

Clausal comparison without degree abstraction in Mandarin Chinese

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This paper argues (a) that the *bǐ* comparative construction in Mandarin Chinese is a form of clausal comparative and (b) that Mandarin Chinese lacks abstraction over degree variables. Beck, Oda, and Sugisaki (2004) propose that languages may vary in whether or not they allow for abstraction over degree variables through movement. In previous work, comparatives with clausal standards have been uniformly analyzed cross-linguistically as involving \bar{A} -movement of a degree operator, and are thereby predicted to not occur in languages without degree abstraction. The paper shows that clausal comparison without degree abstraction is not only theoretically possible but attested, contributing to the cross-linguistic typology of degree constructions. Along the way, I detail the syntactic derivation of *bǐ* comparatives and the obligatory ellipsis operation (comparative deletion) in their derivation.

Keywords: Mandarin Chinese, comparative, clausal comparison, comparative deletion, ellipsis, degree abstraction, Degree Abstraction Parameter

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(3) **Proposed structure for (1):**

[*target clause* John [~~*predicate*~~ tall]] *bǐ* [*standard clause* Mary [*predicate* tall]]

Obligatory comparative deletion (ellipsis) results in the surface string in (1). My proposal is able to derive a range of examples which are not derivable under Liu’s analysis, nor through the many recent phrasal analyses. In section 5, I present additional evidence from movement chains in *bǐ* comparatives which supports this clausal analysis over phrasal analyses.

With details of the syntactic derivation of the *bǐ* comparative in place, in section 6, I present my argument that Mandarin Chinese does not allow for degree abstraction. This takes the form of a proof by contradiction: I present an ungrammatical *bǐ* comparative which would be grammatical if the language allows for degree abstraction, showing that it satisfies all constraints on its syntactic derivation and semantic interpretation. I also discuss the lack of attributive comparatives in Mandarin Chinese, where the gradable predicate is in attributive position within a DP, which has not previously been discussed. Finally, in section 7 I discuss the implications of this work for degree semantics and its cross-linguistic variation.

2 Theoretical background: Ingredients of comparison

I begin with a brief survey of the syntax/semantics of gradability and comparative constructions. I take gradable predicates such as *tall* to relate entities (such as individuals, states, events) to degrees of type *d* (Cresswell, 1976). A common way to represent this is to take one-place gradable predicates such as *tall* to be $\langle d, \langle e, t \rangle \rangle$ functions (4a) which first compose with a degree argument and then an individual.

(4) **Two ways to write *tall*:**

- a. $\llbracket \text{tall} \rrbracket = \lambda d . \lambda x . x \text{ is } d\text{-tall}$ type $\langle d, \langle e, t \rangle \rangle$
b. $\llbracket \text{tall} \rrbracket = \lambda x . \lambda d . x \text{ is } d\text{-tall}$ type $\langle e, \langle d, t \rangle \rangle$

I note that such relations could alternatively be written as type $\langle e, \langle d, t \rangle \rangle$ functions as in (4b), taking their degree argument last. Such denotations have been used by some authors but have simply been treated as a notational variant in previous literature. I flag this here because—I will argue later—the choice between these two types of denotations in (4) is in fact highly consequential. But for most of the remainder of this section, I use the more commonly discussed type $\langle d, \langle e, t \rangle \rangle$ denotations.

The assertion of a comparative makes a claim about the relative ordering of two degrees. Consider the English (5). In such simple cases, we can refer to *John* as the *target* and *Mary* as the *standard*.

(5) $\underbrace{\text{John}}_{\text{target}} \text{ is taller than } \underbrace{\text{Mary}}_{\text{standard}}.$

The assertion of (5) makes the claim that the degree of John’s height exceeds the degree of Mary’s height. Formally, we represent these truth conditions as in (6).

The two-place comparative operator as in (10) takes two arguments at LF: the target and standard degree descriptions of type $\langle d, t \rangle$.

(10) **A two-place *-er* for clausal comparison:**¹

$$\llbracket \text{-er}_{2\text{-place}} \rrbracket = \lambda D_2 \langle d, t \rangle . \lambda D_1 \langle d, t \rangle . \max(D_1) > \max(D_2)$$

On the surface, the clausal standard's gradable predicate *tall* is in many cases obligatorily deleted, as indicated in (9b), through a process of *comparative deletion* (Bresnan, 1975; Napoli, 1983; Kennedy, 2002; Corver, 2005). In the most extreme case, deletion can lead to the standard's appearance as a subsentential phrase, as in (11) below:

(11) **A surface-phrasal standard in English, derived by deletion:**

- a. John is taller than Mary.
 - b. John is taller than [_{clause} *Op* λd Mary is ~~*d*-tall~~]
- ↑—————|

It's important to note here that I use the term *clausal comparison* to refer to the syntactic size and shape of the standard at LF, rather than what is reflected in surface form. In other words, assuming an analysis as in (11b), the English example (11a) has a standard which superficially appears to be phrasal (a DP), but nonetheless employs the clausal / two-place strategy. See Lechner (2001, 2004), Bhatt and Takahashi (2007, 2011), and citations there for evidence for this approach to English surface-phrasal standards such as in (11). I discuss an alternative approach to surface-phrasal standards in the following section.

The \bar{A} -dependency in clausal standards as in (9b) and (11b) is motivated by the availability of embedded standards (12) and their island-sensitivity (13):

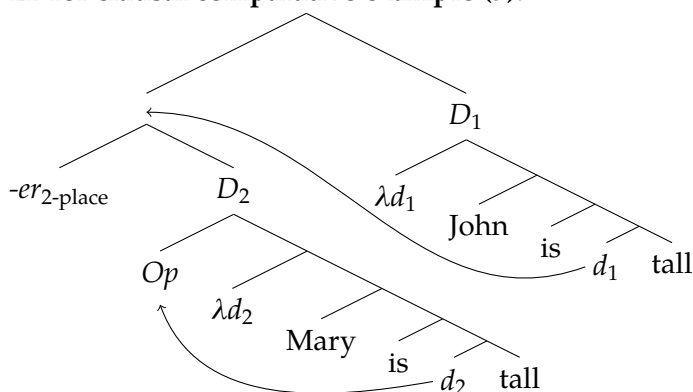
(12) John is taller than [Mary thinks [that he is ___]].

(13) * John is taller than [Mary believes [_{island} the rumor [that he is ___]]].

Recent approaches to English comparatives furthermore posit a covert movement of the comparative operator *more/-er* and the standard clause, in order to yield the target degree description (Wold, 1995; Heim, 2000; Bhatt and Pancheva, 2004). This results in an LF as in (14) for examples (9) and (11), where the two type $\langle d, t \rangle$ degree descriptions are labeled D_1 and D_2 . D_1 is the predicate of degrees true if and only if John is (at least) that tall and D_2 is the predicate of degrees true if and only if Mary is (at least) that tall.

¹Alrenga, Kennedy, and Merchant (2012) attributes this meaning to the standard marker, e.g. *than*, rather than to the comparative morpheme as in earlier work. See Alrenga et al. (2012) and citations there for discussion.

(14) LF for clausal comparative example (9):



The two-place comparative operator *more/-er* in (10) then straightforwardly takes these two degree predicates as arguments and asserts a ranking between the maximal degrees satisfying each. In the case of example (9) derived as (14), we yield the desired truth conditions as follows:

$$\begin{aligned}
 (15) \quad \llbracket (9) \rrbracket &= \llbracket -er_{2\text{-place}} \rrbracket (D_2)(D_1) \\
 &= \llbracket -er_{2\text{-place}} \rrbracket (\lambda d_2 . \text{Mary is } d_2\text{-tall})(\lambda d_1 . \text{John is } d_1\text{-tall}) \\
 &= 1 \iff \max(\lambda d_1 . \text{John is } d_1\text{-tall}) > \max(\lambda d_2 . \text{Mary is } d_2\text{-tall})
 \end{aligned}$$

It's worth noting that, for simple examples such as (9), this clausal comparison approach using the two-place operator in (10) does not by itself necessitate the use of degree abstraction, i.e. syntactic movements to construct predicates of degrees, as in (14). For example, if *tall* were to be type $\langle e, \langle d, t \rangle \rangle$ and take its degree argument last (4b), it could compose with *Mary* to yield the degree description $(\lambda d . \text{Mary is } d\text{-tall})$, without the use of degree abstraction. Of course, this approach would not help in the more general case for English: examples with embedded standards such as (12) above cannot be analyzed in this way without degree abstraction. For this reason, to my knowledge all previous literature on the syntax/semantics of clausal comparison in English and other languages have necessarily made use of degree abstraction in all cases. Later, however, I will propose that Mandarin Chinese in fact is a language with a clausal comparative but without degree abstraction, taking advantage of the availability of degree predicate denotations that take the degree argument last, e.g. type $\langle e, \langle d, t \rangle \rangle$.

2.2 Three-place / phrasal comparison: The Direct Analysis

In the previous section I briefly noted that comparatives with apparently phrasal standards, such as *John is taller than Mary* in (11a), could be analyzed as a two-place comparative with radical reduction of a clausal standard. An alternative approach is to analyze the phrasal standard as is, which necessitates a different approach to the compositional syntax/semantics of comparison. This is the three-place or phrasal approach, often also referred to as the Direct Analysis (Heim, 1985; see also Bhatt and Takahashi, 2011).

In the Direct Analysis, the comparative operator (16) takes three arguments: the target, standard, and a gradable predicate. Here I abstract away from the exact order that *more/-er* takes its argu-

ments. The interpretation of a simple comparative such as *John is taller than Mary* (11a) is illustrated in (17).

(16) **A three-place -er for phrasal comparison:** (Heim, 1985, a.o.)

$$\llbracket [-er_{3\text{-place}}] \rrbracket = \lambda G_{\langle d, \langle e, t \rangle \rangle} \cdot \lambda y_e \cdot \lambda x_e \cdot \max(\lambda d_1 \cdot G(d_1)(x)) > \max(\lambda d_2 \cdot G(d_2)(y))$$

$$\begin{aligned} (17) \quad \llbracket (11) \rrbracket &= \llbracket [-er_{3\text{-place}}] \rrbracket (\underbrace{\lambda d \cdot \lambda x \cdot x \text{ is } d\text{-tall}}_{\text{gradable predicate}}) (\underbrace{\text{Mary}}_{\text{standard}}) (\underbrace{\text{John}}_{\text{target}}) \\ &= 1 \iff \max(\lambda d_1 \cdot (\lambda d \cdot \lambda x \cdot x \text{ is } d\text{-tall})(d_1)(\text{John})) > \\ &\quad \max(\lambda d_2 \cdot (\lambda d \cdot \lambda x \cdot x \text{ is } d\text{-tall})(d_2)(\text{Mary})) \\ &= 1 \iff \max(\lambda d_1 \cdot \text{John is } d_1\text{-tall}) > \max(\lambda d_2 \cdot \text{Mary is } d_2\text{-tall}) \end{aligned}$$

What is important for our purposes is that, in a Direct Analysis LF, the degree descriptions such as $(\lambda d \cdot \text{John is } d\text{-tall})$ or $(\lambda d \cdot \text{Mary is } d\text{-tall})$ are not built in the syntax as two different clauses. As the computation in (17) shows, these degree descriptions are built in the semantics. There is just one instance of the gradable predicate in the syntax, which the comparative operator composes with the target and with the standard during its semantic computation.

3 Previous work and arguments for phrasal comparison

In this section, I will briefly review the previous literature on the analysis of *bǐ* comparatives. Along the way, we will see that the *bǐ* comparative disallows embedded standards and subcomparatives, which have been taken in recent work to support a three-place / phrasal approach to the *bǐ* comparative.

The basic word order of the Mandarin *bǐ* comparative is schematized in (18) below:

(18) **The *bǐ* comparative construction:**

Word order: “ target *bǐ* standard gradable predicate ”

Meaning: ‘*target* is more *predicate* than *standard* is *predicate*.’

Both two-place and three-place approaches to the *bǐ* comparative have been proposed in previous literature, although the two-place proposals are predominantly in earlier literature and without consideration of nor arguments against three-place proposals with phrasal standards.² A rep-

²An exception is the arguments for the clausal analysis from the binding of the reflexive *ziji* and its so-called “blocking effect” presented in Erlewine (2010) and independently in Hsieh (2015). Liu (2011) proposes a “hybrid analysis,” where both clausal and phrasal *bǐ* comparatives exist, but it too lacks sufficient specificity in the description of the deletion operation in clausal comparatives.

Most of this previous literature include no discussion of compositional semantics and refer to the two-place vs three-place approaches as *clausal vs phrasal* or *deletion vs non-deletion*, respectively, referring to the clausal standard and the deletion operation necessary for the adoption of the two-place approach for *bǐ* comparatives.

Among previous two-place/clausal analyses, I concentrate on Liu (1996) here because more recent clausal analyses do not give sufficiently explicit descriptions for the comparative deletion process. For example, comparative deletion in the clausal analysis of Liu (2011) “obligatorily deletes all the subelements of the clause introduced by the marker *bi* except those in a contrastive relation to their corresponding correlates” (p. 1769), without limitation to the size or position of deleted material, which we will see. Hsieh (2015) says he follows the clausal analysis of Liu (1996) and does not formulate a more explicit comparative deletion requirement.

representative two-place proposal is that of Liu (1996). Liu proposes that the standard in a *bǐ* comparative is underlyingly clausal, with \bar{A} -movement of a null degree operator, following the two-place analysis of English clausal comparatives sketched above in section 2.1. Comparative deletion in the form of obligatory *I'* deletion results in the surface word order.

- (19) **The structure of (1) according to Liu (1996):** (cf 9b)
 [IP John [[BI [_{standard} Op λd [IP Mary [~~*t*~~-tall]]]] tall]]
 ↑—————↓

There are, however, a number of important differences between the Mandarin *bǐ* comparative and English clausal comparatives. First, recall that clausal standards in English allow for embedding, which was part of the motivation for the null degree operator movement within the standard clause; see example (12), repeated here as (20). In contrast, as noted in Liu (1996), the *bǐ* comparative disallows embedded standards. An example modeled after (20) is in (21).

- (20) **An embedded standard in English:**
 John is taller than [Mary thinks [that he is ___]].
- (21) **No embedded standards in *bǐ* comparatives:**

* Yuēhàn_i bǐ Mǎlì rènwéi tā_i gāo.
 John BI Mary thinks he tall

Intended: 'John is taller than Mary thinks he is.'

Clausal standards in English also allow for comparison using two different but commensurable predicates in the target and standard, as in (22). Such constructions are called *subcomparatives*. It has been noted since Fu (1978) that the *bǐ* comparative cannot be used to build subcomparatives in a parallel fashion:

- (22) **An English subcomparative:**
 My chair is taller than [your table is wide].
 Interpretation: $1 \iff \max(\lambda d . \text{my chair is } d\text{-tall}) > \max(\lambda d . \text{your table is } d\text{-wide})$
- (23) **No subcomparatives with *bǐ*:**³

* Wǒ de yǐzi gāo bǐ nǐ de zhuōzi kuān.
 1SG GEN chair tall BI 2SG GEN table wide

Intended: 'My chair is taller than your table is wide.'

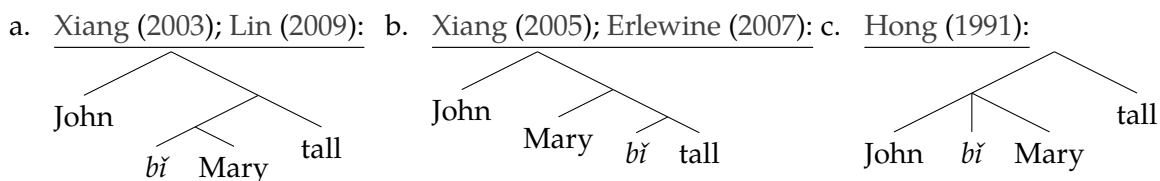
Liu (1996) explains such restrictions through the proposed obligatory deletion of the *local I'* node in the standard clause, as illustrated in (19) above. The inability to target embedded predicates for

³Examples of ungrammatical subcomparatives in the literature differ in their word order depending on the particular author's assumptions regarding where the deleted predicate is linearized in a clausal analysis of *bǐ* comparatives.

deletion can explain the lack of embedded standards as in (21), while the obligatoriness of this comparative deletion accounts for the lack of subcomparison as in (23).

In contrast, many more recent authors have argued for a three-place approach to the *bǐ* comparative (Paul, 1993; Xiang, 2003, 2005; Erlewine, 2007; Lin, 2009). These authors point to the lack of embedded standards and subcomparatives and argue that these properties of *bǐ* comparatives are straightforwardly explained by the view that *bǐ* comparative standards are always subclausal constituents. The three-place comparative operator (16) takes the target, standard, and gradable predicate as arguments. Different authors have proposed different organizations, which require the three-place comparative operator *bǐ* to take its arguments in different orders:

(24) **Different phrase structures for three-place accounts of the *bǐ* comparative:**



Some challenges for the three-place accounts have also been discussed in the literature. One example is the existence of comparatives such as in (25) below, where the target and standard both do not appear to be one syntactic constituent each, but rather a sequence of multiple constituents each. Note that a clausal analysis such as Liu’s in (19) above straightforwardly predicts the availability of such examples.

(25) **Multi-constituent targets and standards:** (example from Tsao, 1989)

Tā zuótiān zài xuexiao bǐ wǒ jīntiān zài jiālǐ kāixīn.
 He yesterday at school 比 I today at home happy

‘He was happier yesterday at school than I am today at home.’

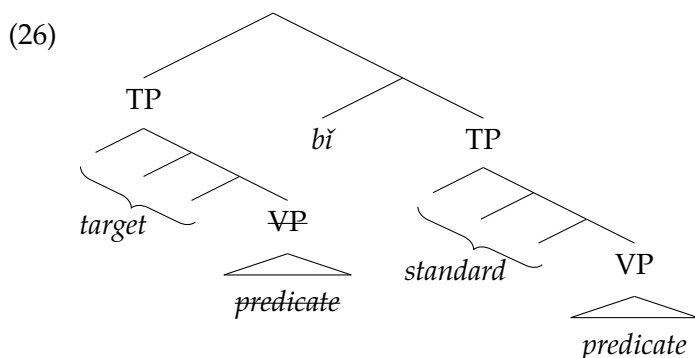
In response, Lin (2009) proposes an ambitious revision to the phrasal / three-place approach in order to account for data such as (25). He proposes that the comparative operator *bǐ* can compose with an *n*-place gradable predicate, followed by *n* constituents which constitute the standard, followed by *n* constituents which constitute the target, for any arbitrary *n*. Lin’s proposal shows that the phrasal / three-place comparative approach—or more accurately, his $(2n+1)$ -place approach—is able to account for a range of examples with complex targets and standards such as (25), which might at first glance prove difficult for the phrasal approach.

In summary, many recent proposals have argued that the Mandarin *bǐ* comparative is unambiguously a phrasal comparative, with targets and standards being subclausal phrases or matching series of multiple subclausal phrases. The lack of embedded standards and subcomparatives is immediately explained by the phrasal accounts. In contrast, the clausal approach must propose an obligatory comparative deletion operation which specifically targets a local predicate, e.g. the local *I'* in Liu (1996). Without compelling evidence to necessitate a clausal analysis, the proposal of

such an obligatory deletion process would be a complex and unnecessary addition to our theory of Mandarin grammar.

4 Proposal

I propose that the Mandarin *bǐ* comparative is a clausal comparative. Despite appearances, the syntactic structure of a *bǐ* comparative includes two instances of the gradable predicate. One forms a clause together with the material we call the “target” in (18) and the other forms a clause with the “standard,” each following the regular rules of Mandarin clausal syntax. The morpheme *bǐ* is then categorically a clausal conjunction, although the comparative meaning that it introduces is asymmetric (cf Moltmann, 1992). This configuration is schematized in (26).⁴ A Comparative Deletion Requirement will be proposed, yielding the final word order with only one instance of the predicate pronounced.



As noted above, a clausal comparison approach to the Mandarin *bǐ* comparative has been proposed previously, most notably by Liu (1996). However, the treatment here diverges from all previous approaches in two crucial ways: I describe and motivate the mechanics of the ellipsis operation involved in detail and the clausal analysis proposed does not involve degree abstraction. I first present my proposal through a basic example in section 4.1. I then present examples of comparatives with complex gradable predicates involving adverbs in 4.2. These latter examples cannot be derived using the clausal analysis in Liu (1996) and serve to motivate my particular formulation of the Comparative Deletion Requirement. They also will form a first argument against the phrasal analyses reviewed in section 3. Additional arguments against the phrasal analyses are presented in section 5.

⁴Derivations will be given here with (a) no extended projections for VP or AP and (b) base-generation of subjects in Spec,TP, for ease of illustration. The proposal made here is also compatible with the predicate-internal subject hypothesis (Kuroda, 1988; Kitagawa, 1986; Koopman and Sportiche, 1991, a.o.), which Huang (1993) has argued to apply to Mandarin. Movement of the subject from predicate-internal position to Spec,TP is compatible with my analysis, in the same way as other movements from predicate-internal position, as discussed in section 5.

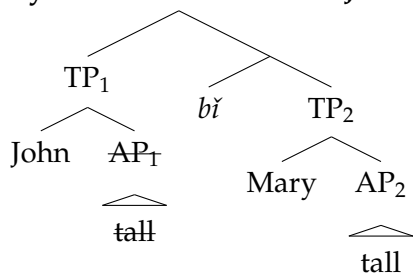
4.1 Proposal and example derivation

For concreteness, I will illustrate this proposal with our basic example (1), repeated here as (27). We'll first look at its syntactic derivation before turning to its semantic interpretation.

- (27) Yuēhàn bǐ Mǎlì gāo.
 John bǐ Mary tall
 'John is taller than Mary.'

First, the two TPs corresponding to the strings “*target predicate*” and “*standard predicate*” are independently constructed. We then conjoin these two TPs with *bǐ*. For concreteness, I assume that the standard TP is the complement of *bǐ* (TP₂) and therefore linearized to follow *bǐ* and the target TP is in a specifier position (TP₁) and linearized to precede *bǐ*.

- (28) **Syntactic derivation for “John *bǐ* Mary tall” (1/27):**



In order to derive the surface word order, a predicate inside TP₁ must be elided. To ensure that this ellipsis takes place, I propose the Comparative Deletion Requirement (29) below. Like other forms of ellipsis, the deleted predicate and its antecedent must be semantically identical (Sag, 1976; Rooth, 1992; Fiengo and May, 1994, a.o.).

- (29) **Comparative Deletion Requirement (CDR):**

In a *bǐ* comparative, elide a *local predicate* (30) of the target TP under identity with a local predicate of the standard TP. If the target TP has no elidable local predicate, the derivation is illicit.

- (30) **Definition: Local predicate**

Given a TP β , α is a *local predicate* of β iff (a) α is a VP or a predicative AP, (b) β dominates α , and (c) there is no TP which is dominated by β and dominates α .

For the basic example (27), illustrated in (28) above, ellipsis of AP₁ ‘tall’ is licensed by identity with AP₂. Because AP₁ is a local predicate of the target clause TP₁ and AP₂ is a local predicate of the standard clause TP₂, ellipsis of AP₁ satisfies the CDR. This yields the observed word order in (27).

The ellipsis enforced by the CDR joins instances of comparative deletion in other languages in having the interesting property of being obligatory: if the required ellipsis does not take place, the

⁴All cases of movement discussed in this paper are instances of overt movement. I therefore assume that the representations evaluated at the PF and LF interfaces are identical modulo comparative deletion.

resulting *bǐ* comparative is ungrammatical. This obligatoriness of comparative deletion contrasts with many cases of ellipsis outside of comparatives, which are optional. A deeper explanation for the obligatory nature of comparative deletion is beyond the scope of this paper. See Kennedy (2002) for extensive data and discussion.⁵

Following Liu (1996), the requirement of comparative deletion in *bǐ* comparatives will account for the lack of subcomparatives and embedded standards. In the ungrammatical subcomparative in (31), repeated here from (23), no predicate has been deleted in TP₁, leading to a violation of the CDR (29). The only candidate for deletion is the predicate *gāo* ‘tall,’ but its deletion is not licensed as there is no identical antecedent.^{6,7}

- (31) * [TP₁ Wǒ de yǐzi gāo] bǐ [TP₂ nǐ de zhuōzi kuān].
 1SG GEN chair tall BI 2SG GEN table wide
 Intended: ‘My chair is taller than your table is wide.’ (=23)

Comparatives with embedded standards are similarly ruled out by the CDR. In (32), repeated from (21) above, we attempt to elide the local predicate *gāo* ‘tall’ in TP₁, but its antecedent is not a local predicate of TP₂, as it is within the embedded clause TP₃.

- (32) * [TP₁ Yuēhàn_i gāo] bǐ [TP₂ Mǎlì rěnwéi [TP₃ tā_i gāo]].
 John tall BI Mary thinks he tall
 Intended: ‘John is taller than Mary thinks he is.’

The CDR also rules out examples such as (33) with the intended interpretation in (a). The intended reading involves comparing the height that John thinks Mary is with John’s own actual

⁵Two other properties of comparative deletion in the *bǐ* comparative make it notable: first, that the deletion is backwards, in the sense that the elided “gap” position linearly precedes its antecedent; and second, that the elided gap cannot be in an embedded clause in the target clause, and its antecedent cannot be in an embedded clause in the standard clause.

Deletion with these properties is also observed in other languages, in particular in processes targeting coordinate structures. Right Node Raising has been argued to be a form of backwards deletion in this sense (Wexler and Culicover, 1980; Kayne, 1994; Bošković, 2004; Chalcraft, 2006). Gapping also exhibits a requirement that the deleted constituent and its antecedent cannot be embedded (Hankamer, 1979, a.o.), as illustrated through the minimal pair in (i–ii) from Johnson (2009, p. 293).

- (i) ✓ Some had eaten mussels and others ___ shrimp.
 (ii) * Some had eaten mussels and she claims that others ___ shrimp.

The comparative deletion in *bǐ* comparatives, analyzed here as a coordinate structure, is thus a case of ellipsis which exhibits these two properties which are each separately observable in other coordinate structures.

⁶One might wonder whether the predicates in question—here, ‘tall’ and ‘wide’—are actually *commensurable*; that is, whether degrees of ‘tall’ and degrees of ‘wide’ can be ordered in Mandarin. We see that this is not the case through the following examples, which offers a grammatical way to express the comparison intended in (23) above. Here we have nominalized each gradable predicate using *-dù* ‘degree’ and compare them using the transitive verb *chāoguò* ‘exceed,’ rather than using a *bǐ* comparative.

- (i) [Wǒ de yǐzi de gāo-dù] chāoguò [nǐ de zhuōzi de kuān-dù].
 1SG GEN chair GEN tall-degree exceed 2SG GEN table GEN wide-degree
 ‘The height of my chair exceeds the width of your chair.’

⁷Other languages with clausal comparatives which nonetheless disallow subcomparatives are attested. See Hsieh (2015, 99–100) for discussion.

height. The derivation for this reading in (33) requires deletion of the predicate ‘tall’ in the standard clause, but this is not a local predicate of TP₁.

- (33) Yuēhàn_i rěnwéi Mǎlì bǐ tā_i gāo.
 John thinks Mary_{BI} he tall
- a. * Intended interpretation: $1 \iff \max(\lambda d . \text{John thinks Mary is } d\text{-tall}) > \max(\lambda d . \text{John is } d\text{-tall})$
 \approx ‘The height that John thinks Mary is is greater than John’s height.’
Intended derivation: [TP₁ John thinks [TP₃ Mary tall]]_{BI} [TP₂ he tall]
- b. ✓ ‘John thinks [Mary is taller than he is].’
Derivation: John thinks [[TP₁ Mary tall]]_{BI} [TP₂ he tall]]

This structure in (33a) is a mirror image of the embedded standard structure in (32). The ungrammaticality of (33a) shows that embedded *targets* are also disallowed in Mandarin, which has not been noted in previous literature. In contrast, the grammatical (33b) simply embeds the entire comparative under ‘John thinks.’

Embedded standards and targets as in (32–33) additionally require the use of degree abstraction to construct the complex degree descriptions for the standard and target, respectively. I will argue in section 6 that Mandarin Chinese does not have degree abstraction, but it is important to note here that such examples are independently ruled out by the syntax, i.e. by the CDR in (29).

Next we turn our attention to the semantic interpretation of *bǐ* comparatives.⁸ I propose that *bǐ* is unambiguously a two-place comparative operator, equivalent in denotation to $-er_{2\text{-place}}$ in section 2.1. It will take two degree expressions of type $\langle d, t \rangle$ —composing first with the standard degree description ($D_2 = \llbracket \text{TP}_2 \rrbracket$) and then with the target degree description ($D_1 = \llbracket \text{TP}_1 \rrbracket$)—and assert that the maximum degree satisfying D_1 is greater than that satisfying D_2 .⁹

(34) ***bǐ* is the familiar two-place comparative operator:**

$$\llbracket bǐ \rrbracket = \llbracket er_{2\text{-place}} \rrbracket (10) = \lambda D_2 \langle d, t \rangle . \lambda D_1 \langle d, t \rangle . \max(D_1) > \max(D_2)$$

Recall from section 2 that degree predicates may be thought of as taking their degree arguments earlier or later. For example, in (4) above I gave both $\langle d, \langle e, t \rangle \rangle$ and $\langle e, \langle d, t \rangle \rangle$ denotations for *tall*. These two types of denotations have simply been considered notational variants in previous work, but here I propose that all gradable predicates have available a denotation where they take their degree argument last. I refer to this idea as *Degree Last*:

⁸A reviewer asks whether the *bǐ* comparative could be thought of as an “implicit” comparative in the terms of Kennedy (2009), akin to the English expression *John is tall compared to Mary*. Erlewine (2007, §3.3) uses a number of diagnostics from Kennedy (2009) to argue that the *bǐ* comparative is indeed an “explicit” comparative which expresses an ordering between degrees, as the comparative operators reviewed in section 2 do.

⁹The *bǐ* comparative in Mandarin can optionally take a differential, with the differential following the gradable predicate. Semantically, the differential would be an argument of the comparative operator, *bǐ*, with a modified comparative semantics which specifies the differential as equal to the difference $\max(D_1) - \max(D_2)$. I will leave an extension of the proposal here to *bǐ* comparatives with differentials for future work. See Xiang (2005) for extensive discussion of differentials in Mandarin comparatives.

(35) **Degree Last:**¹⁰

Gradable predicates can take their degree argument as their last argument.

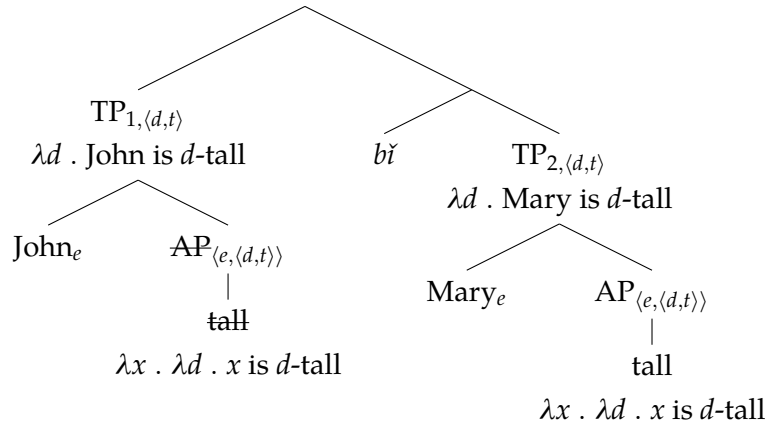
Thus, the predicate *gāo* ‘tall’ will be available with the type signature $\langle e, \langle d, t \rangle \rangle$, instead of the more commonly assumed type $\langle d, \langle e, t \rangle \rangle$:

(36) $\llbracket gāo \text{ ‘tall’} \rrbracket = \lambda x . \lambda d . x \text{ is } d\text{-tall}$

The advantage of the Degree Last denotation is seen in the semantic interpretation of (27) in (37) below:

(37) **Semantic computation for “John 比 Mary tall” (1/27):**

$$\begin{aligned} & \llbracket bǐ \rrbracket (\llbracket TP_2 \rrbracket) (\llbracket TP_1 \rrbracket) \\ &= 1 \iff \max(\llbracket TP_1 \rrbracket) > \max(\llbracket TP_2 \rrbracket) \\ &= 1 \iff \max(\lambda d . \text{John is } d\text{-tall}) > \max(\lambda d . \text{Mary is } d\text{-tall}) \end{aligned}$$



In each clause TP_1 and TP_2 , the gradable predicate of type $\langle e, \langle d, t \rangle \rangle$ composes with the subject through functional application. This results in two degree descriptions of type $\langle d, t \rangle$: the target clause TP_1 describes the height of John and the standard clause TP_2 corresponds to the height of Mary. The two-place comparative operator (34) then takes these two arguments and asserts the ordering over the maxima of these degree descriptions.

4.2 Comparatives with complex predicates

In the simple example used to illustrate the proposal in the previous section, there was only one local predicate in the target clause which could be the target of comparative deletion. In this case, the effect of the obligatory comparative deletion enforced by the CDR (29) cannot be distinguished

¹⁰My discussion here is also compatible with degree predicates all being universally Degree Last, though here I will simply assume that Degree Last denotations are available.

An alternative approach would be to make all gradable predicates “measure functions” that return their maximal degree after saturating all their arguments (Heim, 1985; Kennedy, 1997, a.o.). For example, ‘tall’ would have a type signature of $\langle e, d \rangle$ under such a system. For the purposes of this paper, this measure function approach is completely equivalent to the Degree Last proposal made here and could be adopted for the Mandarin Chinese facts. Here I choose the technical variant which does not require varying the definition of the two-place comparative operator in (34), albeit only notationally.

from the obligatory *I'* deletion proposed in Liu (1996). The language however allows for the construction of *bǐ* comparatives with more internally complex predicates, with multiple local predicates which could be targeted for comparative deletion. I will present such data in this section, motivating the formulation of the CDR in (29) as a requirement to delete a local predicate in the target clause, rather than Liu's *I'* deletion.

Consider the example in (38) below. The predicate of comparison here, *pǎo de kuài*, is a non-gradable verb *pǎo* 'run' modified by the gradable predicate *kuài* 'fast,' which functions here as a manner adverb.

(38) **A comparative with a complex predicate deleted in the target:**

Zhāng Sān bǐ Lǐ Sì pǎo de kuài.
Zhang San BI Li Si run DE fast

'Zhang San runs faster than Li Si (does).'

I begin by demonstrating how such examples can be derived and interpreted under my proposal. Following Huang (1988), Huang, Li, and Li (2009), a.o., I take the whole complex *pǎo de kuài* to be a VP headed by the verb *pǎo* 'run,' modified by a constituent formed of the AP *kuài* 'fast' and the particle *de*, which I take to be semantically inert.¹¹ The derivation of (38) involves the construction and deletion of the entire complex predicate *pǎo de kuài* VP₁ in the target clause TP₁ under semantic identity with the matching predicate VP₂ in the standard clause (39).

(39) [TP₁ Zhang San [VP₁ run [DE [AP₁ fast]]]] BI [TP₂ Li Si [VP₂ run [DE [AP₂ fast]]]]

Using a denotation for adverbial *kuài* 'fast' as in (40) below, we are able to derive the truth conditions in (41).¹² Notice that even though the syntactic head of the complex predicate *pǎo de kuài* is the verb *pǎo* 'run' (Huang, 1988, a.o.), semantically the modifier *kuài* 'fast' will take the verb as its argument, resulting in a complex gradable predicate which adheres to Degree Last (35).

(40) $\llbracket kuài \text{ 'fast'} \rrbracket = \lambda P_{\langle e,t \rangle} . \lambda x . \lambda d . P(x) \text{ is true at a speed of } d$

(41) $\llbracket (38) \rrbracket = 1 \iff \max(\lambda d . \text{Zhang San runs at a speed of } d) > \max(\lambda d . \text{Li Si runs at a speed of } d)$

Next consider the grammatical comparative in (42). Here the target clause describes the speed of Zhang San's running whereas the standard clause describes the speed of planes flying. Thus, the only logical material shared between the target and standard descriptions is the gradable adverb *kuài* 'fast.' My proposal successfully derives this comparative through the structure in (43). Notice that there are two local predicates in TP₁: the VP headed by 'run' and the AP headed by 'fast.'

¹¹The morpheme *de* is obligatory when postverbal adverbs are introduced. It is orthographically distinct from the genitive marker *de* glossed here as GEN and the relative clause marker glossed here as RC (in section 6.2). See Huang (1988); Cheng (2007); Huang et al. (2009) for discussion of this *de* which appears with manner adverbials.

¹²The denotation in (40) must be suitably formalized, for example by the use of event semantics. For example, assuming the predicate-internal subject hypothesis (footnote 4), *kuài* 'fast' could take an event description and return the corresponding degree of degree description for the speed of that event; its type could then be $\langle \langle v, t \rangle, \langle d, t \rangle \rangle$ where *v* is the type of events. See e.g. Davidson (1967) and Eckardt (1998). See also footnote 16 below.

(42) **A comparative with deletion of the adverb, the lower local predicate:**

Zhāng Sān pǎo de bǐ fēijī fēi de kuài.
Zhang San run DE BI plane fly DE fast

‘Zhang San runs faster than planes fly.’

(43) [TP₁ Zhang San [VP₁ run [DE [AP₁ fast]]]] BI [TP₂ plane [VP₂ fly [DE [AP₂ fast]]]]

For the grammatical derivation of (42), we must elide the smaller local predicate AP₁ ‘fast’ under identity with AP₂, as indicated in (43). This satisfies the CDR as stated in (29), which requires that *a* local predicate of the target clause be elided; the CDR does not require that the *largest* local predicate be elided. In this case, VP₁ cannot be elided in (43) as it does not have an appropriate antecedent.

The example in (42) is important for two reasons. First, if we follow the descriptive schema for *bǐ* comparatives in (18), the “target” portion of (42) is the string *Zhāng Sān pǎo de* “Zhang San run DE” and the “standard” is the string *fēijī fēi de* “plane fly DE.” But given our understanding of the structure of postverbal *de* manner adverbs (Huang, 1988; Huang et al., 2009, a.o.), neither of these strings is a constituent. No phrasal analyses for the *bǐ* comparative are able to derive this structure.¹³

Second, this example motivates the statement of the CDR in (29) as requiring ellipsis of a local predicate in the target clause. In structures such as (43) and (39), there are two local predicates within the target clause. The ellipsis of either under identity with an antecedent local predicate in the standard clause will result in a valid comparative. This contrasts sharply from the obligatory comparative deletion proposed by Liu (1996), which uniformly targets an I’ node (here, T’). Liu’s account would be able to derive the comparative in (38) through I’ deletion, but not comparatives such as (42) which involve ellipsis of a smaller local predicate.

What happens in structures where there are multiple candidates for deletion for the satisfaction of the CDR? We note that in (39) above, we elided the larger local predicate VP₁ to yield the correct surface structure in (38). The predicted result of eliding AP₁ in the target clause in (39) is in (44), which is judged as either slightly degraded or ungrammatical, depending on the speaker. This status is indicated by ??/* in (44).

(44) **Ellipsis of smaller local predicate in (39):**

??/* Zhāng Sān pǎo de bǐ Lǐ Sì pǎo de kuài.
Zhang San run DE BI Li Si run DE fast

Intended: ‘Zhang San runs faster than Li Si (does).’ (=38)

¹³This criticism extends to Lin’s (2009) unique phrasal analysis as well. Recall that Lin (2009) allows for the introduction of *n* constituents which will form the standard together with *n* constituents which will form the target. The target and standard here cannot be thought of as two constituents each (e.g. *Zhāng Sān* and *pǎo de*): the particle *de* forms a constituent with the following manner adverb, not the preceding verb (Huang, 1988; Huang et al., 2009). We also cannot think of the *de* particles as additional arguments introduced by Lin’s *bǐ*, as there are not arguments of the gradable predicate. See also the discussion of example (46) later in this section for another, even more striking argument against the Lin (2009) phrasal analysis.

I propose that deletion of the lower local predicate in (44) *does* satisfy the CDR but that its degraded status reflects a general preference to maximize ellipsis of repeated material. As noted by Kennedy (2002), such preferences can be thought of as related to more general principles of Economy and pressures to minimize articulatory effort. The speaker variation observed may reflect general variation in the strength of such effects.

As noted by an anonymous reviewer, a similar preference to maximize ellipsis up to the position of focus can be observed in English comparatives as well. Consider first the structure in (45). English has two grammatical options for deletion in the clausal standard in (45): the larger deletion option, involving VP ellipsis of *run fast* (45a), is judged as completely natural, whereas an option where only the adverb *fast* is deleted is judged as degraded.¹⁴ The parallel between the Mandarin and English behavior observed here supports the view that the preference for larger ellipsis observed in (38–44) reflects a general preference to maximize ellipsis. See Kennedy (2002) for an explicit account of this effect.

(45) **Maximizing deletion in English clausal comparatives:**

Derivation: John runs faster than [λd . Mary runs *d*-fast]

a. Larger deletion: VP ellipsis

✓ John runs faster than Mary does ~~run fast~~.

b. Smaller deletion: comparative deletion of *fast* only

?? John runs faster than Mary runs *fast*.

Now consider example (46) below.¹⁵ On the surface, this comparative looks quite different from most examples we have seen above, in that there is verbal material in the target, to the left of *bǐ*, without corresponding material in the standard, to the right of *bǐ*.

(46) **A comparative with “run DE fast” only in the target:**

✓ Yūehàn pǎo de bǐ fēijī kuài.

John run DE BI airplane fast

‘John runs faster than {an airplane/the speed of an airplane}.’

Derivation: [TP John [VP run feet [VP run DE [AP fast]]]] *bǐ* [TP airplane [AP fast]]

The approach here can straightforwardly derive the comparative in (46) through a target clause which includes the complex predicate “run DE fast” and a standard clause with just the predicate “fast.” This derivation is illustrated in (47):

(47) [TP1 John [VP run DE [AP fast]]] BI [TP2 Mary [AP fast]]

¹⁴Note that, to the extent that (45b) is grammatical, the second instance of *runs* must be destressed. The same is true of the second instance of *pǎo de* in (44) above, for those speakers who do not find the example completely ungrammatical. On similarities between ellipsis and destressing, see Tancredi (1992).

¹⁵I thank an anonymous reviewer for requesting discussion of examples of this form.

The ‘fast’ in the target clause is deleted under semantic identity with the predicate ‘fast’ in the standard clause, and this satisfies the CDR.¹⁶

This analysis is supported by the contrast between (46) above and the superficially similar example (48) below. Example (48) is grammatical but judged as infelicitous.

(48) **Comparative with “run DE fast” in both the target and standard, cf (46):**

Yūehàn bǐ fēijī pǎo de kuài.
John BI airplane run DE fast

≈ ‘John runs faster than airplanes run.’

Speaker comment: Strange/infelicitous because airplanes do not run.

As the speaker comment in (48) indicates, (48) must be interpreted as being a comparison of John’s running speed and the “running” speed of airplanes, but airplanes cannot be described as ‘running’ with the verb *pǎo*. (48) reflects a derivation with the complex predicate “run DE fast” in both the target and standard, with deletion of the entire VP in the standard clause:

(49) [TP1 John [~~VP run DE~~ [~~AP fast~~]]] BI [TP2 airplane [VP run DE [AP fast]]]

The infelicity of (48) in contrast to (46) shows that (46) indeed is constructed with only the gradable predicate ‘fast’ in the standard clause as proposed in (47), without the complex predicate “run DE fast” applying to both John and airplanes. It is not simply the case that the target clause includes a complex predicate if and only if the standard clause does. This in turn forms a strong argument against the three-place/phrasal analyses for the *bǐ* comparative, which require the constituents in the target and standard to match in syntactic and semantic form. Even the most flexible phrasal analysis of Lin (2009) requires that the target and standard be made up of an equal number of corresponding constituents, but the target portion in (46) “John run DE” clearly includes material which has no corresponding part in the standard “airplane.”

The discussion in this section of comparatives with complex predicates—in particular, non-gradable predicates modified by gradable manner adverbs—motivates the particular formulation of the Comparative Deletion Requirement here in terms of local predicates, and furthermore offers my first new argument against the phrasal analysis of *bǐ* comparatives.

5 Additional arguments for clausal comparison from movement chains

In this section I consider some additional types of *bǐ* comparatives, which all involve movement chains in their derivation. I discuss comparatives which involve movement of different types—object preposing, *bèi* long passive formation, and verb-copy—from the predicate of comparison to

¹⁶Semantically, I propose that *kuài* ‘fast’ has a type-flexible denotation. With the adoption of the predicate-internal subject hypothesis, the denotations for ‘fast’ can be unified as $\langle \tau, \langle d, t \rangle \rangle$ for arbitrary type τ . In its adverbial guise, τ may be of event (v) or event description ($\langle v, t \rangle$) type, as in footnote 12; in its adjectival guise, τ could simply be type e . This allows for the deletion of the adverbial use of ‘fast’ in the target clause under semantic identity with the predicative use of ‘fast’ in the standard clause in (47).

the target and from the predicate of comparison to the standard. These comparatives all further support the clausal analysis, wherein the target and standard are each built as part of an independent clause, each with their own instance of the predicate of comparison.

5.1 Object preposing

The first argument for the clausal analysis comes from comparatives such as (50) below, where both the target and standard include arguments which are logically objects of the predicate of comparison.

(50) **Comparatives with objects in the target and standard (ex. from Tsao, 1989):**

Wǒ_i dàishù bǐ *pro*_i jǐhé xǐhuān ____.
I algebra BI *pro* geometry like

‘I like algebra more than I like geometry.’

Note that the gradable predicate in (50) *xǐhuān* ‘like’ is a transitive verb and objects are canonically postverbal in Mandarin. How are the contrasting objects in preverbal position here? Building on evidence from Tsao (1989), I argue that these objects are fronted from their postverbal base positions using the process of *object preposing*, a general, optional process for fronting certain objects of transitive verbs to preverbal position in Mandarin Chinese (Ernst and Wang, 1995; Paul, 2002). Proposed objects are often interpreted in contrast to implicit or explicit alternatives, as in (51).

(51) **Object preposing:**

Wǒ_i [dàishù]_F xǐhuān ____, kěshì *pro*_i [jǐhé]_F bù xǐhuān ____.
I algebra like but *pro* geometry NEG like

‘I like [algebra]_F, but I don’t like [geometry]_F.’

Returning to (50), for both objects to have originated in the complement position of ‘like,’ there must be two ‘like’ VPs in the underlying structure of (50). This forms an argument for the clausal analysis of the *bǐ* comparative.

Tsao (1989) showed that not all objects can participate in object preposing and that these same restrictions also affect this form of comparative as in (50). I begin with Tsao’s animacy restriction. As presented in the left column below, object preposing is grammatical with the inanimate object, ‘algebra,’ but degrades with the semi-animate ‘cat,’ and is ungrammatical with the human ‘Zhang San.’¹⁷ All of these objects are grammatical in postverbal position. In the right column, we see parallel grammaticality judgments for comparatives with contrasting objects of corresponding animacy.¹⁸

¹⁷Tsao (1989) credits Tsao (1979) with the original observation of the animacy condition on the felicity of object preposing. Paul (2002, fn. 7) cites Hou (1979) as first documenting this animacy condition, and also notes that a similar observation is made in C.-T. James Huang’s unpublished MA thesis. Examples and judgments here are from Tsao (1989).

¹⁸There seems to be variation regarding these restrictions. As noted by an anonymous reviewer, Liu (2011) gives example (i) below which has one interpretation (ib) which compares contrasting animate objects in the target and standard. (Interpretation (a) is a case of object topicalization, with contrasting subjects as the target and standard.)

(52) **Animacy restrictions on preposed objects and contrasting objects in comparatives (Tsao, 1989):**

<u>Object preposing:</u>	<u>Comparative:</u>
a. * Wǒ Zhāng Sān xǐhuān. 1SG Zhang San like Intended: 'I like [Zhang San] _F .'	a'. * Wǒ Zhāng Sān bǐ Lǐ Sì xǐhuān. 1SG Zhang San BI Li Si like Intended: 'I like Zhang San more than I like Li Si.'
b. ? Wǒ māo xǐhuān. 1SG cat like Intended: 'I like [cats] _F .'	b'. ? Wǒ māo bǐ gǒu xǐhuān. 1SG cat BI dog like Intended: 'I like cats more than I like dogs.'
c. Wǒ dàishù xǐhuān. 1SG algebra like 'I like [algebra] _F .'	c'. Wǒ dàishù bǐ jǐhé xǐhuān. 1SG algebra BI geometry like 'I like algebra more than I like geometry.'

Moreover, comparatives with contrasting objects in animate-inanimate or inanimate-animate combinations are uniformly judged as deviant; i.e. the animacy restriction applies equally to objects in the target and to objects in the standard. This data point is important to show that both the object in the target and the object in the standard are derived through object preposing.

(53) a. * Wǒ Zhāng Sān bǐ dàishù xǐhuān. 1SG Zhang San BI algebra like Int: 'I like Z.S. more than I like algebra.'	b. * Wǒ dàishù bǐ Zhāng Sān xǐhuān. 1SG algebra BI Zhang San like Int: 'I like algebra more than I like Z.S.'
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Another similarity between object preposing and comparatives with contrasting objects reported in Tsao (1989) concerns the morphological size of the verb. Tsao (1989) claims that object preposing is ungrammatical when the verb is monosyllabic. Example (54a) is judged to be ungrammatical due to its monosyllabic verb *ài* 'love,' while the minimally contrasting (52c) with the disyllabic verb *xǐhuān* 'like' is grammatical. We observe the same contrast between the minimal pair of comparatives (54b) and (52c').

(54) **No monosyllabic verbs in object preposing and comparatives with contrasting objects (Tsao, 1989):**

<u>Object preposing:</u> (cf 52c)	<u>Comparative:</u> (cf 52c')
a. * Wǒ dàishù ài. 1SG algebra love Intended: 'I love [algebra] _F .'	b. * Wǒ dàishù bǐ jǐhé ài. 1SG algebra BI geometry love Intended: 'I love algebra more than I love geometry.'

(i) Máo zhǔxí Zhōu Ēnlái bǐ Dèng Xiǎopíng hái-yào xìnren.
Mao chair Zhou Enlai than Deng Xiaoping even-more trust

- a. 'Zhou Enlai trusts Chairman Mao_i more than Deng Xiaoping trusts him_i.'
b. 'Chairman Mao_i trusts Zhou Enlai more than he_i trusts Deng Xiaoping.'

What is predicted by my analysis, borrowing from Tsao's observation, is a correlation between the conditions on object preposing and the comparative form in (ib). Therefore, speakers who accept examples such as (ib) and therefore do not have a strong animacy constraint on contrasting objects in comparatives should also accept animate object preposing constructions. This anonymous reviewer is such a speaker, judging (ib) as grammatical and also allowing animate object preposing sentences.

Finally, to these parallels between object preposing and comparatives with contrasting objects observed by Tsao (1989), I will add one more. Object preposing cannot cooccur with contrastive subjects. For example, recall that object preposing is often used with an explicit contrasting object in a continuation, as in example (51). If the continuation is changed to involve a contrasting subject, as in (55a), the expression becomes ungrammatical. Similarly, comparatives cannot have both contrasting objects and contrasting subjects in the target and standard, as in (55b), as noted by Liu (2011).

(55) **Subjects cannot contrast in object preposing and in comparatives with contrasting objects:**

a. Object preposing: (cf 51)

* [Zhāng Sān]_F [dàishù]_F xǐhuān __, [Lǐ Sì]_F [jǐhé]_F xǐhuān __.
 Zhang San algebra like Li Si geometry like

Intended: ‘[Zhang San]_F likes [algebra]_F, (and/but) [Li Si]_F likes [geometry]_F.’

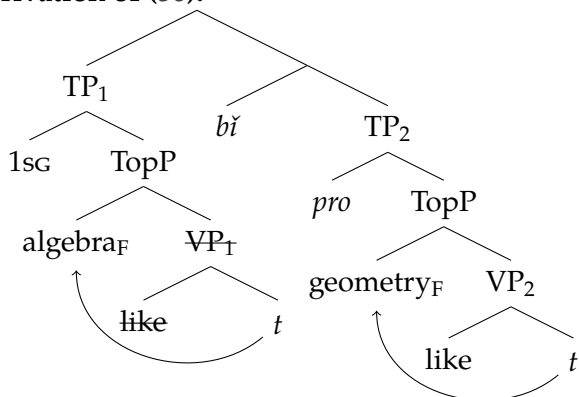
b. Comparative: (Liu 2011, example 19b; cf 50)

* Zhāng Sān dàishù bǐ Lǐ Sì jǐhé xǐhuān __.
 Zhang San algebra _{BI} Li Si geometry like

Intended: ‘Zhang San likes algebra more than Li Si likes geometry.’

The clausal analysis proposed here is able to derive these comparatives. Consider the derivation of (50) in (56) below. We begin by independently constructing the two TPs corresponding to the material in “*target predicate*” and “*standard predicate*,” each involving object preposing, and conjoin them using *bǐ*. Following Paul (2002), I represent object preposing as movement to the specifier of a TP-internal Topic projection. We elide the local predicate VP₁ of the target clause under identity with the local predicate VP₂ of the standard clause, satisfying the CDR.¹⁹

(56) **Derivation of (50):**



The derivation in (56) is made possible by the independent availability of object preposing for the objects ‘algebra’ and ‘geometry.’ Comparatives of the form in (50/56) thus immediately inherit the restrictions on comparatives with such contrasting objects from the independent restrictions

¹⁹In order to satisfy semantic identity of the elided VP₁ and its antecedent VP₂, the indices on traces and their corresponding binders must match. See e.g. Heim and Kratzer (1998).

on object preposing, including the animacy restriction, restriction to polysyllabic verbs, and incompatibility with contrasting subjects.

Now consider how these facts would be analyzed under a phrasal comparison approach. First, I note that the Hong (1991) analysis, where “target *bǐ* standard” is taken to be a constituent which is a complex quantifier (24c; see also Keenan and Moss 1985), cannot account for this data. Such an approach would take the sequence “algebra 比 geometry” in example (50) to be a DP constituent generated in object position, predicting an example with “algebra 比 geometry” in object position (57) to be grammatical, contrary to fact.

- (57) * Wǒ xǐhuān [dàishù bǐ jǐhé].
 1sg like algebra 比 geometry
 Intended: ‘I like algebra more than I like geometry.’

The structure in (57) cannot be generated under my analysis, as *bǐ* cannot directly coordinate DPs. The surface string in (57) also could not be generated as the result of the coordination of TPs, due to the unavailability of gapping in Mandarin Chinese (Tang, 2001, a.o.).

Second, for a phrasal approach where the target and standard are not a constituent, we would have to introduce a separate mechanism for base-generating objects directly in the target and/or standard. Such an approach would view the many parallel restrictions on object preposing and comparatives with contrasting objects as a coincidence. Lin (2009) pursues this alternative, introducing a modified phrasal analysis which can generate comparatives such as (50) without making use of object preposing. His analysis predicts that comparatives with contrasting objects are free of the restrictions on object preposing reviewed here, contrary to fact, and overgenerates many of the ungrammatical comparatives presented in this section.

5.2 *bèi* long passives

The next argument for the clausal analysis comes from the *bèi* passive construction, exemplified in (58). Following Feng (1995), Chiu (1995), a.o., Ting (1998), Huang (1999), and Huang et al. (2009) argue that *bèi* long passives involve \bar{A} -movement of a null operator to a position between *bèi* and the agent (59).

- (58) **The *bèi* long passive:**²⁰

Yūehàn bèi bàba mà de hěn cǎn.
 John BEI father scold DE HEN severe

‘John was scolded severely by his father.’

- (59) John BEI [*Op*_i [father scold *t*_i DE severe]]
 ↑—————↓

²⁰In positive form uses, addition of the morpheme *hěn* is required on gradable predicates in some environments. The nature of *hěn* is beyond the scope of this paper. See Grano (2012) for a recent approach.

The operator movement in (59) is interpreted as λ -abstraction over the base object position, resulting in the predicate (λx . father scolds x severely) which is then applied to the affectee subject (in (58), 'John') introduced by *bèi* (Huang, 1999).

Now consider the comparative in (60) involving two contrasting agents of *bèi* long passives. Following Ting (1998) and Huang (1999), we must posit two instances of operator movement, both originating within the predicate of comparison as the complement of 'scold,' with one landing between *bèi* and 'father' in the target and the other landing between *bèi* and 'mother' in the standard. These two movement chains would again be problematic under a phrasal analysis where there is only one gradable predicate in the syntax.

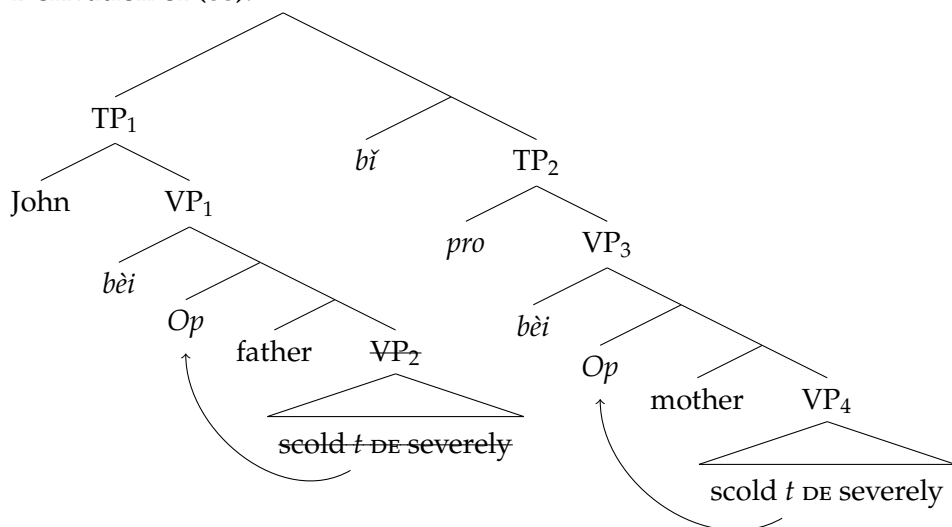
(60) *bèi* long passive agents in the target and standard:²¹

Yūehàn bèi bàba bǐ bèi māma mà de gèng cǎn.
 John BEI father BI BEI mother SCOLD DE GENG SEVERE

'John was scolded by his father more severely than by his mother.'

Under my clausal comparative proposal, the two operator movements out of the predicate are not at all problematic, as there can simply be two different instances of the null operator in the derivation. The derivation for (60) is presented in (61). The precise base position of the operator is not relevant for this argument and therefore the internal syntax of the lower VPs is not illustrated here.

(61) Derivation of (60):



²¹The existence of examples of this form was brought to my attention by an anonymous reviewer. Such examples are also briefly discussed as an argument for the clausal analysis in Liu (2011, p. 1785), but his final analysis in his (64) curiously only involves one movement chain of a *bèi* passive operator. My proposal is that the two *bèi* structures in (60) are each derived through their own null operator movements as seen in (61) below. A parallel argument from comparatives involving objects fronted with *bǎ* is also presented in Liu (2011, p. 1791).

The particular example here in (60), which comes from the reviewer, includes the morpheme *gèng* preceding the gradable predicate *cǎn*. The morpheme *gèng* often optionally appears in *bǐ* comparatives and has been described as an intensifier (Krasikova, 2008) which introduces an evaluative presupposition (Liu, 2010), similar to Japanese *motto* as discussed in Beck et al. (2004).

In order to satisfy the CDR, we must elide a local predicate of TP₁. VP₁ is a local predicate of TP₁, but it does not have a semantically identical antecedent due to its lower agent ‘father.’ We instead elide VP₂, the other local predicate of TP₁.²² VP₂ can be elided under identity with VP₄, satisfying the CDR.

The semantics for (60) can be interpreted straightforwardly following my proposal for the analysis of gradable manner adverbs in complex predicates in section 4.2. Because of the Degree Last manner adverb modification, the embedded *v*Ps “father/mother scold DE severely” will be degree descriptions of type $\langle d, t \rangle$. Interpreting the null operator movement as abstraction over the trace position, the denotations of the complements of *bèi* will be as in (62a) below. Assuming that *bèi* serves only a syntactic function of assigning the affectee theta role and does not compose semantically, we yield the degree descriptions in (62b) as the denotations of the two arguments to *bǐ*. The final truth conditions are as in (62c).

- (62) a. $\llbracket Op_i \text{ father/mother scold } t_i \text{ DE severely} \rrbracket = \lambda x . \lambda d . \text{ father/mother scolds } x \text{ } d\text{-severely}$
 b. $\llbracket TP_1/TP_2 \rrbracket = \lambda d . \text{ father/mother scolds John } d\text{-severely}$
 c. $\llbracket (60) \rrbracket = 1 \iff \max(\lambda d . \text{ father scolds John } d\text{-severely}) > \max(\lambda d . \text{ mother scolds John } d\text{-severely})$

As noted in Liu (2011), examples such as (60) which include the morpheme *bèi* and its agent in the target and the standard cannot be built under a phrasal analysis. *Bèi* and the agent do not form a constituent, unlike for example English *by*-phrases, so they cannot be introduced together by a phrasal *bǐ*. Instead, previous work on the syntax of *bèi* passives makes clear that *bèi* necessarily takes a reduced clause as its complement.

5.3 Verb-copy constructions

The third and final argument against phrasal analyses comes from the Mandarin verb-copy construction. There are cases of *bǐ* comparatives which have a target and standard which both superficially look like clauses—i.e., they include a verb and object—and the gradable predicate is complex predicate of the type in section 4.2: a verb with a gradable manner adverb (63). As noted by Liu (1996), in *bǐ* comparatives of this form, all three instances of the verb must match (64).

(63) **Comparatives with verbs in both target and standard:**

Yūehàn qí mǎ bǐ Mǎlì qí niǔ qí de kuài.
 John ride horse BI Mary ride cow ride DE fast

‘John rides horses faster than Mary rides cows.’

²²I take the projections corresponding to “father scold *t* severely” and “mother scold *t* severely” in (61) to be *v*Ps with predicate-internal subjects, although Ting (1998) and Huang (1999) describe them as IPs, corresponding to TPs in the terms used here. This difference is important for the analysis of example (60) here: If they were labeled TPs, VP₂ “scold *t* severely” would not count as a local predicate of TP₁ in (61), so we would not be able to satisfy the CDR. See Huang (1999, fn. 6) and Her (2009) for evidence that these embeddings are indeed not full TPs.

(64) **All three verbs must match in such comparatives (Liu, 1996):**

* Yūehàn qí mǎ bǐ Mǎlì gǎn yáng {qí, gǎn} de hǎo.
 John ride horse BI Mary keep sheep ride, keep DE good

Intended: 'John rides horses better than Mary keeps sheep.'

Liu (1996) argues that this is predicted through a derivation of (63) that involves two instances of the Mandarin manner verb-copy construction (65), which requires that its two exponents of the verb be identical. Huang (1988) and Cheng (2007) argue that these verb-copy constructions are derived via movement of the verb without deletion of the lower copy. I assume that this structure results in a single TP containing two projections which are labeled VP.

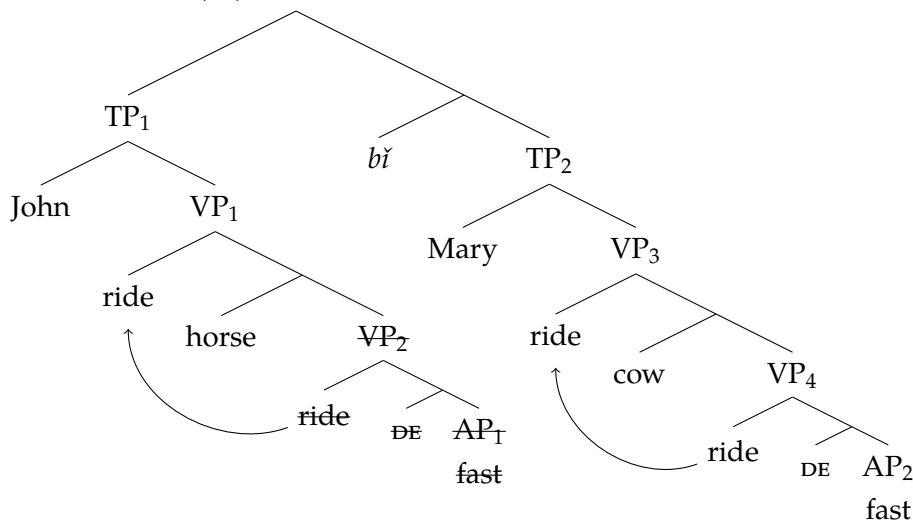
(65) **Mandarin manner "verb-copy" construction:**

Yūehàn [_{VP} qí mǎ [_{VP} qí de kuài]].
 John ride horse ride DE fast

'John rides horses fast.'

As Liu suggests, a clausal comparative would be able to straightforwardly derive comparatives such as (63) using two instances of verb-copy and also explain the matching effect observed in (64). This derivation for (63) is given below. There are two independent instances of verb-copy, which are represented as regular movement chains, but with pronunciation of both the head and the tail of their chains.

(66) **Derivation of (63):**



Now consider how the CDR will apply to this structure. VP₁ is a local predicate of TP₁, but it does not have a semantically identical antecedent so it cannot be elided. Instead, we elide VP₂ under identity with VP₄, satisfying the CDR. We are thus left with three instances of 'ride' linearized at PF. As each TP is constructed using verb-copy, the two verbs in TP₁ will match and the two verbs

in TP₂ will match. Furthermore, ellipsis licensing will require that the lower copy of V in TP₁ and the lower copy of V in TP₂ be identical. By transitivity, all three pronounced instances of the verb must match exactly, deriving the verb matching effect observed in (63–64).

Phrasal approaches would not be able to naturally derive comparatives such as (63) with all three exponents of the verb derived through verb-copy, and would instead have to give a separate account for the verb matching constraint. (See Erlewine (2007) for one such attempt.)

5.4 Summary

The last three sections presented different types of *bǐ* comparatives which are challenging for phrasal comparison in precisely the same way: all involved parts of the target and standard moving out of the predicate of comparison. Two items have moved out, but we only see one gap. These comparatives can all be straightforwardly derived under the clausal analysis, where both the target and standard correspond to their own independent clauses.

In contrast, phrasal approaches to the *bǐ* comparative would have to be revised to allow for the construction of more complex sequences of material in the target and standard, as Lin (2009) has done. However, being able to build the surface strings of grammatical comparatives is not enough. Our goal is a restrictive analysis which derives those examples which are grammatical without overgeneration. For example, recall the various restrictions on object preposing, documented by Tsao (1989) and presented in section 5.1. Building on Tsao (1989), I showed that the same restrictions apply to contrasting preverbal objects in the target and standard of comparatives. A phrasal analysis such as Lin (2009) would have to somehow replicate these exact same restrictions when base-generating objects in the target and standard, duplicating these requirements in multiple domains of the grammar, which must be learned in the course of acquisition. Considerations of parsimony clearly dictate that the *bǐ* comparative should be analyzed as a clausal comparative, corroborating the conclusion of section 4.2 above.

6 Mandarin Chinese lacks degree abstraction

In this paper, I have proposed that the Mandarin *bǐ* comparative is a clausal comparative. Under this approach, two degree descriptions of type $\langle d, t \rangle$ are independently constructed, and the comparative operator asserts a ranking over the maximal degrees satisfying each predicate.

It is standardly assumed following the early work of Bresnan (1973) and Chomsky (1977) on English that such degree descriptions (predicates of degrees) for the target and standard are constructed by \bar{A} -movement of a null operator of type d . *Degree abstraction*, i.e. predicate abstraction over a variable of type d , results in a degree description of type $\langle d, t \rangle$.

(67) John is taller than $[_{\text{standard}} Op \lambda d [_{\text{TP}} \text{Mary is } \cancel{d}\text{-tall}]]$.

↑—————↓

It has been proposed by Beck, Oda, and Sugisaki (2004) that languages differ as to whether their grammars allow degree abstraction. Beck et al. call this the Degree Abstraction Parameter:

(68) **Degree Abstraction Parameter (DAP) (Beck et al., 2004):**

A language {does/does not} have binding of degree variables in the syntax.

Note that Beck et al.'s DAP can be compatible with the Borer-Chomsky conjecture that all linguistic variation is in properties of functional heads, if the DAP reflects the presence or absence of null degree operators and degree-head-attracting probes in the lexicon.

The DAP was proposed based on a close study of comparative constructions in Japanese, where they argue that Japanese has the negative setting of the DAP and therefore cannot construct complex degree descriptions as in (67). However, recent work including Kennedy (2009); Shimoyama (2012); Sudo (2015) have questioned the validity of the conclusions of Beck et al. (2004) for Japanese, including the proposal of the DAP itself. Here I do not review these arguments from Japanese in detail and instead refer the interested reader to these works and references therein.

In this section I will argue that Mandarin Chinese is a language that lacks degree abstraction, i.e. that Mandarin Chinese is a [-DAP] language.²³ Although the *bǐ* comparative involves the construction of $\langle d, t \rangle$ degree descriptions for the target and the standard, it will not do so via degree abstraction as in (67). Instead, I propose that Mandarin Chinese has the Degree Last property in (69), allowing each clause conjoined by *bǐ* to be a $\langle d, t \rangle$ degree description after merging in all its other arguments:²⁴

(69) **Degree Last: (=35)**

All gradable predicates can take their degree argument as their last argument.

I present two arguments for the lack of degree abstraction in Mandarin Chinese. The first, in section 6.1, is based on a particular constructed example, building on our understanding of the CDR above. In section 6.2 I will supplement this with an argument from the lack of attributive comparatives in Mandarin, which has not received attention in the previous literature on *bǐ* comparatives.

For methodological reasons, both arguments are based on the *bǐ* comparative. The evidence here will take the form of proofs by contradiction, presenting configurations which would be grammatical if degree abstraction were available in the language, but which are nonetheless ungrammatical.

²³Krasikova (2008) has previously claimed that Mandarin Chinese lacks degree abstraction, but her evidence is unfortunately inconclusive. First, Krasikova points to the lack of subcomparatives as evidence for the lack of degree abstraction. But subcomparatives can be independently ruled out on syntactic grounds, as discussed in section 4. Second, she presents an argument from a special type of comparative known as the Differential Verbal Comparative (DVC; Li, 2009). (See also footnote 27.) The DVC has been shown by Li (2009) to have many different properties from regular *bǐ* comparatives described here, and its structure has been less studied overall, making it a poor foundation for testing these questions of degree abstraction. The coauthored Beck, Krasikova, Fleisher, Gergel, Hofstetter, Savelsberg, Vanderelst, and Villalta (2009) repeats these claims and additionally discusses degree questions as a testing ground for degree abstraction in the language. But Mandarin Chinese is a *wh*-in-situ language and its degree questions are not subject to syntactic islands (Tsai, 1994; Liao, 2013), suggesting that movement is not involved.

²⁴Implicit in the discussion here is that we do not have a rich inventory of free type-shifting rules such as Geach's rule (Geach, 1970; see e.g. Jacobson, 2014). If such arbitrary type-shifting procedures exist, we will be unable to account for the effects attributed to the lack of degree abstraction in Mandarin, which I present in the subsequent sections. Alternatively, the variant of the negative setting of the DAP in such a variable-free framework may be to say that such type-shifters cannot be used for certain types in some languages. A full discussion of what we predict if such type-shifters are made a part of grammar is beyond the scope of this paper.

To confidently attribute their ungrammaticality to the lack of degree abstraction, we must be sure that the examples otherwise would be grammatical. This requires us to build arguments using the best understood degree constructions in the language, and therefore *bǐ* comparatives will be discussed here.

The arguments from previous sections that the Mandarin *bǐ* comparative is a clausal comparative, together with the arguments in this section that Mandarin lacks degree abstraction, paint a unique picture for Mandarin Chinese: Mandarin is a language without degree abstraction but which nonetheless employs a clausal comparative. To my knowledge such a situation has never been claimed before for any language.

6.1 Matching embedded target and standard clauses

In this section I will present my primary argument that degree abstraction is not available in Mandarin Chinese. The argument comes from the ungrammaticality of the sentence in (70), with the intended meaning as in the corresponding English example in (71). I argue that the ungrammaticality of (70) shows that degree abstraction is not available in Mandarin Chinese.

(70) **The test case for degree abstraction:**

* Yuēhàn bǐ Mǎlì rènwéi Tāngmǔ gāo.
John bǐ Mary think Tom tall

(71) John thinks Tom is taller than Mary thinks he is.

$1 \iff \max(\lambda d . \text{John thinks Tom is } d\text{-tall}) > \max(\lambda d . \text{Mary thinks Tom is } d\text{-tall})$

Recall that Mandarin disallows both embedded standards (21) and embedded targets (33), both of which can be attributed to both the CDR's need to elide a local predicate. Example (70) is an attempt at building an embedded target and embedded standard in parallel, allowing for deletion of a local predicate, satisfying the CDR, but with both embedded targets and standards simultaneously. However, degree abstraction must be used to interpret (70) as desired, just as degree abstraction is involved in the embedded targets and standards in (71). The logic of this argument is as follows:

(72) **Demonstrating the lack of degree abstraction by proof by contradiction:**

a. Assume:

- i. the clausal analysis of *bǐ* comparatives, motivated above;
- ii. the target and standard clauses are independently grammatical in their positive forms;
- iii. \bar{A} -movement exists and can be long-distance in Mandarin Chinese;
— and —
- iv. degree abstraction is available.

b. The above assumptions together entail that (70) with its intended interpretation will be grammatical.

- c. Observe: Example (70) is not grammatical.
- d. Conclusion: Degree abstraction is not available (i.e. assumption (iv) was incorrect).

Assumption (i) is supported by the work of the previous sections of this paper and assumption (iii) is shown in Huang (1982a), Tsai (1994), and much subsequent literature on Mandarin Chinese. Therefore I will now discuss clause (ii).

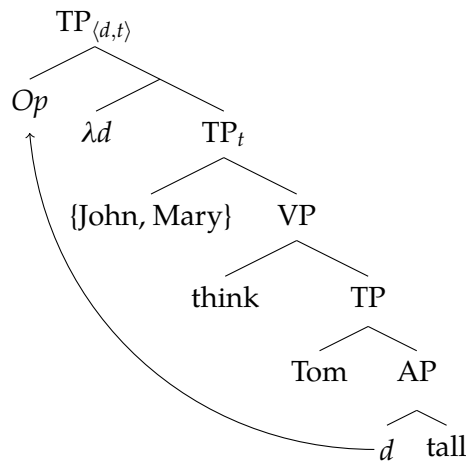
The two clauses required in order to construct (70), “John think Tom tall” and “Mary think Tom tall” are each grammatical in their positive forms. (As noted in footnote 20 above, positive forms of gradable predicates in some environments require the addition of the morpheme *hěn* (Grano, 2012).)

- (73) {Yúèhàn, Mǎlì} rěnwéi [Tāngmǔ hěn gāo].
 John Mary thinks Tom HEN tall
 ‘{John, Mary} thinks that Tom is tall.’

In addition to assumptions (i–iii), we assume for contradiction clause (iv), that degree abstraction is possible. Next we move on to demonstrating step (b), that these assumptions together entail that the test sentence (70) can be generated and will have the intended interpretation.

I begin by demonstrating the syntactic derivation of (70). I take each of the clauses in (73) with a null degree-type operator *Op* merged in place instead of the positive form morphology. I then move the null operator to the edge of the clause, long-distance. (This chain could include a stop in an intermediate landing site, but this is not illustrated here as it does not make a difference.) The null operator movement is interpreted as predicate abstraction, as indicated by the λ -binder. The null operator itself is semantically inert. This much is illustrated in the following structure:

(74) **Constructing the target and standard clauses:**

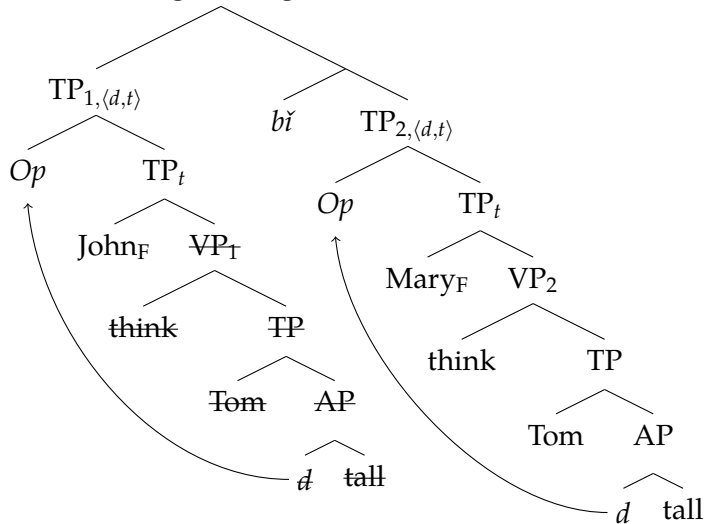


Here I am demonstrating the derivation using a type $\langle d, \langle e, t \rangle \rangle$ denotation for the predicate ‘tall,’ as is commonly assumed for gradable predicates cross-linguistically. However, nothing here hinges on this choice.

Next I coordinate the two clauses in (73) using *bǐ*. The CDR requires that a local predicate of the target clause, TP_1 , be elided under identity with a local predicate of the standard clause, TP_2 .

There is only one local predicate in the target clause, VP_1 , and there is only one local predicate in the standard clause, VP_2 . This ellipsis is licensed, as the two VPs are semantically identical, given identity of indices; see footnote 19.

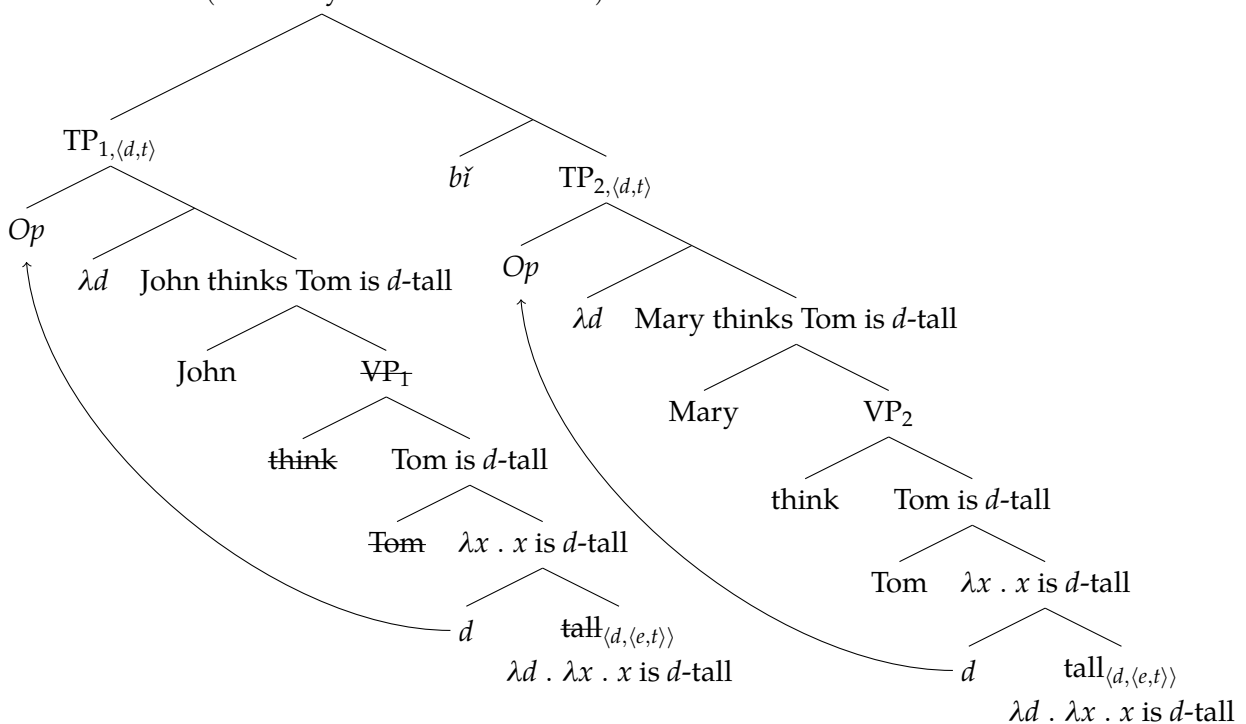
(75) **Coordinating the target and standard clauses:**



Now we turn to the semantic interpretation of this structure, illustrated in (76) below.

(76) **Interpretation:**

$$\begin{aligned} & \llbracket b\check{i} \rrbracket (\llbracket TP_2 \rrbracket) (\llbracket TP_1 \rrbracket) \\ & = 1 \iff \max(\llbracket TP_1 \rrbracket) > \max(\llbracket TP_2 \rrbracket) \\ & = 1 \iff \max(\lambda d . \text{John thinks Tom is } d\text{-tall}) > \\ & \quad \max(\lambda d . \text{Mary thinks Tom is } d\text{-tall}) \end{aligned}$$



As noted above, the null operator movements of degree type will be interpreted as degree abstraction. This yields the construction of the degree predicates $\llbracket \text{TP}_1 \rrbracket = (\lambda d . \text{John thinks Tom is } d\text{-tall})$ and $\llbracket \text{TP}_2 \rrbracket = (\lambda d . \text{Mary thinks Tom is } d\text{-tall})$. The comparative operator $b\check{i}$ takes these two degree descriptions and results in the intended truth conditions. We have thus successfully completed step (b) in (72) above, to show that the assumptions in (i–iv) together entail that the test example (70) can be constructed and yield the intended interpretation.

Finally we have reached the contradiction step of the argument. Example (70) above is judged as ungrammatical. The ungrammaticality of (70) teaches us that (at least) one of the assumptions in (i–iv) must be incorrect. Given that we have independently demonstrated each of the assumptions in (i–iii) to be true, the incorrect assumption must be (iv), that degree abstraction is available. The conclusion of this argument is that degree abstraction is not available in Mandarin Chinese.

6.2 The lack of attributive comparatives

In this section, I consider so-called *attributive* comparatives: comparatives which use a nominal-modifying predicate as their gradable predicate. This contrasts from all of the $b\check{i}$ comparatives we have looked at so far, where the gradable predicate introducing the scale of comparison has been a verb, predicate adjective, or an adverb. There are broadly two types of attributive comparatives: those which compare the degrees of some attributive adjective and those which compare quantities. English examples of these two types are given in (77).

(77) Attributive comparatives in English:

a. Attributive degree comparative:

John wrote a longer paper than Mary did.

$1 \iff \max(\lambda d . \text{John wrote [a } d\text{-long paper]}) > \max(\lambda d . \text{Mary wrote [a } d\text{-long paper]})$

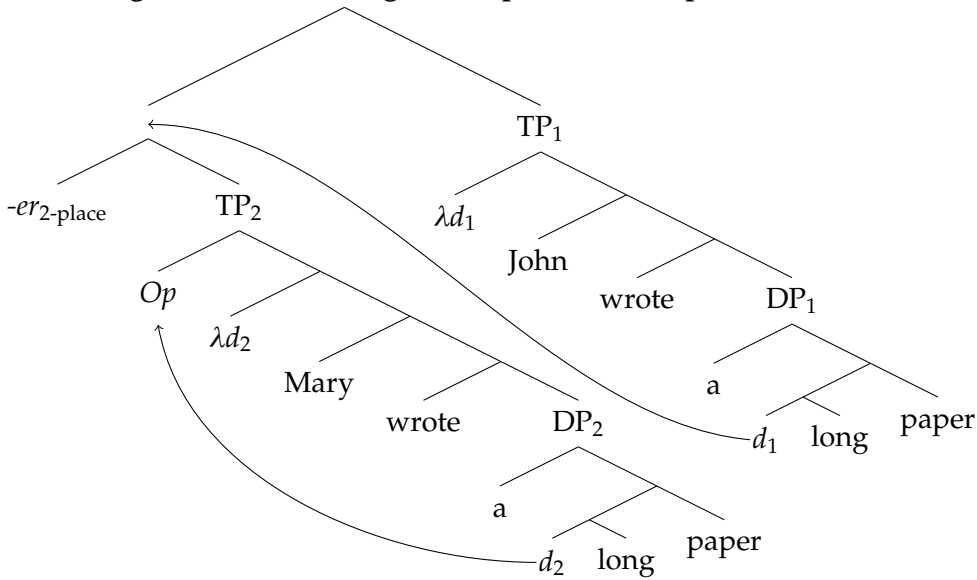
b. Attributive quantity comparative:

John wrote more papers than Mary did.

$1 \iff \max(\lambda d . \text{John wrote [} d\text{-many papers]}) > \max(\lambda d . \text{Mary wrote [} d\text{-many papers]})$

It has been argued that attributive comparatives are derived through \bar{A} -movement of a degree argument from within the DP (Bresnan, 1973; Chomsky, 1977; Kennedy, 1997; Kennedy and Merchant, 2000, a.o.). Consider example (77a), where we are comparing degrees of *long*. The following tree sketches a possible LF structure for (77a) based on discussion in section 2.1; a similar configuration would hold for the LF of (77b):

(78) LF for English attributive degree comparative example (77a):



This LF structure reflects two movements of degree-type operators: first, there is a null operator movement of degree type from the degree argument of *long* in DP₂ to the edge of the standard clause, and second, there is movement of *-er* from the degree argument of *long* in DP₁ to the edge of the target clause (see e.g. Wold, 1995; Heim, 2000; Bhatt and Pancheva, 2004).²⁵ Both of these movements will be interpreted as degree abstraction, i.e. λ -abstraction over a variable of degree type, resulting in the two degree descriptions $\llbracket TP_1 \rrbracket = (\lambda d . \text{John wrote [a } d\text{-long paper]})$ and $\llbracket TP_2 \rrbracket = (\lambda d . \text{Mary wrote [a } d\text{-long paper]})$.

These degree abstraction steps in (78) are crucial for the interpretation of attributive comparatives. Without degree abstraction, it is impossible for the degree argument of a predicate inside a nominal to be exposed at the TP level. My proposal that Mandarin Chinese does not have degree abstraction therefore predicts a lack of attributive *bǐ* comparatives. In this section I will show that this prediction is borne out. To my knowledge, the lack of attributive *bǐ* comparatives and its theoretical significance have not been noted in previous literature.

I begin with attributive degree comparatives, using the English (77a) as a model. The baseline in (79a) shows that Mandarin is able to have gradable predicates—here, ‘long’—modify object nominals, but we are unable to use this degree argument to construct an attributive comparative (79b). Instead, in order to make this comparison, both objects could be nominalized (79c) or one object can be nominalized and compared with within a relative clause on the other (79d).

²⁵These movements may yield a left-branch extraction configuration, but Kennedy and Merchant (2000) argue that this violation is alleviated by comparative deletion of a constituent which properly contains the violation. See also footnote 26 below.

(79) **Mandarin lacks attributive degree comparatives:**

- a. Baseline gradable adjective on object:
✓ Zhāng Sān xiě-le (yī piàn) hěn cháng (de) lùnwén.
Zhang San write-PERF one CL HEN long RC paper
'Zhang San wrote a long paper.'
- b. Attributive comparative:
* Zhāng Sān bǐ Lǐ Sì xiě-le (yī piàn) cháng (de) lùnwén.
Zhang San BI Li Si write-PERF one CL long RC paper
Intended: 'Zhang San wrote a longer paper than Li Si did.'
- c. Grammatical alternative: nominalize both papers
✓ [Zhāng Sān xiě de lùnwén] bǐ [Lǐ Sì xiě de (lùnwén)] cháng.
Zhang San write RC paper BI Li Si write RC paper long
'[The paper that Zhang San wrote] is longer than [the paper that Li Si wrote].'
- d. Grammatical alternative: compare with the other paper inside a relative clause
✓ Zhāng Sān xiě-le (yī piàn) [DP bǐ [DP Lǐ Sì xiě de (lùnwén)] cháng de
Zhang San write-PERF one CL BI Li Si write RC paper long RC
lùnwén].
paper
'Zhang San wrote a paper that is longer than the paper that Li Si wrote.'

What goes wrong in the attributive comparative (79b)? The target and standard clauses in the *bǐ* comparatives are built using the transitive verb *xiě* 'write,' which takes a DP of type *e* as its complement. The degree argument of *cháng* 'long' must be saturated inside the DP, for example using positive degree morphology as in (79a).²⁶ Without degree abstraction, there is no way for the degree argument of the attributive adjective 'long' to be accessible at the TP-level. We are thus unable to yield an LF similar to that of the English (77a) from the structure in (79b). The lack of attributive degree comparatives supports and is explained by my proposal that Mandarin Chinese lacks degree abstraction.

Mandarin similarly lacks attributive quantity comparatives. Example (80a) shows that the gradable 'many/much' word *duō* can be used to quantify object nominals, but we are unable to form a

²⁶A reviewer raises the concern that the relevant modifier 'long'—*cháng de* in (79b)—may be a relative clause and hence a relative clause island, not just a left branch extraction from a modifier. First, following Kennedy and Merchant (2000) (footnote 25), comparative deletion can rescue island violations, if the construction were otherwise available. As the structure of English (78) shows, deletion of the offending violation in just the ellipsis site is sufficient to rescue the entire structure. Second, relative clause islands are notoriously porous in Mandarin Chinese, as has been noted by work such as Huang (1984, 1989); Tsai (1997). These authors have adopted a Generalized Control Rule (GCR) which allows for an exceptional abstraction dependency to be formed across islands, subject to a form of relativized minimality. The GCR predicts that the degree variable saturating *cháng* 'long' will be bound by the degree binder (λ -binder of degree type), across the relative clause island.

comparative over this degree argument, as seen in example (80b). The object can be nominalized in order to express this form of comparison (80c).²⁷

(80) **Mandarin lacks attributive quantity comparatives:**

a. Baseline gradable *many* on object:

✓ Zhāng Sān xiě-le hěn duō lùnwén.
Zhang San write-PERF HEN many paper
'Zhang San wrote many papers.'

b. Attributive comparative:

* Zhāng Sān bǐ Lǐ Sì xiě-le duō lùnwén.
Zhang San BI Li Si write-PERF many paper
Intended: 'Zhang San wrote more papers than Li Si did.'

c. Grammatical alternative: nominalize the papers

✓ [Zhāng Sān xiě de lùnwén] bǐ [Lǐ Sì xiě de (lùnwén)] duō.
Zhang San write RC paper BI Li Si write RC paper many
≈ '[The papers that Zhang San wrote] are more (numerous) than [the papers that Li Si wrote].'

This situation in Mandarin Chinese, where attributive comparatives of both degree and quantity cannot be constructed, differs from the behavior of Japanese, the language initially studied in Beck et al. (2004) to motivate the Degree Abstraction Parameter. Ishii (1991) shows that Japanese allows for attributive comparatives of quantity but not degrees:

(81) **Japanese has attributive comparatives of quantity but not degrees (Ishii, 1991, pp. 106–107):**

a. Attributive degree comparative:

?* Taroo-wa [Hanako-ga katta yori (mo)] nagai kasa-o katta.
TAROO-TOP [Hanako-NOM bought YORI (MO)] long umbrella-ACC bought
Intended: 'Taroo bought a longer umbrella than Hanako did.'

b. Attributive quantity comparative

✓ Taroo-wa [Hanako-ga katta yori (mo)] takusan(-no) kasa-o katta.
TAROO-TOP [Hanako-NOM bought YORI (MO)] many(-GEN) umbrella-ACC bought
'Taroo bought more umbrellas than Hanako did.'

Beck et al. (2004) explain this pattern of grammaticality as follows. First, Beck et al. propose that the function of *yori* is to set a *contextual standard* against which we evaluate the gradable predicate—*nagai* 'long' in (81a) and *takusan* 'many' in (81b). This context-setting function is introduced as

²⁷In addition to the nominalization strategy in (80c), Mandarin also has a distinct construction for comparing the quantity and identity of postverbal constituents, dubbed the "Differential Verbal Comparative" (DVC) by Li (2009), which could be used here as well.

parallel to the English expression *compared to*.²⁸ Second, they propose that Japanese lacks degree abstraction. The content of the *yor*i-clause *Hanako-ga katta* in both (81a) and (81b) is argued to be a free relative, denoting the individual ‘what Hanako bought.’ They therefore propose the following English paraphrases to (81a–b):

(82) **Proposed English paraphrases (Beck et al., 2004, p. 300):**

- a. Paraphrase for attributive degree comparative (81a):
 ? Compared to what Hanako bought, Taroo bought a long umbrella.
- b. Paraphrase for attributive quantity comparative (81b):
 ✓ Compared to what Hanako bought, Taroo bought a lot of umbrellas.

It’s noted that in these English paraphrases, too, there is a contrast between (82a) and (82b). Beck et al. propose that the difference between (82a) and (82b)—and hence between the Japanese (81a) and (81b)—relates to the relative ease with which the appropriate contextual standard is inferred. The attributive adjective *long* in (82a) requires the identification of a contextually-salient degree of length. The contextual standard introduced by *compared to* is the plurality of *what Hanako bought*, which does not by itself make salient the maximal length of the objects in that set. This leads to the relative ungrammaticality of (82a) and, by analogy, also explains the degradedness of the Japanese attributive degree comparative (81a). In contrast, the identification of the *cardinality* of a contextually-salient plurality is taken to be natural, leading to the grammaticality of (82b) and thereby also the Japanese attributive quantity comparative (81b).

Given these Japanese facts and their analysis in Beck et al. (2004), I now return to the situation in Mandarin Chinese. What is notable is Mandarin’s lack of attributive *quantity* comparatives, which *are* available in Japanese. Beck et al. propose that Japanese has attributive quantity comparatives despite the language’s lack of degree abstraction because comparison is done by setting a contextual standard, rather than semantically composing directly with the standard; see footnote 28. The lack of attributive quantity comparatives then not only supports the view that Mandarin Chinese lacks degree abstraction, but also provides an additional argument that *bǐ* does not derive the semantics of comparison by setting a contextual standard, as previously argued by Erlewine (2007).

7 Conclusion

The careful and detailed study of individual languages, combined with considerations of semantic composition and related to a broader cross-linguistic landscape, can teach us not only about the diversity observed in grammar but also shed light on the *shape* of that diversity. It is in this spirit that in this paper I present an investigation of the Mandarin Chinese *bǐ* comparative construction. I have argued (a) that the *bǐ* comparative must be analyzed as a clausal comparative and (b)

²⁸Note however that this characterization of Japanese *yor*i as setting a contextual standard has been challenged (Kennedy, 2009). See also Shimoyama (2012) and Sudo (2015) for additional critiques. Such a context-setting analysis does not apply to the *bǐ* comparative, as noted in footnote 8 above.

that Mandarin Chinese lacks degree abstraction, i.e. predicate abstraction over a degree variable through syntactic movement. This situation—a clausal comparative without degree abstraction—is unique in the cross-linguistic literature on the syntax and semantics of degree constructions.

Although here I concentrated on the *bǐ* comparative construction here, my conclusion that Mandarin Chinese entirely lacks degree abstraction has important consequences for other degree constructions in the language which should be explored. Some degree constructions which in some cases may conceivably involve degree abstraction include superlatives, degree questions, and degree and amount nominalizations. I leave for future work the in-depth investigation of these degree constructions in Mandarin to see whether they might support or challenge my proposal that the language lacks degree abstraction completely.

My conclusion that Mandarin Chinese lacks degree abstraction also acts as an important new argument for Beck et al.'s (2004) Degree Abstraction Parameter. The possibility that languages vary in the availability of degree abstraction raises important questions about the acquisition of this parameter. Building on a reviewer suggestion, for Mandarin, the fact that the comparative morpheme *bǐ* does not form a constituent nor word with the gradable predicate may be a hint to the learner that covert degree abstraction is not necessary in the language. Compare this to e.g. the analysis of comparatives in Bhatt and Pancheva (2004), in part necessitated by the morphological need of *more/-er* to form a tight bond with the gradable predicate in all cases but take scope higher. I hope that my argument here may also act as a template for investigations into degree abstraction in other languages, further contributing to this still understudied point of language variation.

In the history of the generative enterprise, there have been many instances where the careful study of Mandarin Chinese grammar has contributed to our understanding of the syntax and semantics of long distance dependencies and their variation. For example, the study of *wh*-in-situ in Huang (1982b,a) contributed greatly to the theory of LF, covert movement, and islandhood, with further study in works such as Tsai (1994) furthering our understanding of unselective binding in relation to covert movement. Work on the island-insensitivity of certain long distance dependencies as in Huang (1984, 1989) and Tsai (1997) (noted in footnote 26 above) contributed to the development of limited strategies of dependency formation via binding in place of movement. To these many works, we can now add one more: the detailed investigation of the syntax and semantics of *bǐ* comparatives teaches us that the availability of degree abstraction is not a linguistic universal.

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