Degreeless Comparatives: the semantics of Differential Verbal Comparatives in Mandarin Chinese

XIAO LI
Queens College, CUNY

Abstract
This paper studies a type of comparative in Mandarin Chinese, which has rarely been discussed in the literature (Cheng 1966). I refer to them as Differential Verbal Comparatives (DVCs). I show that DVCs, unlike Chinese adjectival/adverbial comparatives, allow differentials that are definite DPs, e.g., *Jane Eyre* vs *Pride and Prejudice*. Based on this fact and other empirical differences between DVCs and adjectival/adverbial comparatives in Mandarin Chinese, I motivate and develop a mapping-based semantic analysis of DVCs and argue that this analysis fares better than a degree-based analysis.

*Key words: differential verbal comparatives, mapping, Mandarin Chinese*
1. Introduction

This paper studies a type of comparative construction in Mandarin Chinese, which has rarely been discussed in the literature (Cheng 1966). I refer to them as Differential Verbal Comparatives (DVCs), as exemplified in (1b).

\[(1)\]
\[a. \text{ Context: Zhangsan read } Jane \text{ Eyre (JE), Wuthering Heights (WH), Pride and Prejudice (PP), Little Women (LW); Lisi read Wuthering Heights (WH) and Little Women (LP).}\]
\[b. \text{ Zhangsan bi Lisi duo du-le much read-asp}\]
\[Janey \text{ Eyre he Pride and Prejudice.}\]
\[\text{and}\]
\[‘Zhangsan’s reading exceeded Lisi’s reading by } Jane \text{ Eyre and Pride and Prejudice.’}\]

DVCs comprise four components: (i) a subject, (ii) a standard of comparison introduced by bi, (iii) a non-gradable verb preceded by the adverb duo ‘much’,\(^1\) and (iv) an obligatory differential—Jane Eyre he Pride and Prejudice ‘Jane Eyre and Pride and Prejudice’ (A differential is a phrase that describes the difference between two items under comparison. For example, in the English comparative John is 2 inches taller than Mary, the measure phrase 2 inches is a differential that describes the difference between John’s height and Mary’s height).

What is interesting about DVCs is that unlike adjectival and adverbial comparatives in Mandarin Chinese, DVCs allow differentials that are definite DPs. For instance, the differential Jane Eyre he Pride and Prejudice ‘Jane Eyre and Pride and Prejudice’ in (1b) refers to a specific difference between what Zhangsan read and what Lisi read. Under the context in (1a), (1b) is intuitively understood as: comparing what Zhangsan read to what Lisi read, for each novel Lisi read, Zhangsan read an identical copy. There are two novels Zhangsan read but Lisi did not, namely, Jane Eyre, and Pride and Prejudice. This meaning is captured by the diagram in (2).

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\(^1\) Gradable verbs such as xihuan ‘to like’, when used in DVCs, only take a non-degree reading as shown below:

\[(i) \text{ Zhangsan bi Lisi duo xihuan liang zhong bingqilin kouwei.}\]
\[\text{much like 2 kind ice.cream flavor}\]
\[‘Zhangsan likes 2 more ice cream flavors than Lisi.’\]
\[∗‘Zhangsan likes (the) 2 ice cream flavors more than Lisi does.’\]
The diagram in (2) contains a one-to-one mapping relation between the set of novels Lisi read (set B), and a subset of the set of novels Zhangsan read (set A), such that every member in set B is paired with exactly one member in set A. There are two novels in set A that are left unpaired, namely, *Jane Eyre* and *Pride and Prejudice*.

The goal of this paper is to motivate and develop a semantic analysis of DVCs based on the mapping relation as shown in (2). I argue that this analysis fares better in capturing the semantics of DVCs than a degree-based analysis. In the rest of this section, I will introduce adjectival and adverbial comparatives in Mandarin Chinese, and show how DVCs differ from them.

### 1.1 Adjectival Comparatives and Adverbial Comparatives

Chinese adjectival comparatives comprise four components: (i) a subject—*Zhangsan*; (ii) a standard of comparison, which is introduced by the morpheme *bi*—*Lisi*; (iii) a bare adjective, which names the dimension of comparison—*gao* ‘tall’ in (3a) and *zhong* ‘heavy’ in (3b); and (iv) an optional differential, which indicates the difference between two objects under comparison, e.g., *liang limi* ‘2 cm’ in (3a) and *liang bang* ‘2 pounds’ in (3b).

\[(3) \text{ a. } \text{Zhangsan bi Lisi gao (liang limi).} \]
\[\text{tall 2 cm} \]
\[\text{‘Zhangsan is (2 cm) taller than Lisi is.’} \]

\[\text{b. } \text{Zhangsan bi Lisi zhong (liang bang).} \]
\[\text{heavy 2 pound} \]
\[\text{‘Zhangsan is (2 pounds) heavier than Lisi is.’} \]

Besides adjectival/adverbial comparatives and DVCs, there is a so-called ‘bare’ or ‘transitive’ comparative in Mandarin Chinese (Xiang 2003, 2005, Grano and Kennedy 2012), as shown in (i). The semantics of bare adjectives is not discussed in this paper.

\[(i) \text{Zhangsan gao Lisi liang limi.} \]
\[\text{tall 2 cm} \]
\[\text{‘Zhangsan is 2 cm taller than Lisi.’} \]

See Lin (2009) for evidence that *bi* and the following standard of comparison form a constituent.
The structure of adjectival comparatives is not only compatible with adjectives, but also compatible with gradable verbs such as *xihuan* ‘to like’ in (4).

(4) Zhangsan bi Lisi xihuan du xiaoshuo.
    like     read      novel
    ‘Zhangsan likes reading novels more than Lisi does.’

Verbs like *xihuan* ‘to like’ and adjectives like *gao* ‘tall’ in (3a) and *zhong* ‘heavy’ in (3b) are gradable, as they can be modified by degree morphology such as *hen*, as shown in (5).4

(5) a.  Zhangsan *hen* gao/zhong.
        very   tall/heavy
    ‘Zhangsan is tall/heavy.’

b.  Zhangsan *hen* xihuan du xiaoshuo.
        very      like        read      novel
    ‘Zhangsan likes reading novels very much.’

Verbs like *pao* ‘to run’ and *du* ‘to read’, by this standard, are non-gradable: they cannot be modified by *hen*, and cannot be used in ‘adjectival comparatives’, as shown in (6) and (7).

(6) a.  *Zhangsan* hen pao.
        very       run

b.  *Zhangsan* hen du xiaoshuo.
        very     read      novel

(7) a.  *Zhangsan* bi Lisi pao.
        run

      read      novel

Non-gradable verbs occur in adverbial comparatives or differential verbal comparatives (DVCs). In Chinese, an adverb is attached to a verb through the functional morpheme *de*. For instance, the Chinese equivalent for the sentence *Zhangsan runs fast* is shown in (8a), where the adverbial phrase *hen kuai* ‘very fast’ is attached to the verb *pao* ‘to run’ by the morpheme *de*. If a verb is transitive like *du* ‘to read’ in (8b), reduplication is required so that the first copy of the verb takes an object, and the second copy takes *de* and then an adverb.

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4 In Liu (2010) and Grano (2012), *hen* is argued to be a positive morpheme that modifies bare adjectives and gives rise to a positive interpretation.
(8) a. Zhangsan pao-de hen kuai.
   run-de very fast
   ‘Zhangsan runs fast.’

   b. Zhangsan du shu du-de hen duo.
   read book read-de very much
   ‘Zhangsan ‘reads books a lot.’

The examples in (8) can be turned into adverbial comparatives if one takes out the degree modifier hen in front of the adverbs, and adds a bi-phrase to introduce the standard of comparison, as shown in (9).

(9) a. Zhangsan bi Lisi pao-de kuai.
   run-de fast
   ‘Zhangsan runs faster than Lisi does.’

   b. Zhangsan bi Lisi du shu du-de duo.
   read book read-de much
   ‘Zhangsan reads books more than Lisi does.’

Like adjectival comparatives, adverbial comparatives may optionally take measure phrases as differentials, as shown in (10).

(10) a. Zhangsan bi Lisi pao-de kuai [liang fenzhong].
   run-de fast 2 minute
   ‘Zhangsan ran 2 minutes faster than Lisi did.’

   b. ?Zhangsan bi Lisi du shu du-de duo [liang xiaoshi].
   read book read-de much 2 hour
   ‘Zhangsan read books for 2 more hours than Lisi did.’

However, they cannot take DPs as differentials, as shown in (11):

(11) a. *Zhangsan bi Lisi du-de duo [liang ben xiaoshuo].
   read-de much 2 Cl novel
   Intended: ‘Zhangsan’s reading exceeded Lisi’s reading by 2 novels.’

   b. *Zhangsan bi Lisi du-de duo
   read-de much
   [Jane Eyre he Pride and Prejudice].
   and
   Intended: ‘Zhangsan’s reading exceeded Lisi’s reading by Jane Eyre and Pride and Prejudice.’
The intended meanings of (11) can be expressed by DVCs, as shown in (12):

\[(12)\]
\[
a. \text{Zhangsan bi Lisi duo du-le liang ben xiaoshuo.}
\]
\[
\text{much read-asp 2 Cl novel}
\]
\['\text{Zhangsan’s reading exceeded Lisi’s reading by 2 novels.}’
\]
\[
b. \text{Zhangsan bi Lisi duo du-le Jane Eyre he Pride and Prejudice.}
\]
\[
\text{much read-asp and}
\]
\['\text{Zhangsan’s reading exceeded Lisi’s reading by Jane Eyre and Pride and Prejudice.}’
\]

Having introduced adjectival and adverbial comparatives in Mandarin Chinese, in the following subsection I will show how DVCs differ from these two types of comparatives.

### 1.2 Defining properties of DVCs

There are three main differences that distinguish DVCs from adjectival and adverbial comparatives. First, DVCs are characterized by the presence of the morpheme \textit{duo} ‘much’ or \textit{shao} ‘little’ in front of non-gradable verbs, as shown in (13):\(^5\)

\[5\]
\[
(i) \text{a. Zhangsan bi Lisi zao shang-le liang nian (de) xue.}
\]
\[
\text{early attend-asp 2 year De school}
\]
\['\text{Zhangsan attended school 2 years earlier than Lisi did.’}
\]
\[
\text{b. Zhangsan bi Lisi wan shang-le liang nian (de) xue.}
\]
\[
\text{late attend-asp 2 year De school}
\]
\['\text{Zhangsan attended school 2 years later than Lisi did.’}
\]

However, unlike (13), the examples in (i) do not require the presence of differentials, as shown in (ii). In the paper I will confine myself to the discussion of DVCs involving \textit{duo} ‘much’ and \textit{shao} ‘little’, and leave comparatives like (i) for future research.

\[6\]
\[
(ii) \text{a. Zhangsan bi Lisi zao lai.}
\]
\[
\text{early come}
\]
\['\text{Zhangsan came earlier than Lisi.’}
\]
\[
\text{b. Zhangsan bi Lisi wan zou}
\]
\[
\text{late leave}
\]
\['\text{Zhangsan left later than Lisi.’}
\]

\(^5\) The morphemes \textit{zao} ‘early’ and \textit{wan} ‘late’ can be used in front of non-gradable verbs to form comparatives similar to DVCs, as shown below:
(13) a. Zhangsan bi Lisi _duo_ du-le liang ben xiaoshuo.
   much read-asp 2 Cl novel
   ‘Zhangsan read 2 more novels than Lisi did.’

b. Zhangsan bi Lisi _shao_ du-le liang ben xiaoshuo.
   little read-asp 2 Cl novel
   ‘Zhangsan read 2 novels fewer than Lisi did.’

Other adverbs such as _kuai_ ‘fast’ or _renzhen_ ‘attentively’ cannot precede non-gradable verbs to form DVCs, as shown in (14):

(14) a. *Zhangsan bi Lisi _kuai_ pao-le liang gongli.
   fast run-asp 2 kilometer

b. *Zhangsan bi Lisi _renzhen_ du-le liang ben shu.
   attentively read-asp 2 Cl books

Second, compared to adjectival/adverbial comparatives whose differentials are optional, differentials of DVCs are obligatory. Without the presence of differentials, DVCs are ungrammatical, as shown in (15):

(15) a. *Zhangsan bi Lisi _duo_ pao-le.
   much run-asp
   Intended: ‘Zhangsan ran more than Lisi did.’

b. *Zhangsan bi Lisi _duo_ du-le.
   much read-asp
   Intended: ‘Zhangsan read more than Lisi did.’

To express the intended meanings of the DVCs in (15), one needs to make use of the adverbial comparatives in (16):

(16) a. Zhangsan bi Lisi _pao-de_ _duo_.
   run-de much
   ‘Zhangsan ran more than Lisi did.’

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6 An empty pronoun ‘pro’ can serve as a differential in a DVC when there is an antecedent available in the context, as shown by the example below:

(i) Speaker A: zuotian, Zhangsan bi Lisi _duo_ du-le [liang pian wenzhang], ma?
   yesterday, much read-asp 2 Cl paper Q
   ‘Yesterday, did Zhangsan exceed Lisi by reading 2 papers?’

   Speaker B: dui, Zhangsan bi Lisi _duo_ du-le [pro].
   correct much read-asp
   ‘Yes, Zhangsan exceeded Lisi by reading 2 papers.’
b. Zhangsan bi Lisi du-de duo.
read-de much
‘Zhangsan read more than Lisi did.’

Third, unlike differentials of adjectival and adverbial comparatives which are uniformly measure phrases, differentials of DVCs fall into two kinds: they can be measure phrases like liang xiaoshi ‘2 hours’ or liang gongli ‘2 kilometers’ in (17) when the verb following duo is intransitive, or DPs like liang ben xiaoshu ‘2 novels’ or Eyre he Pride and Prejudice in (12), when the verb following duo is transitive. I refer to the former as differential MPs, and the latter as differential DPs.

(17) a. Zhangsan bi Lisi duo pao-le liang xiaoshi.
much run-asp 2 hours.
‘Zhangsan ran for 2 more hours than Lisi did.’

b. Zhangsan bi Lisi duo pao-le liang gongli.
much run-asp 2 kilometers.
‘Zhangsan ran 2 more kilometers than Lisi did.’

Given the contrasts above, many interesting questions arise about DVCs. Why are only duo ‘much’ and shao ‘little’ allowed in DVCs, but not other adjectives (or adverbs)? Why are differentials obligatory in DVCs, but not in adjectival and adverbial comparatives? Why are differential DPs allowed in DVCs, but not in adjectival and adverbial comparatives? In the following sections, I will address these questions by arguing for a mapping-based semantic analysis of DVCs.

The rest of the paper is structured as follows. In section 2, I show that differential DPs are distinct from differential MPs in adjectival comparatives, but are parallel to DP objects in non-comparative contexts. In section 3, I discuss the truth-conditions of DVCs and lay out a mapping-based semantic analysis for them. In section 4, I introduce the standard degree-based analyses of the comparative, and show that a degree-based analysis is not as straightforward in explaining the semantics of DVCs as a mapping-based analysis. In section 5, I show that the mapping-based analysis, which accounts for the semantics of DVCs, can be extended to explain the semantics of adjectival comparatives. In section 6, I discuss the ambiguity of duo. Section 7 concludes the paper.

2. Differential DPs of DVCs

An important assumption behind the mapping-based analysis of DVCs which I argue for in this paper is that differential DPs of DVCs are DP objects of verbs. The goal of this section is to provide syntactic and semantic evidence to show that differential DPs in DVCs are parallel to DP objects in non-comparative contexts, but are different from differential MPs in adjectival comparatives.
Syntactically, differentials of DVCs lack a designated position; they have the syntax of verb objects and adverbial measure phrases. When duo combines with transitive verbs, DP objects are interpreted as differentials, as shown in (18) and (19):

(18) a. Zhangsan du-le liang ben xiaoshuo.
    read-asp 2 Cl novel
    ‘Zhangsan read 2 novels.’

    b. Zhangsan du-le Jane Eyre he Pride and Prejudice.
   read-asp and
    ‘Zhangsan read Jane Eyre and Pride and Prejudice.’

(19) a. Zhangsan bi Lisi duo du-le liang ben xiaoshuo.
    much read-asp 2 Cl novels
    ‘Zhangsan’s reading exceeded Lisi’s reading by two novels.’

    b. Zhangsan bi Lisi duo du-le
       much read-asp
       Jane Eyre he Pride and Prejudice.
       and
    ‘Zhangsan’s reading exceeded Lisi’s reading by Jane Eyre and Pride and Prejudice.’

When duo combines with a ditransitive verb such as gei ‘to give’, either a direct object or an indirect object can be interpreted as a differential, as shown in (20) and (21):

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7 An anonymous reviewer asks whether the differential of a DVC can appear in the subject position (e.g., two more students came today than did yesterday) or inside a prepositional phrase (e.g., Tenzing has climbed Mt. Everest through two more routes than Hillary has). Below I provide translations for the two English examples:

(i) jintian lai de xuesheng bi zuotian lai de xuesheng duo liang ge.
    Today come De student yesterday come De student much 2 Cl
    ‘Two more students came today than did yesterday.’

(ii) Tenzing bi Hillary duo tongguo liang tiao luxian zhu feng.
    much pass 2 Cl routes climb Mt. Everest
    ‘Tenzing has climbed Mt. Everest through two more routes than Hillary has.’

The example in (i) shows that a nominal comparative which involves a differential inside the subject is expressed through an adjectival comparative. In (ii), the prepositional phrase is translated into a verb phrase, where the word tongguo ‘to pass’ is argued to be a co-verb (Li & Thompson 1981), and the differential liang tiao luxian ‘2 routes’ is its object. Therefore, based on the examples above, my impression is that Mandarin Chinese lacks nominal comparatives.
(20) a.  Zhangsan gei-le liang-ge-pengyou liwu.  
     give-asg 2-Cl-friend gift  
     ‘Zhangsan gave two friends gifts.’  

b.  Zhangsan gei-le pengyou liang-ge-liwu  
     give-asg friends 2-Cl-gift  
     ‘Zhangsan gave friends two gifts.’  

(21) a.  Zhangsan bi Lisi **duo** gei-le liang-ge-pengyou liwu.  
     much give-asg 2-Cl-friends gift  
     ‘Zhangsan gave two more friends gifts than Lisi did.’  

b.  Zhangsan bi Lisi **duo** gei-le pengyou liang-ge-liwu  
     much give-asg friends 2-Cl-gift  
     ‘Zhangsan gave friends two more gifts than Lisi did.’  

In (20) the ditransitive verb gei ‘to give’ first takes an indirect object and then a  
direct object. When duo precedes the verb gei ‘to give’, either the indirect object  
liang ge pengyou ‘2 friends’ or the direct object liang ge liwu ‘2 gifts’ can be  
interpreted as a differential.  

Besides transitive and ditransitive verbs, duo can also precede intransitive  
verbs. In such a case, an adverbial measure phrase is interpreted as a differential,  
as shown in (22) and (23).  

(22) a.  Zhangsan pao-le liang xiaoshi.  
     run-asg 2 hour  
     ‘Zhangsan ran for 2 hours.’  

b.  Zhangsan pao-le liang gongli.  
     run-asg 2 kilometer  
     ‘Zhangsan ran 2 kilometers.’  

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8 An anonymous reviewer asks whether duo can combine with a transitive verb that has an  
adverbial measure phrase interpreted as a differential. Below I provide such an example:  

(i)  Zhangsan bi Lisi duo du-le liang xiaoshi de shu.  
     much read-asg 2 hour De book  
     ‘Zhangsan read books for 2 more hours than Lisi did.’  

(ii) *Zhangsan bi Lisi duo du-le shu liang xiaoshi.  
     much read-asg book 2 hour  
     ‘Zhangsan read 2 books’  

The example in (i) shows that the measure phrase liang xiaoshi ‘2 hours’ is syntactically part of  
the object, as it is connected with the noun shu ‘book’ through the morpheme de. The example in  
(ii) shows that having the measure phrase liang xiaoshi ‘2 hours’ follow the object results in the  
ungrammaticality of the sentence.
a. Zhangsan bi Lisi duo pao-le liang xiaoshi.
   much run-asp 2 hour
   ‘Zhangsan ran for 2 more hours than Lisi did.’

b. Zhangsan bi Lisi duo zou-le liang gongli.
   much run-asp 2 kilometer
   ‘Zhangsan ran 2 more kilometers than Lisi did.’

In (22), the intransitive verb pao ‘to run’ is followed by the adverbial measure phrases liang xiaoshi ‘2 hours’ in (22a) and liang gongli ‘2 kilometers’ in (22b). In (23), these two adverbial measure phrases are interpreted as differentials.

Moreover, it is also worth mentioning that duo not only combines with activity verbs such as pao ‘to run’ in (23) and du ‘to read’ in (19), it can also combine with stative verbs or achievement verbs, as shown in (24) and (25) respectively.9

**duo + Stative verbs**

(24) a. Zhangsan bi Lisi duo renshi ji ge ren.
   much know several Cl people
   ‘Zhangsan knows a few more people than Lisi does.’

b. xin shouji bi jiu shouji duo you
   new cell.phone old cell.phone much have
   liang ge xin gongneng.
   2 Cl new function
   ‘New cell phones have two more new functions than old ones.’

**duo + Achievement verbs**

(25) a. Zhangsan bi Lisi duo zuo-dui-le liang dao ti
   much do-correct-asp 2 Cl questions
   ‘Zhangsan answered two more questions correctly than Lisi did.’

b. Zhangsan bi Lisi duo xue-hui-le liang yang benshi.
   much study-acquire-asp 2 Cl skills
   ‘Zhangsan acquired 2 more skills than Lisi did.’

Semantically, differential DPs in DVCs differ from differential MPs in adjectival comparatives, but parallel to DPs in non-comparative sentences, with respect to (i) the type of phrase allowed to be differentials/objects, and (ii) the type of WH phrase used to ask questions. First, differential DPs in DVCs can be semantically different types of phrases, including indefinite DPs, e.g., liang ben

9 Verbs are classified according to (i) whether they allow continuous tense, and (ii) whether they allow for durative adverbials (e.g., for an hour) or time-span adverbials (e.g., in an hour). See Yang (1998) for details about the classification of Chinese verbs.
xiaoshuo ‘2 novels’, definite DPs, e.g. Jane Eyre he Pride Prejudice ‘Jane Eyre and Pride and Prejudice’ and zhe liang ben shu ‘these two books’, and kind-denoting bare NPs, e.g. shouji he wazi ‘cell phones and socks’ in (26).

(26) a. Context: Zhan gan and Lisi went shopping. Zhan gan bought two shirts, one cell phone, one pair of jeans, and two pairs of socks. Lisi bought two shirts and one pair of jeans.

   b. Zhan gan bi Lisi duo mai-le shouji he wazi.
      much buy-asp cell.phone and socks
      ‘What Zhan gan bought exceeded what Lisi bought by cell phones and socks.’

The differential of (26b), shouji he wazi ‘cell phones and socks’, refers to the categories of things that Zhan gan bought but Lisi did not. The sentence does not mean: the number of cell phones and socks that Zhan gan bought exceeded the number of cell phones and socks that Lisi bought.

Differentials of adjectival comparatives, on the other hand, are limited to measure phrases. Unlike DPs, measure phrases refer to (or quantify over) abstract degrees. They normally cannot be used referentially, as shown in (27a) and cannot be left without numerals, as shown in (27b).

(27) a. ??Zhan gan bi Lisi gao zhe liang limi.
       tall this 2 cm

      tall cm

Second, differential DPs in DVCs, like DP objects in non-comparative sentences, can be questioned with the wh-phrase shenme ‘what’ (28b&29b), but not with the wh-phrase duoshao ‘how many/much’ (28c&29c).

(28) a. Zhan gan mai-le liang ben xiaoshuo.
       buy-asp 2 Cl novel
       ‘Zhan gan bought 2 novels.’

   b. Zhan gan mai-le shenme?
      buy-asp what
      ‘What did Zhan gan buy?’
Differential MPs of adjectival comparatives, on the other hand, cannot be questioned with the wh-phrase *shenme* ‘what’ (30b), but can be questioned with the wh-phrase *duoshao* ‘how many/much’ (30c).

I conclude from the comparison above that differential DPs in DVCs have the same syntax and semantics as DP objects in non-comparative contexts, but differ from differential MPs in adjectival comparatives. If this conclusion is on the right track, the task we are facing is to give DVCs a semantic analysis that captures this generalization. In the following section, I will lay out a mapping-based semantic analysis of DVCs that meets this purpose.

### 3. A mapping-based analysis of DVCs

In section 3.1, I explain in prose the truth-conditions of DVCs in terms of one-to-one mapping. In section 3.2, I show that the one-to-one mapping that underlies the semantics of DVCs is not random. It is governed by two constraints: the constraint of sort and the constraint of quantity. In section 3.3, I spell out a formal analysis that encodes the truth-conditions of DVCs. In section 3.4, I show how the proposed analysis explains the questions raised in the introduction.
3.1 A mapping-based analysis of DVCs

In my analysis, I define one-to-one mapping as a relation such that for any two sets A and B, every element in set A can be paired with exactly one element in set B, and every element in set B can be paired with exactly one element in set A. There are no unpaired elements left in either set. Under this definition, the DVC in (31b)(repeated from 1b) can be paraphrased as in (32):


   b. Zhangsan bi Lisi duo du-le much read-asp
      *Jane Eyre* he *Pride and Prejudice*.
      and
      ‘Zhangsan’’s reading exceeded Lisi’s reading by *Jane Eyre* and *Pride and Prejudice’.

(32) Call the set of objects that Zhangsan read set A and the set of objects that Lisi read set B. Set B stands in a one-to-one mapping relation to a proper subset of set A, A’. The difference between A and A’ includes two elements, namely, *Jane Eyre* and *Pride and Prejudice*.

The meaning of (32) can be captured by the diagram in (33)(repeated from 2):

In (33), each entity in set B is mapped to its identical counterpart in set A, and there are two elements in set A that are left unpaired, namely *Jane Eyre* and *Pride and Prejudice*. Now let us consider a different mapping. Suppose we have *Little Women* and *Wuthering Heights* in set B paired with *Jane Eyre* and *Pride and Prejudice* in set A. Then we will have *Little Women* and *Wuthering Heights* in set A unpaired, and a DVC like (34):
(34) Zhangsan bi Lisi duo du-le
much read-asp
_Little Women_ he _Wuthering Heights_.
and
‘Zhangsan’s reading exceeded Lisi’s reading by _Little Women_ and _Wuthering Heights_.’

Intuitively, (34) is false under the context in (31a). (Note that the corresponding English gloss of (31b) is true in (31a), but the English gloss of (34) is not). The contrast between (31b) and (34) in (31a) shows that the one-to-one mapping relation that underlines the semantics of DVCs is not random. Then what constrains the mapping in DVCs? In the following subsection, I will provide an answer to this question.

### 3.2 Constraints on mapping

I argue that only entities of the same sort and the same quantity (amount or measure) can be mapped to each other. Consider the truth-values of the DVCs in (36a) and (36b) in the context in (35). Intuitively, (36a) is true in (35), but (36b) is not.\(^\text{12}\)

(35) Context: In a reading class, each student is required to do some additional readings at home. They can choose to read novels, magazines or both. Reading a novel gives a student the same amount of credits as reading a magazine. Zhangsan read 4 novels. Lisi read 2 magazines.

(36) a. Zhangsan bi Lisi duo du-le liang ben _duwu_.
much read-asp 2 Cl reading material
‘Zhangsan’s reading exceeded Lisi’s reading by 2 reading materials.’

b. Zhangsan bi Lisi duo du-le liang ben _xiaoshuo_.
much read-asp 2 Cl novel
‘Zhangsan’s reading exceeded Lisi’s reading by 2 novels.’

The DVCs in (36a) and (36b) minimally differ in their differentials. The differential of (36a) is _liang ben duwu_ ‘2 reading materials’; the differential of (36b) is _liang ben xiaoshuo_ ‘2 novels’. Although both differentials express the same numerical difference between the two sets-- the set of things that Zhangsan read (set A) and the set of things that Lisi read (set B), they differ in how they describe the remainder of set A that are left unpaired. In (36a), the unpaired entities are referred to as reading material; in (36b) they are referred to as novels.

\(^{12}\) I leave open the question of whether (36b) is false or infelicitous in (35). In either case, it does not affect the point I am making here.
The question is: how does such a difference in description affect the truth-values of the DVCs?

The answer to this question has to do with the notion of taxonomy and its role in mapping based comparison. Consider the taxonomy of reading materials. The category of reading material and the categories of novels and magazines belong to different taxonomic levels. Their hierarchical relation is captured by the diagram in (37):

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(37) Reading Material
    {a, b, c, d, e, f}
    
    Novels
    {a, b, c, d}

    Magazines
    {e, f}
```

Suppose that the set of the novels that Zhangsan read in (35) is \{a, b, c, d\}, and the set of magazines that Lisi read is \{e, f\}. (37) shows that \{a, b, c, d, e, f\} are of the same sort when they are classified under the category of reading material, but are of different sorts when they are classified under the categories of novels and magazines. That is, depending on what taxonomic level one chooses, \{a, b, c, d, e, f\} can be either of the same sort or of different sorts.

Differentials of DVCs indicate at what taxonomic level a mapping relation is established. The differential of (36a), \textit{liang ben duwu} ‘two reading materials’ indicates that the mapping relation is established based on the taxonomic level where novels and magazines are of the same sort—the upper level of (37). The differential of (36b), \textit{liang ben xiaoshuo} ‘two novels’, on the other hand, indicates that the mapping relation is established based on the taxonomic level where novels and magazines are of different sorts—the lower level of (37).

If we assume that only entities of the same sort can be mapped to each other, the difference between (36a) and (36b) in (35) can be explained as follows. The DVC in (36a) is true in (35), because at the taxonomic level introduced by the differential, novels and magazines are reading material and hence are of the same sort. Everything that Lisi read can be mapped to some unique reading material Zhangsan read. There are two reading materials Zhangsan read, which are left unpaired. (36b) is false in (35), because at the taxonomic level introduced by the differential, novels and magazines are of different sorts. A novel can only be mapped to a novel, but not to a magazine. It follows that no mapping can be established between what Zhangsan read and what Lisi read in (35).

Although the DVC in (36b) is false in (35), it is true in the contexts in (38a) and (38b):

```
```
b. Context: Zhangsan read 2 magazines and 2 novels. Lisi read 2 magazines and no novels.

(36b) is true in (38a), because at the taxonomic level introduced by the differential, there is a way to map every novel Lisi read to a unique novel Zhangsan read, leaving two novels Zhangsan read unpaired. (36b) is also true in (38b), because at the taxonomic level introduced by the differential, there is a possible mapping that maps every magazine Lisi read into a unique magazine Zhangsan read, leaving the two novels Zhangsan read unmapped. This mapping respects the taxonomic level of the differential – mapping magazines to magazines and (vacuously) novels to novels (see the taxonomy in 37 above). The mapping is complete because it maps everything Lisi read. The fact that (36b) is true in (38b) indicates that (36b) is not merely a comparison of novels; it compares all the entities that Zhangsan and Lisi read.

The DVC in (36b) presupposes that the sets of entities that Zhangsan and Lisi read are not empty. Comparing the context in (38b) to the context in (39), intuitively (36b) is false in (39).


The contrast between (38b) and (39) suggests that (38b) presupposes that Zhangsan and Lisi read, but it does not presuppose that they both read novels.

With the constraint of sort in mind, we can now turn to the DVCs in (31b) and (34) and the context in (31a): (31b) is true in (31a), but (34) is not. The explanation goes as follows. Assuming that novels of different names are of different categories, under each category there are different copies of the same novel, e.g., Zhangsan’s copy of WH, Lisi’s copy of WH, etc, as shown by the diagram in (40).

\[
\text{(40)}
\begin{align*}
\text{Novels} & \\
& \downarrow \\
& \text{JE} \quad \text{WH} \quad \text{PP} \quad \text{LW} \\
& \downarrow \quad \downarrow \quad \downarrow \quad \downarrow \\
& a \quad b \quad c \quad d \\
& \text{a = Zhangsan’s copy of WH} \quad \text{c = Zhangsan’s copy of LW} \\
& \text{b = Lisi’s copy of WH} \quad \text{d = Lisi’s copy of LW}
\end{align*}
\]

(31b) is true in (31a), because at the taxonomic level introduced by the differential, novels of different names are of different sorts. Every novel that Lisi read can be mapped to an identical copy that Zhangsan read. The novels that are left unpaired are *Jane Eyre* and *Pride and Prejudice*. (34) is false in (31a), because at the taxonomic level introduced by the differential, novels of different names are of different sorts, and they cannot be mapped to each other.
The examples I have considered so far all involve comparisons of two sets of atomic objects: one atomic object is mapped to another atomic object of the same sort at the taxonomic level introduced by a differential. This mapping relation between the two sets is one-to-one. In what follows, I will consider examples that involve comparisons of non-atomic substances such as water or running events. I show that in these cases, we need to take into consideration another constraint—the constraint of quantity (amount or measure). Only substances of the same quantity (amount or measure) can be mapped to each other, i.e., one liter of water is mapped to another liter of water. Consider the DVC in (42) in the context in (41):

(41) Context: Zhangsan drank 3 liters of water. Lisi drank 2 liters of water.

(42) Zhangsan bi Lisi duo he-le yi sheng shui.

‘Zhangsan drank one more liter of water than Lisi did.’

The DVC in (42) describes a comparison between the amount of water that Zhangsan drank and the amount of water that Lisi drank. The former is greater than the latter, because all the water that Lisi drank can be mapped to a proper part of the water Zhangsan drank, which measures the same amount. This is shown by the diagram in (43):

(43) A
A’
0 liter 1liter 2liter 3liter 4liter 5liter ...
B

In (43), A stands for the total amount of water that Zhangsan drank and B stands for the total amount of water that Lisi drank. A’ is a proper part of A, and A’ is of the same amount as B. The difference between A and A’ measures 1 liter.

The DVC in (45) below describes a comparison of two events — Zhangsan’s running event and Lisi’s running event.

(44) Context: Zhangsan ran 4 kilometers. Lisi ran 2 kilometers.

(45) Zhangsan bi Lisi duo pao-le liang gongli

‘Zhangsan ran 2 kilometers more than Lisi did.’

Running events can be measured and compared either by temporal length involved, e.g., 2 hours, or by spatial length involved, e.g., 2 kilometers. The
differential of (45), *liang gongli* ‘2 kilometers’, indicates that the running events are measured and compared according to the distance involved. (45) is true in (44), because Lisi’s running event can be mapped to a proper part of Zhangsan’s running event that involves the same distance. The part of Zhangsan’s running event that is left unpaired extends 2 kilometers in distance.

To sum up, in this section we have discussed two constraints on mapping: the constraint of sort and the constraint of quantity. In the following subsection I will lay out a formal analysis of DVCs that encodes their truth-conditions.

### 3.3 A formal interpretation

First, I define mapping as a function \( f \) such that every entity \( x \) in the domain is mapped to a unique \( f(x) \) in the range such that \( f(x) \) and \( x \) are of the same quantity (amount or measure). Given the function \( f \), the truth-conditions of the DVC in (46)(repeated from 12a) can be described as in (47):

(46) Zhangsan bi Lisi duo du-le liang ben xiaoshuo.

much read-asp 2 Cl novel

‘Zhangsan’s reading exceeded Lisi’s reading by 2 novels.’

(47) Call the set of objects that Zhangsan read set A, and the set of objects that Lisi read set B. (46) is a comparison between set A and set B such that every entity \( x \) in set B can be mapped to a unique \( f(x) \) in set A at a specified taxonomic level. The difference between A and \( f(B) \) (\( f(B) = \{ f(x): x \in B \} \)) is not equal to A, and it includes two novels.

To show how the meaning of (47) is compositionally achieved, I assume that (46) has the LF structure in (48):

(48)

\[
\text{[liang ben xiaoshuo]}_i \\
\lambda_i \\
\text{VP} \\
\text{Zhangsan} \\
\text{PP} \\
\text{VP} \\
\text{Lisi} \\
\text{read}
\]

In (48), the morpheme *duo* and the verb *du* ‘read’ form a constituent, which jointly takes the DP *liang ben xiaoshuo* ‘2 novels’ as its object. The constituent structure of *duo-V* is supported by the examples in (49) and (50). (49) shows that two sequences of *duo-V* can be conjoined together by *he* ‘and’; (50) shows
that two sequences of V-DP cannot be conjoined together without repeating duo ‘much’ in the second conjunct. (49) and (50) indicate that duo-V is a constituent, but V-DP is not.

(49) Zhangsan bi Lisi duo xie-le he duo fa-le much write-asp and much publish-asp
liang pian wenzhang.
2 Cl papers
‘Zhangsan wrote and published 2 more papers than Lisi did.’

(50) *Zhangsan bi Lisi duo xie-le liang pian wenzhang much write-asp 2 Cl papers
he fa-le liang pian wenzhang.
and publish-asp 2 Cl papers

In addition, I assume that the morpheme bi is a preposition, which carries no semantic import. The comparative meaning is taken by the morpheme duo. The evidence for this claim comes from the examples in (51) and (52). (51) shows that without the bi phrase, (46) still retains a comparative meaning; (52a-b) show that without duo, (46) is either ungrammatical or non-comparative.

(51) Zhangsan duo du-le liang ben xiaoshuo.
much read-asp 2 Cl novel
‘Zhangsan read 2 more novels (than required or than someone salient in the context).

(52) a. *Zhangsan bi Lisi du-le liang ben xiaoshuo.
read-asp 2 Cl novel

b. Zhangsan du-le liang ben xiaoshuo.
read-asp 2 Cl novel
‘Zhangsan read 2 novels.’

Given the structure in (48) and the truth-conditions in (47), I propose that the morpheme duo in DVCs has the semantics in (53):[^14]

[^13]: This assumption is in accordance with Grano and Kennedy (2012), but contra Lin (2009).

[^14]: As I have previously noted in (36), a DVC presupposes that the two sets under comparison are not empty. If we take this presupposition into consideration, (53) will look something like the following:

\[(\text{duo}) = \lambda \text{P}_{\text{Cl}}. \lambda k. \lambda x. \lambda y. \exists m. \text{P}(m)(y) \rightarrow \\
\exists t. [t = g(f)(x) \land \text{PROPER}(g(f)) \land \text{P}(t)(x) \land \text{P}(k)(x) \land \neg t \circ k]\]
(53) \[[\text{duo} f]\]^g = \lambda P_{\langle<e, e, t>\rangle} \lambda k e \lambda y e \lambda x e \forall z e [P(z)(y) \rightarrow \\
\exists t e [t = g(f)(z) \land \text{PROPER}(g(f)) \land P(t)(x) \land P(k)(x) \land \neg t o k]]

(54) \text{PROPER} is a function (of type } \langle<e, e, t>\rangle \text{ which is true of } g(f) \text{ iff } g(f) \text{ preserves the taxonomic level introduced by the differential.}

In (53), \(o\) is an overlap relation: \(x o y \Leftrightarrow \exists z [z \subseteq x \wedge z \subseteq y]\), where \(\subseteq\) is a part relation. \(\text{duo}\) takes 4 semantic arguments: (i) a predicate \(P\) denoted by the verb following \(\text{duo}\), (ii) an individual \(k\) denoted by the differential, (iii) an individual \(y\) denoted by the standard of comparison, and (iv) an argument \(x\) denoted by the subject. \(f\) is a mapping function, whose value is assigned by the assignment function \(g\). The function \(\text{PROPER}\) requires that \(g(f)\) preserve the taxonomic level specified in the differential.

When \(\text{duo}\) composes with its four semantic arguments, the sentence in (46) has the truth-conditions in (55e):

(55) a. \[[\text{duo}]\] = \(\lambda m e \lambda n e \text{read}(m)(n)

b. \[[\text{liang ben xiaoshuo}]\] = \(\lambda P_{\langle<e, t>\rangle} \exists x e [\text{novel}(x) \land P(x) \land |x| \geq 2]

c. \[[\text{bi Lisi}]\] = Lisi

d. \[[\text{Zhangsan}]\] = Zhangsan

e. \[[\text{Zhangsan bi Lisi duo du-le liang ben xiaoshuo } f]\]^g = 1 iff \\
\exists x e [\text{novel}(x) \land |x| \geq 2 \land \forall z e [\text{read}(z)(Lisi) \rightarrow \\
\exists t e [t = g(f)(z) \land \text{PROPER}(g(f)) \land \text{read}(t)(Zhangsan) \land \text{read}(x)(Zhangsan) \land \neg t o x]]

(55e) says: there is an entity \(x\) consisting of at least two atomic novels. For each entity \(z\) that Lisi read, there is an entity \(t\) such that \(t\) and \(z\) are of the same quantity and the same sort at the taxonomic level introduced by the differential of (46). Zhangsan read \(t\). Zhangsan read \(x\). \(t\) does not overlap with \(x\).

The DVC in (56)(repeated from 42) can be interpreted in the same fashion as (46). The semantics of (56) is captured by the formula in (57):

(56) Zhangsan bi Lisi duo he-le yi sheng shui.
much drink-asp one liter water
‘Zhangsan drank one more liter of water than Lisi did.’

(57) \[[\text{Zhangsan bi Lisi duo he-le yi sheng shui } f]\]^g = 1 iff \\
\exists x e [\text{water}(x) \land \text{liter}(x) \geq 1 \land \forall z e [\text{drink}(z)(Lisi) \rightarrow \\
\exists t e [t = g(f)(z) \land \text{PROPER}(g(f)) \land \text{drink}(t)(Zhangsan) \land \text{drink}(x)(Zhangsan) \land \neg t o x]]

21
(57) says: there is an entity $x$ such that $x$ is water and $x$ measures at least 1 liter. For all the water $z$ that Lisi drank, there is an entity $t$ such that $t$ and $x$ are of the same quantity and the same sort at the taxonomic level introduced by the differential. Zhangsan drank $t$. Zhangsan drank $x$. $t$ does not overlap with $x$.

Finally, let us turn to the DVC in (45)(repeated in 58). Unlike the DVCs in (46) and (56), (58) has a differential that is a measure phrase, liang gongli ‘2 kilometer’.

(58) Zhangsan bi Lisi duo pao-le liang gongli
    much run-asp 2 kilometer
    ‘Zhangsan ran 2 kilometers more than Lisi did.’

Measure phrases like liang gongli ‘2 kilometer’, when used as adverbials, can be interpreted as event modifiers, as shown in (60b).\(^{15}\)

(59) Zhangsan pao-le liang gongli.
    run-asp 2 kilometer.
    ‘Zhangsan ran 2 kilometers.’

(60)

a. $[[pao \ ] ] = \lambda x_e \lambda e_v [\text{Agent (}e) = x \land \text{run (}e\text{)} ]$

b. $[[\text{liang gongli} \ ] ] = \lambda E_{e_v, e} \lambda e_v [E(e) \land 2 \text{ km.}(e)]$

c. $[[\text{Zhangsan pao-le liang gongli} \ ] ] = 1 \iff \exists e_v [\text{Agent (}e) = \text{Zhangsan} \land \text{run (}e\land 2 \text{ km.}(e)\text{)} ]$

In (60b), liang gongli takes a set of events $E$, and returns a set of events that extends 2 kilometers in distance.\(^{16}\) The sentence in (59) has the interpretation in (60c), which says: there is a running event $e$, whose agent is Zhangsan. $e$ extends 2 kilometers.

If we incorporate the semantics of the transitive verb $pao$ ‘to run’ in (60a) and the semantics of the measure phrase $liang gongli$ ‘2 kilometers’ in (60b) into the interpretation of the DVC in (58), the morpheme $duo$ will have a slightly different semantics from the one in (53), as shown in (61).\(^{17}\)

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\(^{15}\) In Morzycki (2004), adverbial measure phrases such as liang gongli ‘2 kilometers’ in (59) are degree-denoting expressions. They are introduced by a functional projection which prepares them to be semantically connected to verbs.

\(^{16}\) In the paper, I make use of the following types: type $e$ for individuals, type $v$ for events, type $t$ for truth-values, and type $d$ for degrees.

\(^{17}\) In my analysis, $duo$ has different semantics when it combines with verbs of different argument structures, i.e., intransitive verbs, transitive verbs, and ditransitive verbs. For instance, $duo$ has the semantics in (53) when combining with transitive verbs, and has the semantics in (61) when combining with intransitive verbs. In this regard, $duo$ is similar to the conjunction morpheme and, which has different interpretations when conjoining conjuncts of different categories, i.e., nouns, verbs, adjectives, etc. What is crucial about the multiple interpretations of $duo$ is that they are not
(61) \[[\text{\textit{duo}}_y]\] = \lambda P_{<e, \langle v, d, \rangle \lambda K_{<v, \langle v, d, \rangle \lambda y_e \lambda x_e \lambda e_e}[K(P(x))(e) \wedge \\
\forall z_e[P(y)(z) \rightarrow \exists t_o[t = g(f)(z) \wedge \text{PROPER}(g(f)) \wedge P(x)(t) \wedge \neg t o e]]

duo in (61) differs from the one in (53) in its first two arguments. The argument \(P\) in (61) is a relation between individuals and events; the argument \(K\) is an event modifier. When duo composes with its four semantic arguments, the result is shown in (62):

(62) \[[\text{\textit{Zhangsan bi Lisi duo pao-le liang gongli}}_f]\] = \lambda x_{e}[\exists e_{v} [\forall z_{v} [][\text{run}(z) \rightarrow \exists t_{o} \] \[\text{Agent}(z) = \text{Lisi}] \rightarrow \exists t_{o} \] \[\text{Agent}(t) = \text{Zhangsan} \wedge \neg t o e] ][]

(62) says: there is an event \(e\) of Zhangsan running 2 kilometers. For every running event \(z\) whose agent is Lisi, there is an event \(t\) of Zhangsan’s running which involves the same distance as \(z\). \(t\) does not overlap with \(e\).

To summarize, in this section I provided a mapping-based analysis that captures the semantics of DVCs. In the following subsection, I will show how this proposed analysis explains the asymmetries between DVCs and adjectival/adverbial comparatives as we have seen in section 1.2.

### 3.4 Explanations for the asymmetries

First, recall that only duo ‘much’ and shao ‘little’ can be used to form DVCs, but other adjectives or adverbs cannot, as shown in (63)(repeated from 13):

(63) a. \*Zhangsan bi Lisi kuai pao-le liang gongli.
   fast run-asp 2 kilometer

   b. \*Zhangsan bi Lisi renzhen du-le liang ben shu.
   attentive(ly) read-asp 2 Cl books

In the mapping-based analysis, duo ‘much’ and shao ‘little’ have interpretations distinct from other adjectives (or adverbs). The latter are standardly interpreted as relations between individuals and degrees (of type \(<e, <d, t>\)\), as shown by the contrast in (64) and (65) 18,19:

18 Adverbs can be interpreted as relations between events and degrees (of type \(<v, <d, t>\)\).
19 Alternatively, in Kennedy (1997, 1999) and Bartsch and Vennemann (1973), adjectives denote measure functions of type \(<e, d>\).
(64) a.  \[ \lambda P_{xy} \lambda y \lambda x \forall z e [P(z)(y) \rightarrow \exists t [t = g(f)(z) \land \text{PROPER}(g(f)) \land P(t)(x) \land P(k)(x) \land \neg t \circ k]] \]

b.  \[ \lambda P_{xy} \lambda y \lambda x \forall z e [P(z)(x) \rightarrow \exists t [t = g(f)(z) \land \text{PROPER}(g(f)) \land P(t)(y) \land P(k)(y) \land \neg t \circ k]] \]

(65) a.  \[ \lambda x_e \lambda d_e. x \text{’s speed} \geq d \]

b.  \[ \lambda x_e \lambda d_e. x \text{’s attentiveness} \geq d \]

The sentences in (63) are ungrammatical, because *kuai ‘fast’ or renzhen ‘attentive(ly)’ do not share the same type of interpretation as *duo ‘much’ and *shao ‘little’, and therefore, are not allowed in DVCs.

Second, in the mapping based analysis, differentials play important semantic roles. They constitute an integral part of DVCs and are obligatory.

(66) a.  *Zhangsan bi Lisi duo du-le.

   much read-asp

   Intended: ‘Zhangsan read more than Lisi did.’

b.  *Zhangsan bi Lisi duo pao-le.

   much run-asp

   Intended: ‘Zhangsan ran more than Lisi did.’

Other than describing the difference between two sets under comparison, a differential indicates the taxonomic level at which a mapping relation is established. (66a) is ungrammatical, because without a differential DP, the sentence does not specify how mapping should be established between what Zhangsan read and what Lisi read.20

20 (66a) is ungrammatical also because the transitive verb *du ‘to read’ lacks an object.
The differential of (67a) indicates that Lisi’s running event is mapped to a proper part of Zhangsan’s running event that takes the same amount of time; the differential of (67b), on the other hand, indicates that Lisi’s running event is mapped to a proper part of Zhangsan’s running event that involves the same distance. (66b) is ungrammatical, because without a differential MP, the sentence does not indicate how running events are measured and compared.

Finally, in the mapping based analysis, differential DPs such as liang ben xiaoshuo ‘2 novels’, and differential MPs such as liang gongli ‘2 kilometers’ in DVCs have the same syntax and semantics as DP objects and adverbial measure phrases in non-comparative contexts. As such, this analysis successfully captures the parallel between differential DPs in DVCs and DP objects in non-comparative contexts as well as the distinction between differential DPs in DVCs and differential MPs in adjectival comparatives, as we have seen in section 2.

To summarize, in this section I have shown how a mapping-based semantic analysis of DVCs accounts for the differences between DVCs and adjectival (adverbial) comparatives. As one might have noticed, this analysis differs from the current standard approach to the semantics of the comparative, namely the degree-based approach. In the following section, I will introduce the basic idea of the degree-based analyses of the comparative and discuss the challenges for extending this type of analysis to DVCs.

4. A degree-based analysis of DVCs

4.1 The degree-based analyses of comparatives

On the view of the current degree-based analyses of the comparative (Seuren 1973, Cresswell 1976, Hellan 1981, Hoeksema 1983, von Stechow 1984, Rullmann 1995, Kennedy 1997, Hackl 2000, Heim 2000, Schwarzschild and Wilkinson 2002 and references therein), a comparative describes a comparison of two degrees. Degrees are (totally) ordered points on a scale of some dimension (Kennedy 1997). For instance, a simple adjectival comparative like (68a) expresses a comparative relation between the maximal degree to which John is tall and the maximal degree to which Mary is tall, as shown in (68b).

(68) a. John is taller than Mary is.
   b. \[ \text{Max.}\{d: \text{John's height} \geq d\} > \text{Max.}\{d': \text{Mary's height} \geq d'\} \]

(68b) says John’s maximal height is greater than Mary’s maximal height.

Measure phrases, when used in comparatives, are analyzed as names of degrees (of type $d$) (Cresswell 1976, von Stechow 1984, and Heim 2001).\(^{21}\) They

\(^{21}\) Schwarzschild (2005) argues that measure phrases are predicates of gaps; Svenonius and Kennedy (2006), Sawada & Grano (2011), and Grano & Kennedy (2012) propose that measure phrases are introduced by a special function head which semantically prepares the adjective to be able to combine with measure phrases.
describe the difference between two degrees under comparison. For example, the comparative in (69a) takes a measure phrase such as 2 inches as a differential. It indicates that the difference between John’s maximal height and Mary’s maximal height is (at least) 2 inches, as shown in (69b).

(69)  
  a. John is 2 inches taller than Mary is.  
  b. Max.{d: John’s height ≥ d} − Max.{d': Mary’s height ≥ d'} ≥ 2 (inches)  

Against this background, in the following subsection I will sketch out a degree-based analysis for DVCs.

4.2 A degree-based analysis of DVCs

Consider the context in (70) and the DVC in (71): (71) is intuitively true in the context in (70).

(70) Context: Zhangsan read 2 novels and 2 magazines.  
Lisi read 2 novels and no magazine.

(71) Zhangsan bi Lisi duo du-le liang ben zazhi.  
     much read-asp 2 Cl magazine  
     ‘Zhangsan’s reading exceeded Lisi’s reading by 2 magazines.’

Under the degree-based analyses of comparatives, it is reasonable to assume that (71) describes a comparison of amounts of reading: the amount Zhangsan read, d, and the amount Lisi read, d’. For any degrees d and d’, we can establish that d is greater than d’ by showing d = d’ + d” (d” ≠ 0). For the DVC in (71), this means that we need to show that the amount Zhangsan read is equal to the amount Lisi read and some additional amount. Let us assume that the two novels that Zhangsan read count as the same amount of reading as the two novels that Lisi read. The novels that they read do not have to be identical. Suppose Zhangsan read two novels, Wuthering Heights (WH) and Little Women (LW), and two magazines, Vogue (V) and People (P). Lisi read two novels, Jane Eyre (JE) and Pride and Prejudice (PP). Wuthering Heights (WH) and Little Women (LW) count as the same amount of reading as Jane Eyre (JE) and Pride and Prejudice (PP), as shown by the diagram in (72):
According to (72), (71) is true in (70), because $d = d' + 2$ magazines (assuming that the differential liang ben zazhi ‘2 magazines’ denotes a degree parallel to the differential 2 inches in (69)).

Bearing such a degree-based analysis in mind, let us now turn to another pair of examples, (73) and (74)(repeated from 31and 34). Intuitively, (74a) is true in (73), but (74b) is false.

(73) Context: Zhangsan read Jane Eyre (JE), Wuthering Heights (WH), Pride and Prejudice (PP), Little Women (LW); Lisi read Wuthering Heights (WH) and Little Women (LP).

(74) a. Zhangsan bi Lisi duo du-le much read-asp
    
    Jane Eyre he Pride and Prejudice.
    
    and
    
    ‘Zhangsan’s reading exceeded Lisi’s reading by Jane Eyre and Pride and Prejudice.’

b. Zhangsan bi Lisi duo du-le much read-asp
    
    Little Women he Wuthering Heights.
    
    and
    
    ‘Zhangsan’s reading exceeded Lisi’s reading by Little Women and Wuthering Heights.’

The contrast between (74a) and (74b) in (73) shows that the equivalence relation in (72) cannot hold for the DVC in (74b), because if we assume that the reading of Wuthering Heights (WH) and Little Women (LW) is equivalent to the reading of Jane Eyre (JE) and Pride and Prejudice (PP), we would erroneously predict (74b) to be true in (73), contrary to the intuition, as shown by the diagram in (75).
The examples in (70-71) and (73-74) show that what counts as an ‘equivalent amount’ varies in different contexts. For the DVC in (71), the equivalence relation is defined at the taxonomic level where novels and magazines are of different sorts, i.e., reading a novel is equivalent to reading a novel, but not to reading a magazine. For the DVCs in (74), the equivalence relation is defined at the taxonomic level where novels of different names are of different sorts, i.e., reading *Wuthering Heights* is considered equivalent to reading *Wuthering Heights*, but not to reading *Jane Eyre*. A degree-based analysis as such, which refers to the non-degree information in differentials for the definition of the equivalence relation, is not truly degree-based, for it goes beyond a simple comparison of pure amounts as in adjectival comparatives.

Another challenge that a degree-based analysis of DVCs faces is how to maintain a consistent semantics for differential DPs in comparative and non-comparative contexts. As we have seen in section 2, differential DPs in DVCs are distinct from differential MPs in adjectival comparatives, but are parallel in syntax and semantics to DP objects in non-comparative sentences. Under the degree-based analyses of comparatives, however, a differential describes the difference between degrees and must be a degree-denoting expression.

To summarize, in this section we have seen the challenges that a degree-based analysis faces in dealing with the semantics of DVCs. One might wonder whether a mapping-based analysis would run into a similar situation when dealing with the semantics of adjectival comparatives. In the following section, I will show that the mapping-based analysis is indeed compatible with degrees. When it is applied to adjectival comparatives, the analysis draws an interesting parallel to a type of degree-based analysis that makes use of the proper subset relation (Heim 2000).

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22 An anonymous reviewer pointed out to me that there are proposals in the literature that investigate the relation between events and degrees (Caudal and Nicolas 2005, Kennedy and Levin 2008, Piñón 2008), which might provide useful tools for one to achieve a degree-based analysis for DVCs. Due to limited space, I cannot go through each proposal and show how it can be implemented in a degree-based analysis of DVCs. What I think is more important here is not whether we can give DVCs a degree-based analysis (in fact, I think it is possible), but whether there is enough motivation to do so.
5. Towards a uniform analysis

In section 5.1, I lay out a degree-based analysis of adjectival comparatives in Mandarin Chinese based on existing accounts in the literature. This analysis is based on the ‘greater than’ relation between two degrees. In section 5.2, I compare this analysis to the mapping-based analysis of adjectival comparatives and show that the latter has wider application than the former.

5.1 The ‘greater than’ analysis of adjectival comparatives

To begin with, I will lay out a degree-based analysis of adjectival comparatives that makes use of the ‘greater than’ relation. This analysis is mainly based on Lin (2009) and Xiang (2003, 2005).

(76) a. Context: Zhangsan is 172cm tall; Lisi is 170cm tall.

b. Zhangsan bi Lisi gao liang limi.
   tall 2cm
   ‘Zhangsan is 2 cm taller than Lisi.’

I assume that the comparative in (76b) has the structure in (77):

(77) S
    Zhangsan DegP
    PP   Deg’
        P  bi
        NP Lisi
        Deg  ∅i
        A   ‘tall’
        Deg’
        MP liang limi 2 cm

The structure in (77) is based on two main assumptions. First, following Xiang (2003), I assume that Chinese adjectival comparatives are phrasal rather than clausal. Second, following Xiang (2005), I assign Chinese adjectival comparatives a Deg-shell structure with a null deg-head ∅.  

Semantically, I follow Heim (1985) and Bhatt and Takahashi (2011) in assuming that the Deg head has a 4-place interpretation, as shown in (78b):

23 Lin (2009) and Xiang (2005) each deal with different issues in Chinese adjectival comparatives. Lin (2009) is mostly concerned with the comparison of different types of arguments in adjectival comparatives (e.g., individuals, times, locations); Xiang (2003) focuses on the syntactic relation between the transitive comparative (cf. footnote 2) and the adjectival comparative. As these issues are not the main concern of the paper, I do not address them in here.

24 Larson (1991) and Izvorski (1995) have proposed a similar Deg-shell structure for English adjectival comparatives.
When the Deg head composes with its 4 semantic arguments, the result is in (78e). It says: the maximal degree of Zhangsan’s height is greater than the maximal degree of Lisi’s height by at least 2 centimeters.

5.2 The mapping-based analysis of adjectival comparatives

Let us turn to the mapping-based analysis of adjectival comparatives. (76b), if paraphrased in terms of mapping, has the truth-conditions in (79), which is captured by the diagram in (80):

(79) There is a set of degrees to which Zhangsan is tall (set A), and a set of degrees to which Lisi is tall (set B). Each degree in set B can be mapped to an identical counterpart in set A. The set of unpaired degrees in set A spans 2cm on a scale of height.

(80) ![Diagram](https://via.placeholder.com/150)

In (80), set A contains all the degrees to which Zhangsan is tall, i.e., \{d: d ≤ 172\}. Set B contains all the degrees to which Lisi is tall, i.e., \{d’: d ≤ 170\}. \(f\) maps from all the degrees in set B to their identical counterparts in set A. The difference
between A and \( f(B) \) is \{ d": 170 < d" <172 \}, which ranges 2 cm on a scale of height.\(^\text{25}\)

Given the interpretation in (79) and the structure in (77), the interpretation of (76b) is sketched out in (81).

\[
(81) \quad \text{a. } [[ \text{ gao } ]] = \lambda x_e \lambda d_d. x's \text{ height } \geq d
\]

\[
\text{b. } [[ \text{ liang gong fen } ]] = \lambda D_{<d}. [D = 2 \text{ cm}]
\]

\[
\text{c. } [[ \emptyset ]]^8 = \lambda P_{<e, <d}. \lambda y_e \lambda x_e. \forall z_d [P(z)(y) \rightarrow \\
\exists t_d [t = g(f)(z) \land \text{PROPER}(g(f)) \land P(t)(x) \land P(k)(x) \land \neg t \circ d]^26
\]

\[
\text{d. } [[ \text{ Zhangsan bi Lisi gao liang limi } ]]^8 = 1 \text{ iff } \\
\{d_d, \forall z_d [\text{Lisi’s height } \geq z \rightarrow \exists t_d [t = g(f)(z) \land \text{PROPER}(g(f)) \land \\
\text{Zhangsan’s height } \geq t \land \text{Zhangsan’s height } \geq d \land \neg t \circ d] \} = 2 \text{ cm}
\]

In (81b), I follow Schwarzschild (2005) in assuming that measure phrases are predicates of gaps. The measure phrase liang gongfen ‘2 cm’ is a predicate of any interval that spans 2 cm on a scale of height. The null degree head \( \emptyset \) in (81c) assumes an interpretation parallel to the meaning of duo in (53)(repeated in 82).

\[
(82) \quad [[ \text{ duo } ]]^8 = \lambda P_{<e, <d}. \lambda k_e \lambda y_e \lambda x_e. \forall z_d [P(z)(y) \rightarrow \\
\exists t_d [t = g(f)(z) \land \text{PROPER}(g(f)) \land P(t)(x) \land P(k)(x) \land \neg t \circ k]
\]

duo in (82) and \( \emptyset \) in (81c) differ in two aspects. First, duo and \( \emptyset \) are subject to different selectional restrictions: the former selects for non-gradable predicates (mostly verbs), while the latter selects for gradable predicates (mostly adjectives). Second, duo and \( \emptyset \) also differ in whether they have to take a differential argument: duo does, but \( \emptyset \) does not.\(^\text{27}\) When \( \emptyset \) composes with its 4 arguments,

\(\text{25} \) Strictly speaking, the difference between A and \( f(B) \) is less than 2 cm, but let us assume that such a small difference does not concern us here.

\(\text{26} \) In (81c), \( \emptyset \) in sequence composes with the denotation of the adjective, the denotation of the differential measure phrase, and the two individual arguments. This way, it looks more parallel to the meaning of duo in (82). Alternatively, \( \emptyset \) can have the semantics in (i) below, which differs from (81c) in the order of the first two semantic arguments.

\(\text{27} \) A question arises from extending the mapping-based analysis to adjectival comparatives: why doesn’t \( \emptyset \) in adjectival comparatives require an obligatory differential argument, like duo in DVCs? I do not have a clear answer for this question. My guess is that it might have to do with the semantic difference between adjectives and verbs. The semantics of adjectives encodes dimensions. It indicates scales along which degrees are compared, e.g., height, weight, etc. Verbs, on the other hand, do not encode dimensions, and therefore require the presence of differentials to indicate how objects/events are measured and compared (c.f. 67a-b).
the formula in (81d) says: for every degree \( z \) to which Lisi is tall, there is an equivalent degree \( t \) to which Zhangsan is tall. The set of degrees to which Zhangsan is tall that do not overlap with \( t \) spans 2 cm on a scale.

The semantics in (81d) demonstrates an interesting parallel to a type of degree-based analysis that makes use of the proper subset relation (Heim 2000), as shown below:

(83)  
\[ \begin{align*}  
\text{a.} & \quad \text{John is taller than Mary.} \\
\text{b.} & \quad \{d: \text{John’s height} \geq d\} \supset \{d’: \text{Mary’s height} \geq d’\} 
\end{align*} \]

According to this analysis, a comparative describes a proper subset relation between two sets of degrees. For example, (83a) means: the set of degrees to which Mary is tall is a proper subset of the set of degrees to which John is tall, as shown in (83b). If we add a differential measure phrase, e.g., 2 cm, to (83a), the sentence has the meaning in (84b):

(84)  
\[ \begin{align*}  
\text{a.} & \quad \text{John is 2cm taller than Mary.} \\
\text{b.} & \quad \forall d \left[\left\{\text{Mary’s height} \geq d\right\} \rightarrow \left\{\text{John’s height} \geq d\right\}\right] \land \\
& \quad \left\{\lambda d’. \text{John’s height} \geq d’ \land \neg \text{Mary’s height} \geq d’\right\} = 2\text{cm} 
\end{align*} \]

(84b) says: for every degree \( d \), if Mary is tall to \( d \), John is also tall to \( d \). The set of degrees \( d’ \) to which John is tall, but not Mary, spans 2 cm on a scale of height. Comparing (84b) to (81d), both formulas express a proper subset relation between two sets of degrees. They mainly differ in that in (81d), the proper subsethood is defined on top of the mapping relation \( f \).

Now we have two different semantic analyses of adjectival comparatives: one makes use of the ordering relation between two degrees, i.e. (78e), and the other makes use of the proper subset relation between two sets, i.e., (81d). Comparing these two analyses, they are extensionally equivalent in the context of scalar predicates (e.g. tall) and adjectival comparatives. However, their difference is shown when we turn to comparatives that do not involve scalar predicates and degrees, for example, DVCs in Mandarin Chinese. Only the analysis based on the proper subset relation can be applied to comparatives that compare the relative contents of two sets. Therefore, what DVCs in Mandarin Chinese tell us is that: (i) degrees, though being an important concept in the analyses of the semantics of adjectives and adjectival comparatives, may not have the same status for all types of comparatives; and (ii) an analysis based on the proper subset relation is more general in dealing with the semantics of comparatives than an analysis based on the greater than relation.

In the following section, I will turn to a prediction that falls out of the current analysis--the ambiguity of \textit{duo}. I argue that \textit{duo} is ambiguous between a comparative head and a normal adjective.
6. The ambiguity of *duo*

The morpheme *duo*, like other adjectives in Mandarin Chinese, can be used as a NP modifier, e.g., (85a), or a predicate, e.g., (85b).

(85) a. hen duo shu
very much books
‘a lot of books’

b. zher de shu hen duo.
here De book very much
‘There are a lot of books in here.’

It can also be used to form adjectival comparatives, as shown in (86):

(86) zhe-gang-shui bi na-gang-shui duo (liang sheng).
this-tank-water that-tank-water much 2 liter
‘There are 2 more liters of water in this tank than in that tank.’

(86) describes a comparison of amounts of water. Its truth-conditions can be captured by the formula in (87b):

(87) a. \[ [[\text{ Duo }]] = \lambda x. \lambda d. \text{x’s quantity} \geq d \]

b. \[ [[\text{ zhe-gang-shui bi na-gang-shui duo liang sheng }]] = 1 \text{ iff } \lambda d. \forall z. \text{quantity (that tank of water)} \geq z \rightarrow \exists t. (t = g(f)(z) \land \text{PROPER}(g(f)) \land \text{quantity (this tank of water)} \geq t \land \text{quantity (that tank of water)} \geq d \land \neg t \in d]) = 2 \text{ liters} \]

(87b) says: every portion of the water \(z\) in that tank can be mapped to a unique portion of the water \(t\) in this tank that shares the same quantity. The amount of water in this tank that is left unpaired measures 2 liters. In this analysis, the adjective *duo* ‘much’ is a relation between individuals and degrees, parallel to other adjectives in Mandarin Chinese.

Let us compare the adjectival comparative in (86) to the comparative in (88b). (88b) has a similar formation as the adjectival comparative in (86), yet unlike (86), it has a differential DP, *yi pi ma* ‘one horse’.

(88) a. Context: there are two almost identical pictures, A and B. The only difference between them is that A has a horse in the picture which B does not have. Other than that, everything else is identical.

\(A = \text{this picture}; B = \text{that picture}\)
b. zhe-fu-hua bi na-fu-hua duo yi-pi-ma.
   this-Cl-picture that-Cl-picture much one-Cl-horse
   ‘There is a horse in this picture which that picture does not have.’

Intuitively, (88b) compares the entities contained in picture A and picture B. It says that picture A has all the entities in picture B, and in addition it has a horse that picture B does not have. The differential of (88b), like differential DPs in DVCs, can be modified by the demonstrative pronoun zhe ‘this’, as shown in (89). And it can be questioned with the wh-phrase shenme ‘what’, but not with the wh-phrase duoshao ‘how much’, as shown in (90).

(89) zhe-fu-hua bi na-fu-hua duo zhe-pi-ma.
   this-Cl-picture that-Cl-picture much this-Cl-horse.
   ‘This picture has this horse that that picture does not have.’

(90) a. zhe-fu-hua bi na-fu-hua duo shenme?
   this-Cl-picture that-Cl-picture much what
   ‘What is in this picture but not in that picture?’

b. *zhe-fu-hua bi na-fu-hua duo duoshao?
   this-Cl-picture that-Cl-picture much how much

I take the examples in (89) and (90) to indicate that (88b) is a DVC in disguise, where duo is followed by an implicit verb you ‘to have’. When you ‘to have’ is overtly present, the sentence is grammatical and it shares the same interpretation as (88b), as shown in (91):

(91) = (88b)
   zhe-fu-hua bi na-fu-hua duo [you] yi-pi-ma.
   this-Cl-picture that-Cl-picture much have one-Cl-horse
   ‘This picture has a horse that that picture does not have.’

In (91) and (88b), duo is a comparative head, which has the semantics in (92a)(repeated from 53). When duo composes with all its arguments, (91) has the interpretation in (92b):

(92) a. \[
[[ \text{duo} ]]^g = \lambda P_{\ll, \ll, \gg, \gg} \lambda k \lambda \chi_\ll \lambda \chi_{\ll, \gg} \forall \chi_\ll [P(z)(y) \Rightarrow
\exists t_\ll [t = g(f)(z) \land \text{proper}(g(f)) \land P(t)(x) \land P(k)(x)]
\]

b. \[
[[ \text{zhe-fu-hua bi na-fu-hua duo [you yi-pi-ma]} ]]^g = 1 \text{ iff } \\
\exists \chi_\ll [\text{horse}(x) \land |x| \geq 1 \land \forall \chi_\ll [\text{have}(z)(\text{that picture}) \Rightarrow \exists t_\ll [t = g(f)(z) \land \text{proper}(g(f)) \land \text{have}(t)(\text{this picture}) \land \text{read}(x)(\text{this picture}) \land \neg t \circ x]]]
\]
(92b) says: for every entity \( z \) in that picture, there is an entity \( t \) in this picture such that \( z \) and \( t \) are of the same quantity and the same sort at the taxonomic level introduced by the differential. There is an entity \( x \) such that \( x \) contains at least one atomic part and each part is a horse. \( x \) does not overlap with \( t \).

Finally, let us turn to comparatives that are ambiguous between an adjectival comparative and a DVC, as shown in (93):^28

\[
(93) \quad \text{wo-du-de-shu bi ni-du-de-shu \textit{duo} liang ben.} \quad \text{I-read-De-book you-read-De-book much 2 Cl}
\]

‘I read 2 more books than you did.’

(93) differs from (86) and (88b) in having a numeral-classifier phrase, e.g., \textit{liang ben} ‘2 Cl’ as a differential. Numeral-classifier phrases pattern with both differential DPs in DVCs and differential MPs in adjectival comparatives. That is, like a differential MP, the numeral-classifier phrase \textit{liang ben} ‘2 Cl’ can be questioned with the \textit{wh}-phrase \textit{duoshao} ‘how much’, as shown in (94):

\[
(94) \quad \text{wo-du-de-shu bi ni-du-de-shu \textit{duo} \textit{duoshao}?} \quad \text{I-read-De-book you-read-De-book much how.much.}
\]

‘How much does my reading exceed your reading?’

And like a differential DP, the numeral-classifier phrase \textit{liang ben} ‘2 Cl’ can be modified by the demonstrative pronoun \textit{zhe} ‘this’, as shown in (95a), and it can be questioned with \textit{shenme} ‘what’, as shown in (95b).

\[
(95) \quad \text{a. wo-du-de-shu bi ni-du-de-shu \textit{duo} \textit{zhe} \textit{liang ben}.} \quad \text{I-read-De-book you-read-De-book much this 2 Cl}
\]

‘What I read exceeded what you read by these two (books).’

\[
(95) \quad \text{b. wo-du-de-shu bi ni-du-de-shu \textit{duo} \textit{shenme}?} \quad \text{I-read-De-book you-read-De-book much what}
\]

‘By what does my reading exceed your reading?’

(94) and (95) show that the numeral-classifier phrase \textit{liang ben} ‘2 Cl’ can be analyzed either as a degree-denoting measure phrase, as shown in (96a), or as a DP that quantifies over \textit{ben}-objects, as shown in (96b). Depending on which meaning \textit{liang ben} ‘2 Cl’ takes, the comparative in (93) can be interpreted either as an adjectival comparative or as a DVC.

\[
(96) \quad \text{a. } [ [ \textit{liang ben} ] ] = 2 \text{ ben}
\]

\[
(96) \quad \text{b. } [ [ \textit{liang ben} ] ] = \lambda P_{<e, t} \exists x_e. [ |x| = 2 \land \textit{ben}(x) \land P(x)]
\]

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^28 I thank an anonymous reviewer for bringing this example to my attention.
7. Conclusion

To conclude, in this paper I have introduced a type of comparative in Mandarin Chinese which has rarely been studied in the literature (Cheng 1966), namely differential verbal comparatives (DVCs). I showed that unlike adjectival comparatives and adverbial comparatives in Mandarin Chinese, DVCs allow differentials that are definite DPs, e.g., *zhe liang ben shu* ‘these two books’ in (97a) and *Jane Eyre and Pride and Prejudice* in (97b). These differentials, unlike differential measure phrases such as *liang limi* ‘2 cm’, refer to specific differences between two sets of objects under comparison.

(97) a.  Zhangsan   bi Lisi duo  du-le   zhe  liang  ben   xiaoshuo.  
         much     read-asp   this  2   Cl   novel
   ‘Zhangsan’s reading exceeded Lisi’s reading by these 2 novels.’

   b.  Zhangsan   bi Lisi duo   du-le   
         much     read-asp
   Jane Eyre   he   Pride and Prejudice,  
             and
   ‘Zhangsan’s reading exceeded Lisi’s reading by Jane Eyre and Pride and Prejudice.’

Based on this fact and other empirical differences between DVCs and adjectival (adverbial) comparatives (section 2), I motivated and developed a mapping-based semantic analysis of DVCs and argued that this analysis fares better than a degree-based analysis (section 3 and section 4).

I also showed that the mapping-based analysis, which is motivated to explain the semantics of DVCs, can be extended to adjectival comparatives, and thus can be considered as a more general approach to the semantics of the comparative than the degree-based analyses that make use of the ‘greater than’ relation (Section 5). Finally, if what I have argued here is right, DVCs in Mandarin Chinese imply that, in natural language, the semantics of comparatives does not entail comparisons of degrees.

Xiao Li
King Hall 203
65-30 Kissena, Blvd.
Flushing, NY 11365, USA
xiao.li@qc.cuny.edu

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