

First, Nakanishi's involves assumptions which are unnecessary in ours. Recall that in Nakanishi's analysis, the motivation to posit an implicit morpheme *MANY* in syntax is to create a degree argument which *sugi-* can quantify over. This morpheme becomes unnecessary, if we assume that *sugi-* can also compare sets of events and individuals. Moreover, by assuming that *sugi-* only denotes a comparison of degrees, FNQs in *sugi-* sentences are forced to have different syntax and semantics from those in non-*sugi-*

sentences: FNQs in *sugi*-sentences are arguments of *sugi*- and degree-denoting measure phrases, while in non-*sugi* contexts, they are adverbs. However, in our analysis FNQs have consistent syntax and semantics in *sugi*- and non-*sugi* contexts, as shown in (75):

(75) a. FNQs in our analysis:

$$\| \text{san-satu} \| = \lambda P_{\langle e,t \rangle} \lambda y_e \exists K_{\langle e,t \rangle} [K \sqsubseteq (\lambda u_e \exists v_e [\text{satu}'(v) \wedge u \bullet [\ ] v] \cap P) \wedge |K| \geq 3 \wedge \cup K = y]$$

b. FNQs in Nakanishi's analysis:

$$\| \text{san-satu} \| = 3$$

Finally, our analysis captures the truth-value of *sugi*-sentences in situations where Nakanishi's analysis fails.<sup>36</sup> Consider the example in (76) and (77), Nakanishi's analysis does not, but our analysis does, predict that the *sugi*-sentence in (76a) have different truth-values in the two scenarios described in (76b) and (77b).

(76) a. John-ga syoosetu-o san-satu yomi-sugi-ta.  
John-nom novel-acc 3-Cl read-exceed-past  
'John read 3 novels too many.'

b. In the final exam of an intensive reading class, the professor required each student to read {**A, B, C**} only. John read {**A, B, C, D, E, F**}.

In Nakanishi's analysis, (76a) compares two degrees: the degree  $d$ , which is the number of books that John read in  $w$ , and the degree  $C$ , which is the number of books that John read in the closest possible world  $w'$  to  $w$  where the reading requirement is met.  $d$  is 6 and  $C$  is 3. Nakanishi's analysis correctly predicts (76a) to be true in  $w$  where (76b) is true. Now compare (76) with (77):

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<sup>36</sup> As Chris Kennedy and Roger pointed out (through p.c.), Nakanishi's analysis can be saved by assuming that *sugi*- presupposes the satisfaction of the identity requirements described in (77b) and (78b).

- (77) a. John-ga syoosetu-o san-satu yomi-sugi-ta.  
 John-nom novel-acc 3-Cl read-exceed-past  
 ‘John read 3 novels too many.’
- b. In the final exam of an intensive reading class, the professor required each student to read {**A, B, C**} only. John read {**B, C, D, E, F, G**}.

(77b) differs from (76b) in the set of books John read in  $w$ . According to (77b), John read 2 required novels {B, C} and 4 prohibited novels {D, E, F, G} in  $w$ . Nakanishi’s analysis predicts that (77a) to be *true* in  $w$ , because the number of novels that John read in  $w$  is 6, and the number of novels that he is required to read is 3. The difference between these two degrees is 3. However, our intuition says that (77a) is *not true* in  $w$ , which is captured by our analysis in scenario 5.

Having said where the two analyses fall apart, let us look at some cases where the two analyses fall together. First, Nakanishi’s analysis and our analysis make the same predictions about the truth-values of *sugi*-sentences in situations where there are *only* amount requirements involved:

- (78) a. John-ga syoosetu-o san-satu yomi-sugi-ta.  
 John-nom novel-acc 3-Cl read-exceed-past  
 ‘John over-did the reading by three novels.’
- b. In the final exam of an intensive reading class, the professor selected 5 English novels, and required each student to read *exactly* 2 novels from the set so that each of them would have some fresh materials that he had not yet seen in the exam. John violated this rule by reading all the 5 novels.



In (78), the closest possible world  $w'$  to  $w$  where John met the requirement is a world *where* John read 2 out of the 5 assigned novels. Nakanishi's analysis predicts (78a) to be true in  $w$  where (78b) is true, because the actual number of novels that John read is 5 and the standard degree  $C$  is 2. The difference between these two degrees is 3. Our analysis also predicts (78a) to be true in  $w$ , as shown in the section 3.3.2.4.

Second, when *sugi-* combines with gradable predicates such as *naga* 'long' in (79a), Nakanishi's analysis and our analysis both predict that *sugi-* compares two sets of degrees.

- (79) a. kono sukaato-ga ni inchi naga-sugi-ru.  
           this skirt-nom 2 inch long-exceed-present  
           'This skirt is 2 inches too long.'
- b. Mary is picky. She asked her tailor to shorten her shirt to 20 inches. When she found it was actually 22 inches, she sent it back.

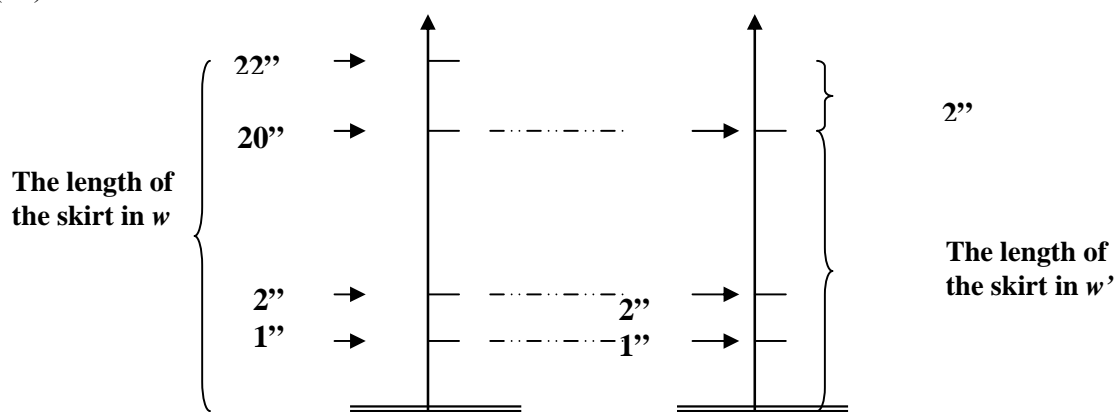
According to Nakanishi's analysis, (79a) means the degree  $d$  to which this skirt is long in the world  $w$  exceeds by 2 inches the degree  $C$  to which the skirt should be long. Given the situation in (79b), this skirt is 22 inches in  $w$ , thus  $d = 22$ . In the closest possible world  $w'$  to  $w$  where this skirt met the requirement, it is 20 inches, thus  $C = 20$ . The difference between 22 and 20 is 2 inches. (79a) is predicted to be true in  $w$ .

Our analysis also predicts (80a) to be true in  $w$ , because given the semantics of *sugi-* in (80), (81a) means: there is a set of degrees  $x_d$  to which this skirt is long in  $w$ , but not in the closest possible world  $w'$  to  $w$  where the relevant requirements are met.  $x_d$  spans 2 inches on the scale of height. For all degrees  $z_d$  to which this skirt is long in  $w'$ , it is also long to  $z_d$  in  $w$ .

$$(80) \quad || \text{ sugi}_{-r,f} ||^g = \lambda w_s \lambda P_{\langle s, \langle d, t \rangle \rangle} \lambda x_d. \\ \exists w'_s [g(f)(g(r), w) = w' \wedge [P(w)(x) \wedge \neg P(w')(x)] \wedge \forall z_d [P(w')(z) \rightarrow P(w)(z)]]$$

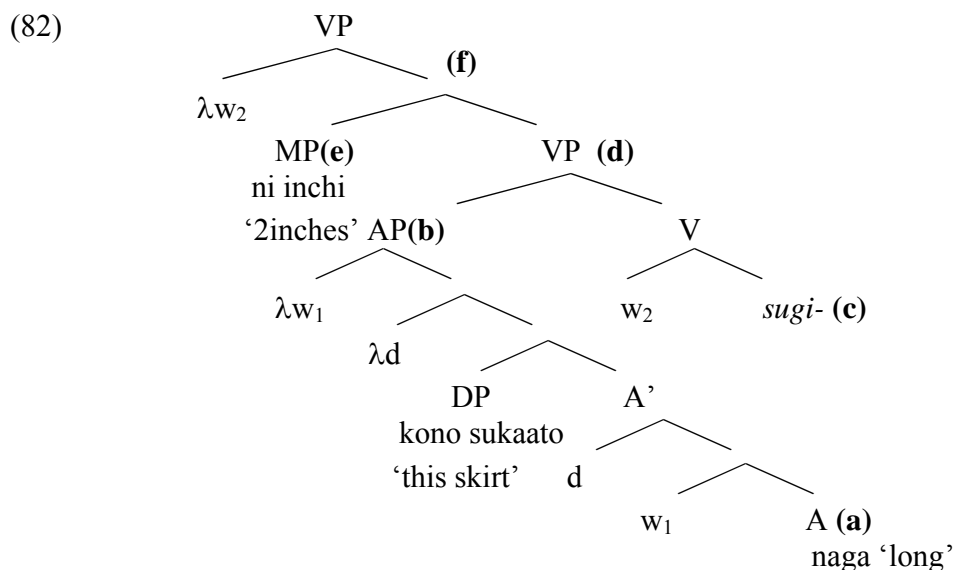
This meaning is captured by the figure in (81).

(81)



In (81) the set of degrees to which the skirt is long in  $w$  is  $\{d: d \leq 22\}$ . The set of degrees to which the skirt is long in the closest possible world  $w'$  to  $w$  where the requirements are met is  $\{d': d' \leq 20\}$ . For each degree  $z_d$  such that this skirt is long to  $z_d$  in  $w'$ , it is also long to  $z_d$  in  $w$ . There are some degrees  $x_d$  such that this skirt is long to  $x_d$  in  $w$ , but not in  $w'$ .  $x_d$  ranges from 20 to 22 on the scale.

The logical form of (79a) is provided in (82), and its step-by-step interpretations are given in (83):



In (82), the measure phrase *ni inchi* ‘2 inches’, like the FNQ *san-satu*, is a VP adverb adjoining to the VP above *sugi-*. Semantically, it is a predicate of parts of scales.

In (83), the adjective *naga* ‘long’ denotes an intensional relation between degrees  $d$  and individuals  $x$  such that  $x$  is long to  $d$  in  $w$  (83a). When *naga* combines with the subject *kono sukaato* ‘this skirt’, the AP [kono sukaato naga] denotes a property of degrees to which this skirt is long in  $w$  (83b). When the AP combines with *sugi-* (83c), the result is a set of degrees to which this skirt is long in  $w$ , but not in the closest possible world to  $w$  where the relevant requirements are met (83d). The measure phrase *ni inchi* ‘2 inches’ is predicated of the set of degrees that the skirt is long to in  $w$ , but not in  $w'$ . That set of degrees spans 2 inches on the scale of length (83f).

- (83) a.  $\| \text{naga} \| = \lambda w \lambda d \lambda x. \text{length}(w)(d)(x)$
- b.  $\| \text{AP} \| = \lambda w_1 \lambda d. \text{length}(w_1)(d)(\text{this skirt})$
- c.  $\| \text{sugi-}_{r,f} \|_g = \lambda w_s \lambda P_{\langle s, \langle d, t \rangle \rangle} \lambda x_d.$   
 $\exists w'_s [g(f)(g(r), w) = w' \wedge [P(w)(x) \wedge \neg P(w')(x)] \wedge \forall z_d [P(w')(z) \rightarrow P(w)(z)]]$

- d.  $\| \text{AP } \textit{sugi-}_{r,f} \|_{\text{g}} = \lambda d_d. \exists w'_s [g(f)(g(r), w) = w' \wedge$   
 $[\text{length}(w_2)(d)(\text{this skirt}) \wedge \neg \text{length}(w')(d)(\text{this skirt})] \wedge$   
 $\forall z_d [\text{length}(w')(z)(\text{this skirt}) \geq z \rightarrow \text{length}(w_2)(z)(\text{this skirt})]]$
- e.  $\| \text{ni inchi} \| = \lambda D_{\langle d, t \rangle} \text{ni inchi}'(D)$
- f.  $\| \text{ni inchi AP } \textit{sugi-}_{i,f} \|_{\text{g}} = \text{ni inchi}' (\lambda d_d. \exists w'_s [\lambda d_d. \exists w'_s [g(f)(g(r), w) = w' \wedge$   
 $[\text{length}(w_2)(d)(\text{this skirt}) \wedge \neg \text{length}(w')(d)(\text{this skirt})] \wedge$   
 $\forall z_d [\text{length}(w')(z)(\text{this skirt}) \rightarrow \text{length}(w_2)(z)(\text{this skirt})]])$

(83f) says that the set of degrees which this skirt is long to in  $w$ , but not in the closest possible world  $w'$  to  $w$  where the requirements are met, spans 2 inches on the scale of length. For all the degrees  $z$ , if this skirt is long to  $z$  in  $w'$ , it is also long to  $z$  in  $w$ .

The semantics of *sugi-* in (79) differs from its semantics in (4a-b) in that the former compares a set of *degrees* in  $w$  to that in the closest possible world  $w'$  to  $w$  where the requirements are met, and the latter compares two set of *events* or *individuals* in  $w$  and  $w'$ . It is easy to see that it is the gradability of the predicate that *sugi-* combines with that determines whether *sugi-* compares degrees or non-degrees. When the predicate that *sugi-* combines with is gradable, *sugi-* compares two sets of degrees; when the predicate that *sugi-* combines with is non-gradable, *sugi-* compares two sets of events or individuals.

### 3.4.3 The A-not-A analysis<sup>37</sup>

Our analysis of *sugi-* demonstrates an interesting parallel to the A-not-A analysis of adjectival comparatives in the literature (McConnell-Ginet 1973, Klein 1980, 1982, Seuren 1973, 1984). This is shown by the interpretation of the adjectival comparative in (84a)

<sup>37</sup> I am indebted to Roger for pointing out the similarity between my analysis of *sugi-* in (89) and the A-not-A analysis of adjectival comparatives. The term 'A-not-A analysis' is also from him.

- (84) a. This skirt is longer than that one.  
 b.  $\exists d. [\text{length}(\text{this skirt})(d) \wedge \neg \text{length}(\text{that skirt})(d)]$

According to the A-non-A analysis, the comparative in (84a) means: there is some degree of length: this skirt meets or exceeds it and that skirt does not meet or exceed it. The A-not-A analysis differs from the standard degree-based analyses we introduced in chapter 1 in the negation inside the comparative clause after *than*. It was motivated in part to account for the occurrence of negative polarity items in comparative clauses, as shown in (85):

- (85) a. This skirt is longer than *any* other skirt is.  
 b. Oil is more expensive than it has *ever* been.

Measure phrases in the A-not-A analysis are predicates of parts of scales (of type  $\langle\langle d, t \rangle, t \rangle$ ). They are predicated of the set of degrees which the subject meets or exceed, but the standard of comparison does not. For instance, if we insert the differential measure phrase *2 inches* in (84), the sentence means: there is a set of degrees such that this skirt meets or exceeds, but that skirt does not meet or exceed. This set of degrees spans 2 inches:

- (85) a. This skirt is 2 inches longer than that one.  
 b. 2 inches  $(\lambda d. [\text{length}(\text{this skirt})(d) \wedge \neg \text{length}(\text{that skirt})(d)])$

Comparing the interpretation in (85b) to that in (83f), the two interpretations are similar in both having a negation in the comparative clause. They differ from each other in intensionality. In (83f), the comparison is made between the degree to which the skirt is long in  $w$  and the degree to which it is long in the closest possible world  $w'$  to  $w$  where

the requirements are met. In (86b) the comparison is made between the length of this skirt and the length of that skirt.

This parallel between our analysis of *sugi-* and the A-not-A analysis of adjectival comparatives has theoretical implications. It shows that our analysis of *sugi-* falls into a very general analysis of comparatives. Moreover, it shows that the A-not-A analysis, which was originally motivated to account for adjectival comparatives in English, can be easily extended to account for comparatives which do not involve degrees.

### 3.4.4 Summary

To summarize, in this section we reviewed a degree-based analysis of *sugi-* proposed by Nakanishi (2004a,b). We showed that her analysis differs from ours in whether or not *sugi-* must denote a comparison of degrees. In our analysis, *sugi-* compares a set of degrees, individuals or events in  $w$  to that in the closest possible world  $w'$  to  $w$  where the relevant requirements are met. In Nakanishi's analysis, *sugi-* only denotes a comparison of degrees.

In the following section, we will look at an asymmetry between subject-oriented FNQs and object-oriented FNQs in *sugi-*constructions, which Nakanishi uses as evidence to show that FNQs in *sugi-*constructions are distinct from those in non-*sugi-*counterparts.

### 3.5 A puzzle in Nakanishi's analysis

Nakanishi observes that subject-oriented FNQs and object-oriented FNQs show different behaviors in *sugi*- and non-*sugi* contexts. Though both of them are allowed in non-*sugi* constructions (ex.87), only object-oriented FNQs can occur in *sugi*-constructions (ex.88).

(87) Subject-oriented FNQs

- a. **Gakusei-ga** kinoo **san-nin** sono miitingu-ni sankasi-ta.  
 student-nom yesterday 3-Cl that meeting-in participate-past  
 'Three students participated in that meeting yesterday.'

Object-oriented FNQs

- b. John-ga **hon-o** kinoo **san-satu** yonda.  
 John-nom book-acc yesterday 3-Cl read-past  
 'John read 3 books yesterday.'

(88) Subject-oriented FNQs

- a. ?? **Gakusei-ga** kinoo **san-nin** sono miitingu-ni sankasi-*sugi*-ta.  
 Student-nom yesterday 3-Cl that meeting-in participate-exceed-past

Intended meaning: 'Three too many students participated in that meeting yesterday.'

Object-oriented FNQs

- b. John-ga [**hon**]-o kinoo **san-satu** yomi-*sugi*-ta  
 John-nom book-acc yesterday 3-CL read-exceed-past  
 (i) 'John over-read (the) 3 books.'  
 (ii) 'John over-did the reading by 3 books.'

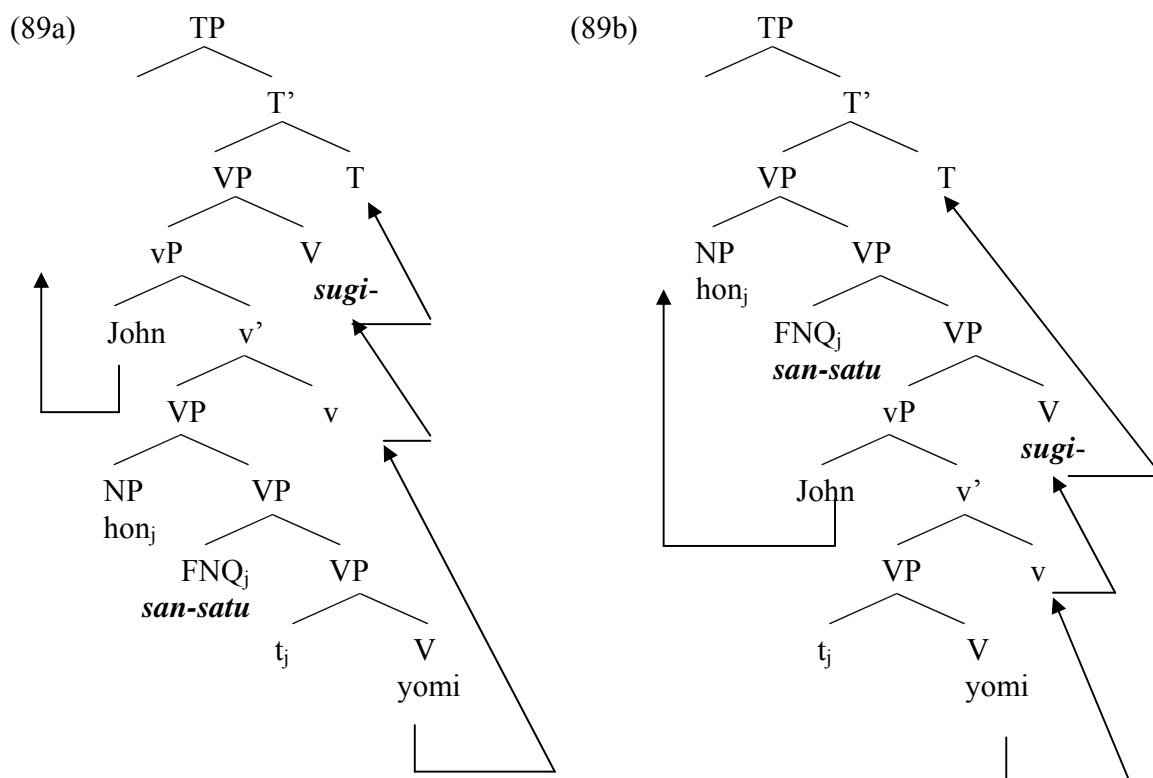
Based on the contrast between (87) and (88), Nakanishi argues that FNQs in *sugi*-constructions are distinct from those in non-*sugi* constructions: FNQs in non-*sugi*-

constructions are vP/VP adverbs, but those in *sugi*-constructions are arguments of *sugi*-. She leaves open the question of why only object-oriented FNQ, but not subject-oriented FNQs, can serve as arguments of *sugi*.

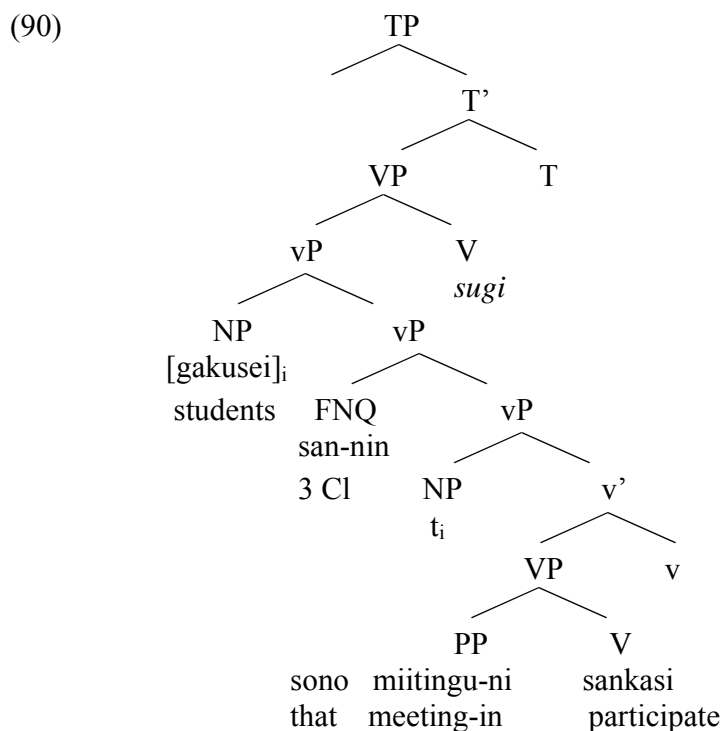
The purpose of this section is to show that the distributional difference between FNQs in *sugi*- and non-*sugi*-contexts does not constitute a strong piece of evidence to show that they are different. There might be other reasons that explain the unacceptability of subject-oriented FNQs in *sugi*-constructions.

(88b) has two readings: the salient reading--*John overdid the reading by three books*, and the non-salient reading--*John over-read (the) three books*. These two readings are related to two different syntactic structures. The salient reading is related to the structure where the FNQ *san-satu* is adjoined to the VP above *sugi*- (ex. 89b) (repeated from 33b); the non-salient reading is related to the structure where the FNQ *san-satu* is adjoined to the VP below *sugi*- (89a)(repeated from 33a).





The *sugi*-sentence in (88a) has only one syntactic structure in (90). Given that subject-oriented FNQs are vP-adverbs, the FNQ *san-nin* in (88a) is a vP adverb which is adjoined to the vP below *sugi*-. The host NP *gakusei* ‘students’ is moved to c-command *san-nin*, and is co-indexed with it.



Comparing the structure in (90) to the one in (89a), both structures have a FNQ below *sugi-*: in (89) it is the subject-oriented FNQ *san-nin* and in (90a) it is the object-oriented *san-satu*. In our analyses, only FNQs above *sugi-* can be interpreted as differentials, and those below *sugi-* cannot. It follows that the subject-oriented FNQ *san-nin* in (91) cannot be interpreted as a differential, because it is below *sugi-*. Therefore, our analysis predicts that (91) receives the interpretation--‘*three students participated in that meeting more than they should have*’, but not the interpretation: \*‘*three students too many participated in that meeting.*’

Here is what we find out by consulting native Japanese speakers about the reading of (88a). To most speakers, (88a) is a marginally acceptable sentence. If it ever has a reading, it is the reading--*Three students participated in that meeting too much*. It can not

receive the reading-- *three students too many participated in that meeting*. Their judgments are in fact consistent with our prediction above.

Now let us turn to the question raised by Nakanishi: if *san-nin* in (88a) is a FNQ, why can't it appear in *sugi*-constructions? We do not have a direct answer to this question, but here is a relevant observation. The structure in (89a) and the one in (89b) are related to the two interpretations of (88b). Note that the two interpretations have different status. (89b), where the FNQ is above *sugi*-, is related to the salient reading, and (89a), where the FNQ is below *sugi*-, is related to the non-salient reading. The sentence in (89b) has the structure where the FNQ is below *sugi*-, and the sentence is marginally acceptable. So, the generalization appears to be that when FNQs are not interpreted as differentials, the result is marked.

### 3.6 Conclusion

To conclude, in this chapter we proposed an analysis of *sugi*- in Japanese. We argued that *sugi*- compares a set of individuals, events or degrees in world  $w$  to that in the closest possible world  $w'$  to  $w$  where the requirements are met. This analysis, when combined with a general analysis of FNQ, explains the (non-)ambiguity of (4a-b).

- (4) a. John-ga [hon san-satu]-o kinoo yomi-*sugi*-ta. Non-FNQ  
 John-nom book 3-CL-acc yesterday read-exceed-past  
 'John over-read (the) 3 books yesterday.'
- b. John-ga [hon]-o kinoo san-satu yomi-*sugi*-ta. FNQ  
 John-nom book-acc yesterday 3-CL read-exceed-past  
 (i) 'John over-read (the) 3 books yesterday.'  
 (ii) 'John overdid the reading by 3 books yesterday'

The advantage of our analysis of *sugi-* is that it gives a consistent syntactic and semantic analysis to FNQs throughout *sugi-* and non-*sugi-* constructions.

## Chapter 4

### Bijections, Comparatives Compared

#### 4.1 Introduction

In chapter 2 and chapter 3, we presented two non-degree analyses of Japanese *sugi*-constructions and Chinese DVC. We argued that *duo* in Chinese DVCs has the semantics in (1), it compares two sets of individuals or events based on bijections. Japanese *sugi*-‘exceed’, on the other hand, has the semantics in (2). It is an intensional operator which compares a set of individuals, events or degrees in  $w$  to that in the closest possible world  $w'$  to  $w$  where the relevant requirements are met.

- (1)  $\| duo \| = \lambda P_{\langle e, \langle e, t \rangle \rangle} \lambda k_e \lambda y_e \lambda x_e \exists f_{\langle e, e \rangle} [f \text{ is a bijective function} \wedge P(k)(x) \wedge \forall z_e [P(z)(y) \rightarrow [P(f(z))(x) \wedge f(z) \cap k = \emptyset]]]$
- (2)  $\| sugi_{-r, f} \|_g = \lambda w_s \lambda P_{\langle s, \langle \tau, t \rangle \rangle} \lambda x_\tau \exists w'_s [g(f)(g(r), w) = w' \wedge [P(w)(x) \wedge \neg P(w')(x)] \wedge \forall z_\tau [P(w')(z) \rightarrow P(w)(z)]]]$

In this chapter, we show that the two independently motivated interpretations in (1) and (2) can be unified under the notion of bijections. Following Lewis’s counterpart theory (1968, 1971), we assume that an individual cannot exist in more than one possible world. Rather than saying  $x$  exists in possible world  $w$  and  $w'$ , we would say  $x$  exists in  $w$ , and the counterpart of  $x$  exists in  $w'$ . Once we incorporate the counterpart relation into the semantics of *sugi*, it becomes clear that *sugi*- also compares two sets, set A in  $w$  and set B in  $w'$ , based on a one-to-one correspondence (or bijection) from set B to a proper subset

of set A, A'.<sup>38</sup> A' consists of the counterparts of the elements in set B. As such the semantics of *sugi-* is parallel to the semantics of *duo* in Chinese DVC.

We further argue that the bijective approach is a more fundamental approach to the semantics of comparatives than the degree-based approach, because the bijective approach can be applied to both adjectival and non-adjectival comparatives, but the degree approach can only be applied to adjectival comparatives. According to the bijective approach, adjectival comparatives describe a comparative relation between two sets of degrees A and B such that every degree in set A has a degree counterpart in set B, and there are some degrees in set B which do not have degree counterparts in set A. Since the difference between two sets of degrees is necessarily a degree, the bijective approach predicts that differentials of adjectival comparatives are degree-denoting expressions. It also follows that the distinction between the bijective approach and the degree approach is trivial when applied to adjectival comparatives, because they do not differ in the analysis of differentials.

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<sup>38</sup> The counterpart relation does not have to be a one-to-one relation, as Lewis (1968) points out below. In my analysis of *sugi-*, I simply treat the counterpart relation as a one-to-one relation, and I assume that it is symmetric, which means if  $x$  is a counterpart of  $y$ , then  $y$  is a counterpart of  $x$ .

*... It would not have been plausible to postulate that nothing in any world had more than one counterpart in any other world. Suppose  $x_{4a}$  and  $x_{4b}$  in world  $w_4$  are twins; both resemble you closely; both resemble you far more closely than anything else in  $w_4$  does; both resemble you equally. If so, both are your counterparts. It would not have been plausible to postulate that no two things in any world had a common counterpart in any other world. Suppose you resemble both the twins  $x_{4a}$  and  $x_{4b}$  far more closely than anything else in the actual world does. If so, both are you are a counterpart of both.*

This chapter is structured as follows. In section 2, we show that the semantics of *sugi-* and Chinese DVC can be unified under the notion of bijections. In section 3, we apply bijections to Chinese adjectival comparatives, and show that the bijective analysis, which is originally motivated to explain the semantics of DVC, can be extended to adjectival comparatives. In section 4, we show that English differs from Japanese and Chinese in that it only has adjectival and adverbial comparatives. Hence, it is trivial to distinguish the bijective approach and the degree approach in the analysis of English comparatives. Section 5 is a conclusion.

## 4.2 The counterpart relation and Japanese *sugi-*

This section is devoted to a re-analysis of *sugi-* based on the counterpart theory (Lewis 1968, 1971). We show that the semantics of *sugi-* and the semantics of *duo* in DVC can be unified under the bijective analysis. In section 4.2.1, I briefly review the counterpart theory; in section 4.2.2, I re-interpret *sugi-* based on the counterpart theory.

### 4.2.1 The counterpart theory

The counterpart theory is in part motivated to deal with issues related to transworld identity—identity across possible worlds, which arise in the interpretation of a sentence involving *de re* modal<sup>39</sup>. Consider the counterfactual conditional in (3):

- (3) Bertrand Russell might have been a playwright, if he were not a philosopher.<sup>40</sup>

Following Stalnaker's analysis of counterfactual conditionals (cf. chapter 3, section 3.3.2.2), the sentence in (4) means: in the closest possible world  $w'$  to the actual world  $w$

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<sup>39</sup>*de re* modality is modality that is predicated of an object, as opposed to *de dicto* modality which is predicated of a statement.

<sup>40</sup>This example is based on Mackie (2006).

where Bertrand Russell was not a philosopher, he was a playwright. This interpretation implies that there is an individual in world  $w'$  who is not a philosopher but a playwright, and he is identical to Bertrand Russell in  $w$ . In other words, there is a transworld identity between an individual in  $w'$  and Bertrand Russell in  $w$ . The transworld identity gives rise to the following question: how do people identify two individuals in different worlds as the same person, if they are not exactly identical?

In response to this question, Lewis (1968, 1971) argues that an individual exists only in one possible world, but can have counterparts in other worlds. Under this theory, (4) means: there was a counterpart of Bertrand Russell in the closest possible world  $w'$  to  $w$  where he was not a philosopher, but resembled Bertrand Russell more than anyone else in  $w'$ . That individual is a playwright. A counterpart relation between two individuals  $x$  and  $y$  is written as  $Cxy$ :  $x$  is a counterpart of  $y$ .

#### 4.2.2 The counterpart theory and *sugi-*

In this section, we proceed to incorporate the counterpart relation into the semantics of *sugi-* and show that the meaning of *sugi-* is parallel to the meaning of *duo* in DVC

In Chapter 3, we proposed that *sugi-* has the following meaning in (3). It compares a set of individuals, events or degrees in  $w$  to that in the closest possible world  $w'$  to  $w$  where the relevant requirements are met. With Lewis' counterpart theory, the semantics of *sugi* in (3) can be restated in (4):

$$(3) \quad ||sugi_{-r,f}||^g = \lambda w_s \lambda P_{\langle s, \langle e, t \rangle \rangle} \lambda x_e \exists w'_s$$

$$[g(f)(g(r), w) = w' \wedge [P(w)(x) \wedge \neg P(w')(x)] \wedge \forall z_e [P(w')(z) \rightarrow P(w)(z)]]$$



$$(4) \quad || \text{sugi-}_{r,f} ||^g = \lambda w_s \lambda P_{\langle s, \langle e, t \rangle \rangle} \lambda x_e. \\ \exists w'_s \exists C [C \text{ is a counterpart relation} \wedge g(f)(g(r), w) = w' \wedge [P(w)(x) \wedge \\ \neg \exists x' [C x' x \wedge P(w')(x')]] \wedge \forall z'_e [P(w')(z') \rightarrow \exists z [C z z' \wedge P(w)(z)]]]$$

(4) has 4 conjuncts. The first one says  $C$  is a counterpart relation. The second one says  $w'$  is the closest possible world to  $w$  where the proposition  $g(r)$  is true. The third conjunct says  $x$  makes  $P$  true in  $w$ , but there is no counterpart of  $x$  in  $w'$  which makes  $P$  true in  $w'$ . The last conjunct says for all  $z'$  in  $w'$ , if  $z'$  makes  $P$  true in  $w'$ , then there is a counterpart of  $z'$  in  $w$ , namely  $z$ , which makes  $P$  true in  $w$ . (4) differs from (3) in that in (3) the variables  $x$  and  $z$  range over individuals in world  $w$  and the closest possible world  $w'$  to  $w$  where the relevant requirements are met. In (4) variables  $x$  and  $z$  range over individuals in world  $w$ , and their counterparts in  $w'$ , namely  $x'$  and  $z'$ , range over individuals in  $w'$ .

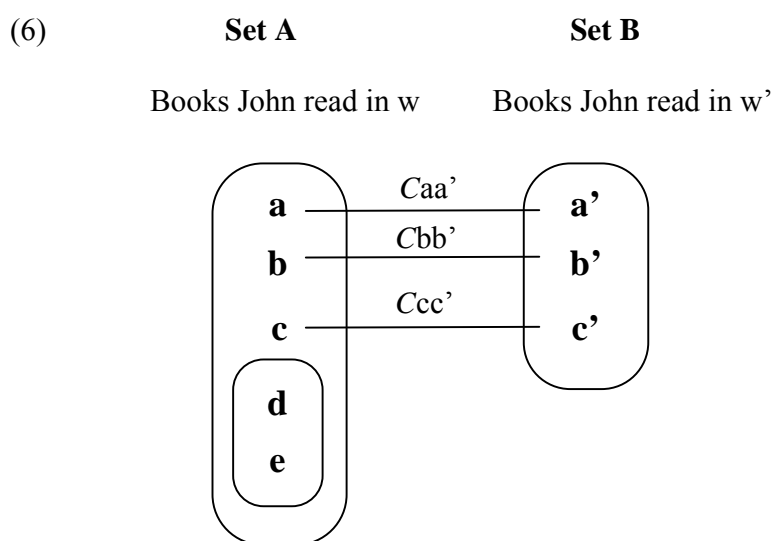
To see the difference that the counterpart relation makes to the meaning of *sugi*-constructions, let us consider the example in (5):

- (5) a. John-ga [hon]-o kinoo ni-satu yomi-sugi-ta.  
John-nom book-acc yesterday 2-CL read-exceed-past  
'John overdid the reading by 2 books yesterday'
- b. In the final exam of an intensive reading class, the professor required students to read {a, b, c} only so that they would have some fresh materials that they had not yet seen in the exam. John violated this rule by reading {a, b, c, d, e}

(5a) is an intuitively correct statement in the world  $w$  where (5b) is true. According to the semantics of *sugi*- in (3), the one without the counterpart relation, (5a) compares the set of books that John read in  $w$ , namely {a, b, c, d, e}, to the set of books that he read in the closest possible world  $w'$  to  $w$  where he met the reading requirements, namely {a, b, c}.

For every book that John read in  $w'$ , he read it in  $w$ . There are 2 books, namely  $\{d, e\}$ , which John read in  $w$ , but not in  $w'$ . Note that in this interpretation, the set of books that John read in  $w$  is a *superset* of the set of the books that he read in  $w'$ .

Let us now turn to the interpretation of *sugi-* in (4), the one with the counterpart relation. According to (4), (5a) compares the set of books John read in world  $w$   $\{a, b, c, d, e\}$  to the set of books John read in the closest possible world  $w'$  to  $w$  where the reading requirements are met, namely  $\{a', b', c'\}$ .  $a'$  is the counterpart of  $a$  in  $w'$ ,  $b'$  is the counterpart of  $b$  in  $w'$ , and  $c'$  is the counterpart  $c$  in  $w'$ . For every book that John read in  $w'$ , he read its counterpart in  $w$ . There are 2 books which John read in  $w$ , whose counterparts he did not read in  $w'$ . This meaning is captured by the diagram in (6):



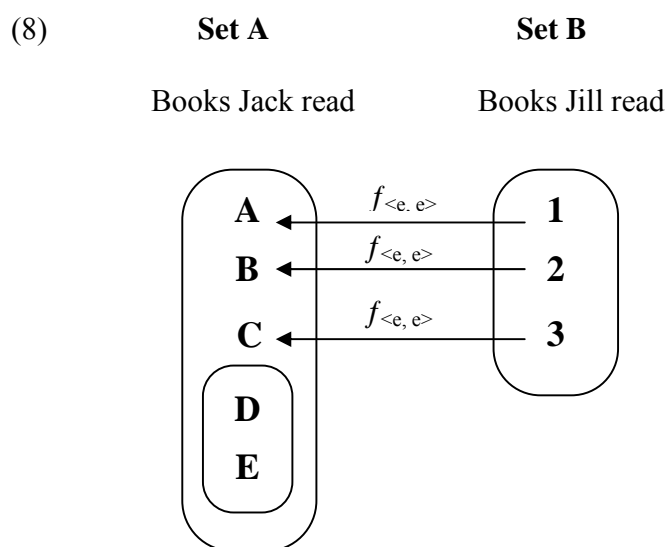
In (6), the counterpart relation  $C$  sets up a one-to-one correspondence from set B to a subset of set A,  $A'$  such that each element in B is mapped to a unique element in  $A'$ . Each element in  $A'$  is mapped to a unique element in B. This relation is parallel to the bijective function we use to describe the semantics of DVC (A bijection or bijective function from set A to set B is a function such that every member of A is paired with

exactly one member of B, and vice versa). Compare the *sugi-* example in (5) to the DVC in (7):

(7) a. Jack bi Jill *duo* du-le liang ben xiaoshuo.  
 Jack Jill much read-asp 2 Cl novel  
 ‘Jack read 2 more novels than Jill did.

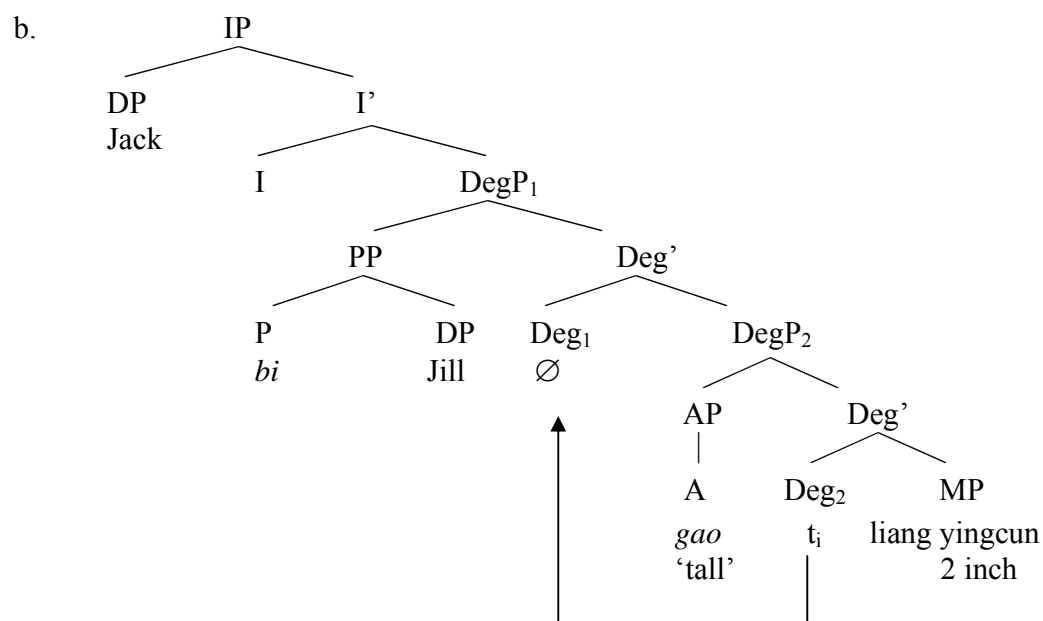
b. Jack read 5 books {a, b, c, d, e}. Jill read 3 books {1, 2, 3}

The DVC in (7a) compares the set of books that Jack read, namely {a, b, c, d, e}, and the set of books that Jill read, namely {1, 2, 3}. It is true iff for every book Jill read, Jack read its *f*-counterpart. There are two books which Jack read, whose *f*-counterparts Jill did not read. This meaning is captured by the diagram in (8):



Both (6) and (8) describe a comparative relation between two sets A and B based on a one-to-one correspondence (or a bijection) from set B to a proper subset of set A, A'. However, there is a difference between the counterpart relation in *sugi-* and the bijection in DVC. That is, the former is based on a similarity relation between two individuals





(10) a.  $\|\emptyset\| = \lambda d_d \lambda G_{\langle e, d \rangle} \lambda y_e \lambda x_e [G(x) - G(y) \geq d]$

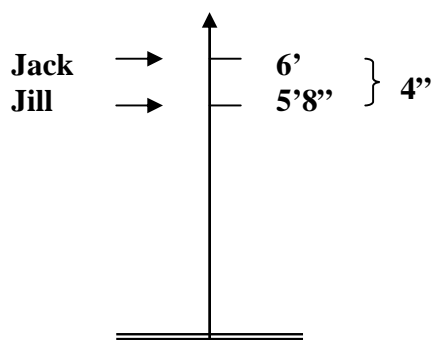
b.  $\|gao\| = \lambda x_e x$ 's height

c.  $\|si\ yingcun\| = 4$  inches

d.  $\|Jack\ bi\ Jill\ gao\ si\ yingcun\| = 1$  iff height (Jack) - height (Jill)  $\geq 4$  inches

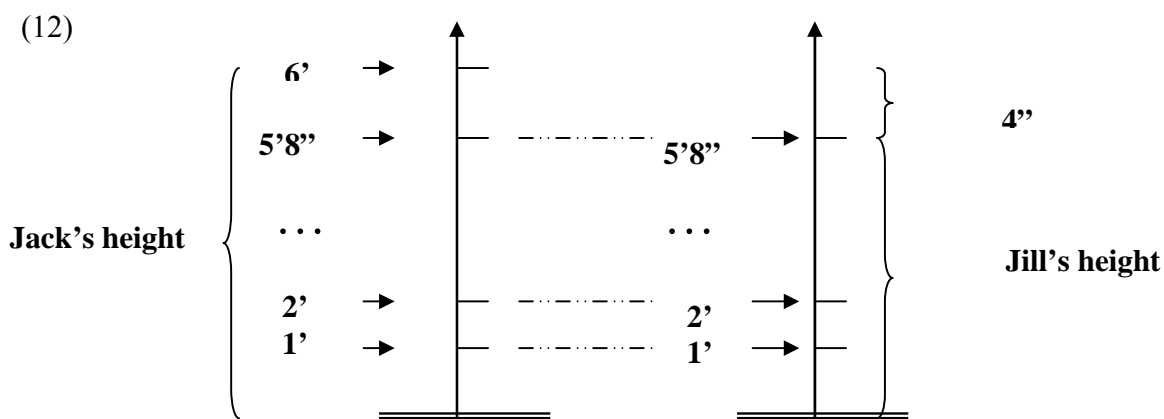
(10d) says: (9a) is true iff the degree  $d$  to which Jack is tall exceeds the degree  $d'$  to which Jill is tall by 4 inches. (9a) is true in the situation where Jack is 6 feet (e.g.  $d = 6$ ), and Jill is 5.8 feet ( $d' = 5.8$ ). The difference between  $d$  and  $d'$  is 4 inches. This meaning is captured in the diagram in (11).

(11)



The diagram in (11) shows that in the degree-based analyses, adjectival comparatives like (9a) describe an ordering relation of two degrees, where degrees are (totally-ordered) points on a scale.

If we apply the bijective analysis, the comparative in (9a) means: Jack possesses a set of degrees of height and Jill possesses a set of degrees of height. For all the degrees of height  $d$  that Jack possesses, Jill possesses their  $f$ -counterparts. There are some degrees of height which Jack possesses, whose  $f$ -counterparts Jill does not possess. This meaning is captured by the diagram in (12):



Let us consider how this meaning is compositionally achieved in the structure in (9b). First, the bijective function  $f$  compares two sets of degrees, thus we assume that gradable adjectives like *gao* ‘tall’ denotes a relation between degrees and individuals (of type  $\langle d, \langle e, t \rangle \rangle$ ) (13a). The differential measure phrase *si yingcun* ‘4 inches’ denotes a set of degrees which are 4 inches on a scale. It has the semantics in (13b). The null Deg head  $\emptyset$  has the semantics in (13c), parallel to the interpretation of *duo* in DVC. It takes 4 arguments: (i) a relation  $P$  denoted by an adjective—*gao* ‘tall’; (ii) a set of degrees  $D$  denoted by a differential—*si yingcun* ‘4 inches’; (iii) a standard of comparison  $y$ —*Jill* and

(iv) a subject  $x$ --*Jack*. When  $\emptyset$  composes with all its arguments, the result is in (13d). It says: there is a bijective function  $f$  such that for every degree  $z$ , if Jill is tall to  $z$ , Jack is tall to the  $f$ - counterpart of  $z$ . There is a set of degrees  $d$  such that Jack is tall to  $d$ , and  $d$  does not intersect with  $f(z)$ .  $d$  spans 4 inches on the scale.

- (13) a.  $\| \text{gao} \| = \lambda d_d \lambda x_e. \text{height}(x) \geq d$
- b.  $\| \text{si yingcun} \| = \lambda d [4 \text{ inches}(d)]$
- c.  $\| \emptyset \| = \lambda P_{\langle d, \langle e, t \rangle \rangle} \lambda D_{\langle d, t \rangle} \lambda y_e \lambda x_e. \exists f_{\langle d, d \rangle} [f \text{ is a bijective function} \wedge \exists d [D(d) \wedge P(d)(x)] \wedge \forall z_d [P(z)(y) \rightarrow [P(f(z))(x) \wedge f(z) \cap d = \emptyset]]]$
- d.  $\| \text{Jack bi Jill gao si yingcun} \| = 1$  iff  
 $\exists f_{\langle d, d \rangle} [f \text{ is a bijective function} \wedge \exists d [4 \text{ inches}(d) \wedge \text{height}(d)(x)] \wedge \forall z_d [\text{height}(z)(\text{Jill}) \rightarrow [\text{height}(f(z))(\text{Jack}) \wedge f(z) \cap d = \emptyset]]]$

The degree analysis in (10) and the bijective analysis in (13) represent two different ways to capture the truth-value of (16a): the former compares Jack's height to Jill's height based on an ordering relation between two degrees; the latter compares the set of degrees that Jack possess and the set of degrees that Jill possesses based on a bijection  $f$ . However, the distinction between these two analyses is trivial, because in both analyses, differentials in adjectival comparatives are predicted to be degreed-denoting expressions.

Finally, let us compare the semantics of the null Deg head  $\emptyset$  in (14a) to the semantics of *duo* in (14b):  $\emptyset$  compares two sets of individuals and events based on bijections, whereas *duo* compares two sets of degrees based on bijections.

- (14) a.  $\| \emptyset \| = \lambda P_{\langle d, \langle e, t \rangle \rangle} \lambda D_{\langle d, t \rangle} \lambda y_e \lambda x_e. \exists f_{\langle d, d \rangle} [f \text{ is a bijective function} \wedge \exists d [D(d) \wedge P(d)(x)] \wedge \forall z_d [P(z)(y) \rightarrow [P(f(z))(x) \wedge f(z) \cap d = \emptyset]]]$
- b.  $\| \text{duo} \| = \lambda P_{\langle e, \langle e, t \rangle \rangle} \lambda k_e \lambda y_e \lambda x_e. \exists f_{\langle e, e \rangle} [f \text{ is a bijective function} \wedge P(k)(x) \wedge \forall z_e [P(z)(y) \rightarrow [P(f(z))(x) \wedge f(z) \cap k = \emptyset]]]$

(14) predicts that Chinese has two comparative morphemes, each of which combines with a different type of predicate to form comparatives.  $\emptyset$  only combines with gradable predicates, like gradable adjectives (ex.15a) and gradable VPs such as *xihuan chi mian* ‘like eating noodles’ (ex.15b). It does not combine with non-gradable verbs such as *du* ‘read’, as shown in (16)

(15) a. Jack bi Jill gao si yingcun.

tall 4 inch

‘Jack is 4 inches taller than Jill.’

b. Jack bi Jill xihuan chi miantiao.

like eat noodles

‘Jack likes eating noodles more than Jill does.’

(16) \*Jack bi Jill du-le liang ben xiaoshuo.

much read-asp 2 Cl novel

‘Jack read 2 more novels than Jill did.’

*duo* on the other hand only combines with non-gradable verbs to form DVCs, as shown in (17). It cannot combine with gradable predicates, as shown in (18).

(17) Jack bi Jill ***duo*** du-le liang ben xiaoshuo.

much read-asp 2 Cl novel

‘Jack read 2 more novels than Jill did.’

(18) a. \*Jack bi Jill ***duo*** gao-le liang yingcun

much tall-asp 2 inch

Intended meaning: ‘Jack is taller than Jill by 2 inches.’



c. \*Jack bi Jill *duo* xihuan mao  
 much tall-asp cat

Intended meaning: Jack likes cats more than Jill does.'

To summarize, in this section we re-analyzed the semantics of Chinese adjectival comparatives in terms of bijections. We showed that the bijective analysis presents a more general approach to the semantics of comparatives than the degree-based analyses, because the former can explain comparatives with degree-denoting and non-degree denoting differentials, whereas the latter only accounts for comparatives with degree-denoting differentials. Moreover, we argued that the distinction between the bijective approach and the degree-based approach is trivial in the analysis of adjectival comparatives, because they both capture the truth-values of adjectival comparatives and predict that their differentials are degree-denoting expressions.

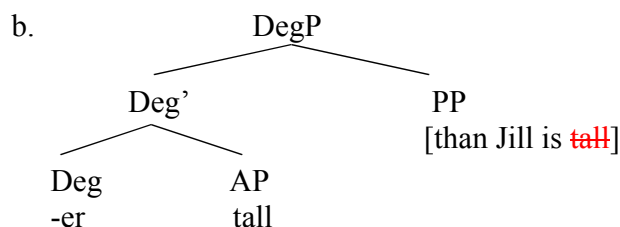
Having said about Chinese and Japanese comparatives, in the following section we will briefly look at English comparatives. We show that English differs from Japanese and Chinese in that it only has adjectival and adverbial comparatives. Therefore, in English the distinction between the degree-based analyses and the bijective analyses is trivial, but in Chinese and Japanese where there are both adjectival and non-adjectival comparatives, the distinction is significant.

#### 4.4 Bijections and English comparatives

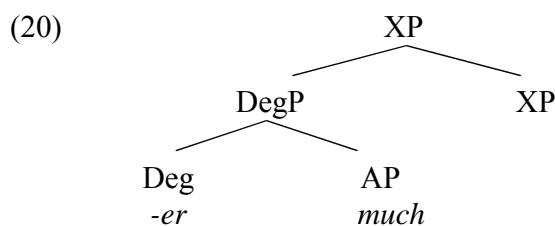
It has been argued that the comparative morpheme *-er* in English is a Degree head, which only selects for an AP as its complement (Neeleman, van de Koot and Doetjes 2004). For example, an adjectival comparative like '*Jack is taller than Mary is*' in (19)

has the syntactic structure in (19b), where the comparative marker *-er* selects for the AP [tall] as its complement.

(19) a. Jack is taller than Jill is.



The comparative morpheme *-er* does not combine with any non-adjectival predicate to form comparatives unless *-er* is modified by the adjective (or adverb) ‘much’. i.e. *er + much = more*. This is shown in (20) and (21):



(Neeleman, van de Koot and Doetjes 2004)

(21) a. He is more [like his father]<sub>PP</sub> than his mother.

b. He [understands it]<sub>VP</sub> more than anyone else does.

c. There are more [books]<sub>NP</sub> here than anywhere else is.

Therefore, in light of the morphological complexity of the word *more*, English does not have ‘real’ non-adjectival comparative like Chinese and Japanese, as in Chinese DVC and Japanese *sugi*-constructions, a comparative morpheme is directly marked on a non-adjectival predicate. Given what we have said in the last section, the degree-based analyses and the bijective analyses can be applied to adjectival comparatives and the difference between them is trivial, we can see that it is not as crucial to distinguish these two types of analyses in English as it is in Chinese and Japanese.

## 4.5 Conclusion

In this chapter, we have achieved two goals. We showed that the two independently motivated semantics of *sugi-* and *duo* can be unified under the notion of bijections. We also showed that the bijective approach, compared to the degree-based approach, is more fundamental to comparatives, because the former can be applied to both adjectival and non-adjectival comparatives, while the latter can only be applied to adjectival comparatives.



Further differences between *liang be xiaoshuo* ‘2 novels’ and *liang yingcun* ‘2 inches’ are manifested in (i) the modification by the demonstrative *zhe* ‘this’; (ii) the ability to introduce discourse referents which serve as antecedents for the pronouns *ta* ‘it/he/she’ or *tamen* ‘they’, and (iii) the type of *WH*-phrase used to ask questions. Based on these differences, I arrived at the conclusion that DVCs do not make reference to degrees; instead, they are based on bijections. According to my bijective analysis, (1) is paraphrased as: for each book that Jill read, Jack read its counterpart; there are two novels which Jack read, whose counterparts Jill did not. The counterpart relation between the two sets is established through a bijective function  $f$ . Given that in our analysis comparisons are not degree-based, differentials of DVC do not have to be degree-denoting expressions.

Chapter 3 provided the second example of degreeless comparison, Japanese *sugi*-constructions, which are exemplified in (3):

- (3) John-ga [hon]-o kinoo san-satu yomi-sugi-ta.  
 John-nom book-acc yesterday 3-CL read-exceed-past  
 ‘John overdid the reading by 3 books yesterday’

In (3), the differential is expressed by the Floating Numeral Quantifier (FNQ) *san-satu*, which describes the difference between what John read and what he should have read. The FNQ *san-satu* in non-*sugi*-constructions in (4) is a VP-adverb (). Semantically it is a VP-quantifier, which quantifies over a set of individuals denoted by VP. Hence, we have a different type of differential, which is not a degree-denoting expression.

- (4) John-ga [hon]-o kinoo san-satu yonda  
 John-nom book-acc yesterday 3-CL read-past  
 ‘John read 3 books yesterday’

I argued that *sugi-* denotes a comparison of two possible worlds: world  $w$  and the closest possible world  $w'$  to  $w$  where the relevant requirements are met. As such, my analysis of *sugi-* follows the possible world analysis of Stalnaker (1968, 1984). According to my analysis, (3) means: for every book that John read in the closest possible world  $w'$  to  $w$  where he met the reading requirements, he read it in world  $w$ . There is a set of books that John read in  $w$ , but not in  $w'$ . That set of books has the cardinality of (at least) 3. As our analysis of *sugi-* is not limited to comparisons of degrees, FNQs can receive a consistent syntax and semantics in *sugi-* and non-*sugi-* constructions. Note that this analysis is very different from that of DVC, as differentials of the former are adverbs, but those of the latter are DPs, and also the former makes use of possible world semantics, but the latter does not.

I also compared my analysis of *sugi-* to Nakanishi’s analysis, which is based on the standard degree-based analyses of comparatives. I argued that by assuming that *sugi-* only denotes a comparison of degrees, Nakanishi failed to tie the FNQ in *sugi-* constructions to what is independently understood about the FNQ in non-*sugi-* contexts.

Given the two independently motivated analyses of Chinese DVC and Japanese *sugi-* constructions, in the last Chapter I showed that these two analyses can be related to each other by bijections. I further argued that bijections constitute a more fundamental method of comparison than any degree-based analysis of comparatives, because the former compares entities including individuals, events and degrees, and is able to account for a

wider range of data than the latter which only compares degrees. I showed that when bijections and the degree-based analyses are both applied to comparisons of degrees, their differences are trivial.

Finally, Chinese and Japanese are not the only two languages that have non-adjectival comparatives. It is been observed that there are many other languages which are similar to Chinese and Japanese in that in their comparatives, differentials are not degree-denoting expressions. Ibibio is one such language. In (5), the differential is the DP *ebot iba* ‘goat 2’, which is not a measure phrase, and does not denote degrees.

- (5) a. ami mmeɲɔ:ŋ ŋkan Okon.  
 I Agr-tall Agr-exceed Okon  
 ‘I am taller than Okon.’
- b. ami mmenie ebot iba ŋkan Okon.  
 I Agr-have goat 2 Agr-exceed Okon  
 ‘I have two more goats than Okon.’

Having established the method of bijections, there is now a whole range of questions which are interesting to not only linguists, but also to psychologists as well.<sup>41</sup>

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<sup>41</sup> Upon finishing this dissertation, Chris Kennedy brought into my awareness that some psycholinguists, including Paul Pietroski, Jeffery Lidz, and Tim Hunter from University of Maryland, and Justin Halberda from Johns Hopkins University, are also working on this matter from psycholinguistic perspective.

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- Yang, R. 2001. *Common Nouns, Classifiers, and Quantification in Chinese*. Doctoral dissertation, Rutgers University.

## Curriculum Vitae

**Xiao Li**

### **Education**

2009 Ph. D in Linguistics, Rutgers University

2000 B. A. in English, Central-South University, China

### **Publications**

2005. Lexical Properties and Chinese Resultative Verbal Compounds. In *Proceedings of the Seventeenth North American Conference on Chinese Linguistics*, Qian Gao (ed.). Los Angeles: GSIL Publications, University of Southern California.