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# Comparatives Combined with Scalar Particles: The Case of Chinese HAI

Yi-Hsun Chen  
*Rutgers University*

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# Comparatives Combined with Scalar Particles: The Case of Chinese HAI

## Abstract

This paper investigates the syntax and semantics of the scalar particle HAI combined with Chinese *bi* comparatives. Several empirical facts are presented and discussed. First of all, two syntactic positions of HAI are identified: syntactically, the scalar particle HAI can either precede the comparative standard (HAI<sub>high</sub>) or follow it (HAI<sub>low</sub>) in the Chinese *bi* comparative. Second, HAI<sub>low</sub> leads to a positive inference while HAI<sub>high</sub> does not. Third, although many focus particles may appear in the position of HAI<sub>high</sub>, they are categorically banned from the position of HAI<sub>low</sub>. Finally, HAI<sub>high</sub> conveys that the assertive content contravenes the speaker's expectation. The core proposal made in this paper is the following. Syntactically, HAI<sub>high</sub> is an adjunct adjoined to the degree phrase while HAI<sub>low</sub> occupies the degree head. Semantically, the scalar HAI involves two core ingredients: a scale and some presuppositional conditions based on the type of the scale. In particular, HAI<sub>high</sub> employs the scale of likelihood (similar to English *even*) and presupposes that the prejacent  $p$  is less likely than its alternative  $\neg p$ : the negation of the prejacent. By contrast, HAI<sub>low</sub> takes the scale provided by gradable predicates and presupposes that both the comparative target and the comparative standard are ordered above the contextual standard of the scale. Finally, it is proposed that the semantics of the scalar HAI is constrained by its syntactic position: while HAI<sub>high</sub> operates on the domain of propositions based on the scale of likelihood, HAI<sub>low</sub> on the domain of degrees based on the dimension of gradable predicates.

# Comparatives Combined with Scalar Particles: The Case of Chinese HAI

Yi-Hsun Chen\*

## 1 Introduction

In Chinese, the particle HAI has three different uses: (i) an aspectual use, similar to English *still*; (ii) an additive use, similar to English *also*; (iii) a scalar use, similar to English *even* (e.g., Liu 2000, Liu et al. 2001, Yang 2017).<sup>1</sup> The first two uses are exemplified in (1). Informally, on the aspectual reading, (1) presupposes that there was some time in the past abutting the utterance time such that Zilu liked Xiaomei during that time.<sup>2</sup> On the additive reading, suppose the focus associate is Xiaomei, (1) presupposes that there is someone in the previous discourse such that Zilu like her, in addition to Xiaomei.

- (1) Aspectual and Additive Use
- a. Zilu HAI xihuan Xiaomei.  
Zilu still/ also like Xiaomei  
'Zilu still/ also likes Xiaomei.'

This paper focuses on the scalar use of HAI in the Chinese *bi* comparative, as illustrated in (2). For the purposes of discussion, I refer to the scalar HAI in the case of (2a) as HAI<sub>high</sub> and in the case of (2b) as HAI<sub>low</sub>. Intuitively, there are two differences between (2a) and (2b). First, the latter, but not the former, leads to a positive inference: both Zilu and Lisi are presupposed to be above the contextual standard of tallness in (2b).<sup>3,4</sup> Second, HAI<sub>high</sub> is apparently outside the degree phrase while HAI<sub>low</sub> is part of the degree phrase, as the latter syntactically intervenes between the gradable predicate and the comparative standard.<sup>5</sup>

- (2) Scalar Use
- a. Zilu HAI bi Lisi gao.  
Zilu HAI than Lisi tall  
'Zilu is taller even than Lisi.'

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<sup>1</sup> Chinese HAI is not the only particle showing the three-way ambiguity. German *noch* is another particle well-known for having the three uses: the aspectual use, the additive use and the scalar use. See Krifka (1999, 2000), Umbach (2009, 2012) and recently Beck (2016) for discussion of the meanings of German *noch*.

<sup>2</sup> See Krifka (2000), Ippolito (2007) and Greenberg (2009) for discussion of the meaning of English *still*.

<sup>3</sup> The rise of the positive inference in a comparative construction is surprising because a comparative by itself does not require both the comparative target and comparative standard to be above the contextual standard of the dimension provided by the gradable predicate. Consider (i) and (ii). In English, (i) does not require both Adam and Bill to be above the contextual standard of tallness. By contrast, *even* (similar to Chinese HAI<sub>low</sub>) triggers a positive inference in (ii): both Adam and Bill are above the contextual standard of tallness.

- (i) Adam is taller than Bill.  
(ii) Adam is even taller than Bill.

<sup>4</sup> According to Umbach (2009), German *noch* does not necessarily trigger a positive inference when it combines with a comparative (in the terminology of Umbach: the comparatives use of *noch*). In this respect, German *noch* differs from English *even* and Chinese HAI<sub>low</sub>. Furthermore, according to Umbach (2009), the comparative use of German *noch* is not related to the scale of likelihood in its semantics. In this respect, German *noch* differs from Chinese HAI<sub>high</sub> and again from the canonical view of English *even*. However, see Greenberg (2016) for arguments against the traditional likelihood analysis of English *even*.

<sup>5</sup> A terminological note here: I use *comparative standard* to refer to the standard of comparison in the comparative and *comparative target* to refer to the individuals/ objects that are compared with the comparative standard. For instance, Zilu is the comparative target and Lisi is the comparative standard in (2).

- b. Zilu bi Lisi HAI gao.<sup>6</sup>  
 Zilu than Lisi HAI tall  
 ‘Zilu is even taller than Lisi.’

In Section 2, I provide empirical data corroborating the two differences. To anticipate, the core of my proposal is outlined below.

- (3) The syntax and semantics of HAI<sub>high</sub>  
 a. [DegP HAI<sub>high</sub> [DegP Subject [DegP *bi*-phrase [DegP [Deg [AP [A ]]]]]]]  
 b.  $\|HAI_{high}\| = \lambda C_{\langle s,t \rangle} . \lambda p_{\langle s,t \rangle} . \lambda w_{\langle s \rangle} . \exists q [q \in C \wedge q = \neg p \wedge p <_{likely} q] . p(w)$   
 The prejacent  $p$  is less likely to be true than its alternative  $q$  in  $w$ , with respect to a given context  $c$ ; When defined, the prejacent  $p$  is true in  $w$ .
- (4) The syntax and semantics of HAI<sub>low</sub>  
 a. [DegP Subject [DegP *bi*-phrase [DegP [Deg HAI<sub>low</sub> [AP [A ]]]]]  
 b.  $\|HAI_{low}\| = \lambda C_{\langle d,t \rangle} . \lambda G_{\langle e, d \rangle} . \lambda y_{\langle e \rangle} . \lambda x_{\langle e \rangle} . \exists d [d \in C \wedge d \geq d_s \wedge G(x) > d \wedge G(y) > d]$   
 $G(x) > G(y)$   
 The degrees to which individual  $x$  and individual  $y$  hold respectively w.r.t. the gradable property  $G$  are above the contextual standard  $d_s$ ; when defined, the  $G$ -ness of  $x$  is greater than the  $G$ -ness of  $y$ .

Very briefly, syntactically, HAI<sub>high</sub> is an adjunct adjoined to the degree phrase while HAI<sub>low</sub> occupies the degree head. This means that the position of HAI<sub>low</sub> is syntactically dedicated and other focus particles may not appear in that position. Semantically, the scalar HAI involves two core ingredients: a scale and some presuppositional conditions based on the scale. More specifically, HAI<sub>high</sub> employs the scale of likelihood (similar to English *even*) and presupposes that the prejacent  $p$  is less likely than its alternative  $\neg p$ : the negation of the prejacent. By contrast, HAI<sub>low</sub> takes the scale provided by gradable predicates and presupposes that both the comparative target and the comparative standard are ordered above the contextual standard of the scale. This means that the use of HAI<sub>high</sub> indicates that the assertive content contravenes the speaker’s expectation and the use of HAI<sub>low</sub> leads to the positive inference in the comparative. Furthermore, the semantics of the scalar HAI is actually constrained by its syntactic position: while HAI<sub>high</sub> operates on the domain of propositions based on the scale of likelihood, HAI<sub>low</sub> on the domain of degrees based on the dimension of gradable predicates. Finally, it is worth emphasizing that (2a) and (2b) virtually make the same assertive content while differ in their presuppositional content, given the analysis in (3) and (4).

The remainder of this paper proceeds as follows. Section 2 provides empirical data showing how HAI<sub>high</sub> and HAI<sub>low</sub> differ both syntactically and semantically. Section 3 is devoted to an analysis of HAI<sub>high</sub> and HAI<sub>low</sub>. Section 4 points out some directions of future research and then concludes the paper.

## 2 Two Positions of Scalar HAI in Chinese Bi Comparatives

<sup>6</sup> Yang (2017) reports that the addition of a measure phrase in the Chinese *bi* comparative makes the positive inference from HAI<sub>low</sub> disappear. (i) is an example illustrating her point.

- (i) Zilu bi Lisi HAI gao san-gongfen.  
 Zilu than Lisi HAI tall three-centimeter  
 ‘Zilu is even taller than Lisi by three centimeters.’

However, the judgment seems subtle. Furthermore, two of her reviewers disagree with her judgment. In fact, Yang (2017) argues that the positive inference is a conversational implicature, rather than a presupposition. If her judgment on (i) is real, one way going with it is to make the positive inference sensitive to different focus associates. In this line, however, it seems extremely difficult to explain why the positive inference in the case without a measure phrase (such as (2b)) is so hard to cancel, unlike the canonical case of conversational implicature. This paper sticks to the presuppositional view of the positive inference and leaves the case with measure phrases for future research.

As briefly mentioned in the introduction, the scalar particle HAI syntactically can either precede the comparative standard (HAI<sub>high</sub>) or follow it (HAI<sub>low</sub>) in the Chinese *bi* comparative. This section shows that HAI<sub>high</sub> and HAI<sub>low</sub> demonstrate different semantic and syntactic properties. Specifically, they differ in the following two important respects: (i) HAI<sub>low</sub> leads to a positive inference that the comparative standard is presupposed to exceed the contextual standard of the dimension provided by the gradable predicate, while HAI<sub>high</sub> does not. (ii) Although other focus particles such as *shenzhi* ‘even’ and *zhi* ‘only’ may appear in the position of HAI<sub>high</sub> (i.e., preceding the comparative standard), they are plainly banned from the position of HAI<sub>low</sub> (i.e., following the comparative standard). Moreover, HAI<sub>high</sub> conveys that the assertive content contravenes the speaker’s expectation. In what follows, I present some empirical data showing that they do differ both semantically and syntactically.

First, let’s consider their difference concerning the sensitivity to the positive inference. Imagine a scenario that there are three individuals in the discourse: Akiu, Lisi and Zilu. All the three individuals are below the contextual standard of tallness say, 170 centimeters. We are interested in who is the tallest and thus start to compare their heights. In such a scenario like (5), the sentence with HAI<sub>high</sub> is felicitous as a continuation while the sentence with HAI<sub>low</sub> is not. Consider the contrast between (5a) and (5b).

- (5) Scenario A: The standard of tallness is 170 cm. Akiu is 150 cm tall, Lisi is 155 cm tall and Zilu is 160 cm tall. “Lisi is taller than Akiu, (however) ...”

- a. Zilu HAI bi Lisi gao.  
 Zilu HAI than Lisi tall  
 ‘Zilu is taller even than Lisi.’  
 b. #Zilu bi Lisi HAI gao.  
 Zilu than Lisi HAI tall  
 ‘Zilu is even taller than Lisi.’

By contrast, in a scenario when the three individuals are all above the contextual standard of tallness in the discourse such as (6), a sentence with either HAI<sub>high</sub> or HAI<sub>low</sub> is felicitous as a continuation, as shown in (6a, b).

- (6) Scenario B: The standard of tallness is 170 cm. Akiu is 170 cm tall, Lisi is 180 cm tall and Zilu is 190 cm tall. “Lisi is taller than Akiu, (however) ...”

- a. Zilu HAI bi Lisi gao.  
 Zilu HAI than Lisi tall  
 ‘Zilu is taller even than Lisi.’  
 b. Zilu bi Lisi HAI gao.  
 Zilu than Lisi HAI tall  
 ‘Zilu is even taller than Lisi.’

The contrast above indicates that a sentence with HAI<sub>low</sub> is sensitive to whether the comparative standard (in the present case, Lisi) exceeds the contextual standard of the dimension provided by the gradable predicate, while a sentence with HAI<sub>high</sub> is not.

Second, HAI<sub>low</sub> seems to occupy a syntactically dedicated position. Although other focus particles such as *shenzhi* ‘even’, *ye* ‘also’ and *zhi* ‘only’ may appear in the position of HAI<sub>high</sub>, they are plainly banned from the position of HAI<sub>low</sub>. Consider the contrast between (7) and (8).

- (7) a. Zilu shenzhi bi [Lisi]<sub>F</sub> gao.  
 Zilu even than Lisi tall  
 ‘Zilu is taller even than Lisi.’  
 b. Zilu ye bi [Lisi]<sub>F</sub> gao.  
 Zilu also than Lisi tall  
 ‘Zilu is also taller than Lisi.’  
 c. Zilu zhi bi [Lisi]<sub>F</sub> gao.

Zilu only than Lisi tall  
 ‘Zilu is taller only than Lisi.’

- (8) Zilu bi Lisi \*shenzhi/ \*ye/ \*zhi gao.  
 Zilu than Lisi even also only tall

The contrast above indicates that  $HAI_{high}$  and  $HAI_{low}$  differ not only in their semantic sensitivity to the positive inference but also in their syntactic positions.

Third, a sentence with  $HAI_{high}$  conveys that the assertive content somehow contravenes the speaker’s expectation.<sup>7</sup>

- (9) Context: It is common knowledge that many restaurants charge extra service fees/ tips when people eat inside. Thus, eating inside is generally more expensive than take-out. The speaker walked in a restaurant and would like to take out. But the price shows that take-out is actually more expensive than eating inside.

Speaker Expectation: Eating inside is/ should be more expensive than take-out.

- a. Waidai HAI bi neiyong gui!  
 Take-out HAI than eating-inside expensive  
 ‘Take-out is more expensive even than eating inside!’

Two remarks are in order. First, (9a) does not lead to any positive inference: neither eating inside nor take-out is presupposed to be expensive. Second, the use of  $HAI_{high}$  in (9a) felicitously signals that the assertive content contravenes the speaker’s expectation in (9), given the context. (10) illustrates the same point. In (10a), neither the salary by monthly-pay nor the salary by hour-pay is presupposed to be high in the discourse. Again, the use of  $HAI_{high}$  in (10a) felicitously signals that the assertive content contravenes the speaker’s expectation in (10), given the context.

- (10) Context: It is common knowledge that the salary by hour-pay is less than the salary by monthly-pay. The speaker saw an advertisement about a job offering both hour-pay and monthly-pay for the salary.

Speaker Expectation: The salary by hour-pay is/ should be less than the salary by monthly-pay.

- a. Shi-xin HAI bi yue-xin gao!  
 Hour-pay HAI than monthly-pay high  
 ‘The salary by hour-pay is higher even than the salary by monthly-pay!’

In short,  $HAI_{high}$  and  $HAI_{low}$  differ not only in their semantics but also in their syntax. In the next section, I first lay out my assumptions about the syntax and semantics of gradable adjectives and the Chinese *bi* comparative, couched in the framework of degrees. Then, I propose the semantics and syntax of  $HAI_{high}$  and  $HAI_{low}$ , and show how my proposal explains the three contrasts we have seen in this section: the absence vs. presence of positive inference, distributional restriction, and the contravention of the speaker’s expectation.

### 3 An Analysis of Scalar HAI

<sup>7</sup> There is a judgment variation on whether  $HAI_{low}$  conveys a contravention of the speaker’s expectation. If  $HAI_{low}$  does convey the contravention of the speaker’s expectation, I speculate that the content should be related to the positive inference. A potential form of the contravention would be something like the following: that the comparative target is above the contextual standard of the dimension provided by the gradable predicate is less likely than that the comparative standard is above the contextual standard of the dimension provided by the gradable predicate. In this paper, I tentatively stick to the judgment that  $HAI_{low}$  does not convey a contravention of the speaker’s expectation, while leave it as an unresolved issue for future research.

For the purposes of this paper, I assume that a gradable adjective denotes a measure function (of type  $\langle e, d \rangle$ ), from individuals to their degrees on the dimension specified by the adjective (Kennedy 1999, 2007, Xie 2014). For example, the gradable adjective *gao* ‘tall’ denotes a measure function from individuals to their heights.<sup>8</sup>

- (11) The semantics of Chinese gradable adjectives  
 $\|gao\| = \lambda x. \iota d[x \text{ is } d\text{-tall}]$

Syntactically, I assume that the degree head is a functional head in the extended projection of the adjective (Corver 1997, Kennedy 1999, Neeleman et al. 2004, Grimshaw 2005).

- (12)  $[_{\text{DegP}} [_{\text{Deg}} [_{\text{AP}} [_{\text{A}} ]]]]$

Finally, I assume that the subject is base-generated at the specifier of the degree phrase (DegP) and the comparative standard, *bi*-phrase, is a prepositional adjunct in Chinese *bi* comparatives (cf. Erlewine 2007, Lin 2009, Liu 2011).<sup>9, 10</sup> The subject moves to Spec, IP in the latter derivation to satisfy some formal requirements. With these assumptions in place, the structure of Chinese *bi* comparatives is schematized below.

- (13) The structure of Chinese *bi* comparatives  
 $[_{\text{IP}} [_{\text{I}} [_{\text{DegP}} \text{Subject} [_{\text{Deg}'} \text{bi-phrase} [_{\text{Deg}'} [_{\text{Deg}} [_{\text{AP}} [_{\text{A}} ]]]]]]]]]]$

Now, let's turn to the syntax and semantics of scalar HAI. Syntactically, I propose that  $\text{HAI}_{\text{high}}$  is an adjunct adjoined to the degree phrase while  $\text{HAI}_{\text{low}}$  occupies the degree head.<sup>11</sup> Semantically, I propose that semantic core of the scalar HAI involves two ingredients: a scale and some presuppositional conditions based on the scale. More specifically,  $\text{HAI}_{\text{high}}$  (similar to English *even*) employs the scale of likelihood and presupposes that the prejacent proposition  $p$  is less likely than its alternative  $\neg p$ : the negation of the prejacent. By contrast,  $\text{HAI}_{\text{low}}$  takes the scale provided by gradable predicates and presupposes that both the comparative target and the comparative standard are ordered above the contextual standard of the scale. Seeing in this light, the semantic contribution of the scalar HAI is actually constrained by its syntactic position: while  $\text{HAI}_{\text{high}}$  operates on the domain of propositions based on the scale of likelihood,  $\text{HAI}_{\text{low}}$  on the domain of degrees based on the dimension of gradable predicates.

In short, (14) and (15) summarize the core of my proposal.  $C$  represents the contextual re-

<sup>8</sup> There are several alternative views of gradable adjectives under the framework of degree semantics. For instance, a more widely-held view is that a gradable adjective denotes relations between degrees and individuals (of type  $\langle d, \langle e, t \rangle \rangle$ ), and the degree argument of the adjective is saturated by comparatives (or other degree constructions). The choice here is simply for expository purposes. See Kennedy (1999), Heim (2000), and Neeleman et al. (2004) for the issues in choosing between the two approaches.

<sup>9</sup> Here, I consider the role of DegP in the adjectival domain as a parallel with the role of vP in the verbal domain (in the sense of Kratzer 1996) with respect to the introduction of the subject.

<sup>10</sup> Grano & Kennedy (2012) propose that transitive comparatives and *bi* comparatives in Chinese both involve a degree-shell structure, reminiscent of a ditransitive construction (cf. Xiang 2005). Under a degree-shell structure, the standard marker *bi* is a degree word heading the higher degree projection and the subject is base-generated at the specifier of the adjectival projection. Interested readers are referred to Grano & Kennedy (2012) for details. See Lin (2009) for arguments against a complementation analysis of Chinese *bi* comparatives and see Liu (2011, 2012) for arguments against treating *bi* as a degree word.

<sup>11</sup> Grano and Kennedy (2012) suggest that the particle HAI can be simultaneously a phrasal modifier and a head modifier in Chinese *bi* comparatives. My current proposal differs from Grano and Kennedy (2012) in two important respects. First, I explicitly identify two syntactic positions of HAI:  $\text{HAI}_{\text{high}}$  and  $\text{HAI}_{\text{low}}$ , with the former being a phrasal modifier while the latter a head modifier. Secondly, I propose that although semantically both  $\text{HAI}_{\text{high}}$  and  $\text{HAI}_{\text{low}}$  involve a scale of likelihood, the former operates on the domain of propositions while the latter the domain of degrees. Readers are referred to Grano and Kennedy (2012) for discussion of the syntax of HAI in Chinese *bi* comparatives.

striction on the set of alternatives (in the sense of Rooth 1992).

- (14) The syntax and semantics of  $\text{HAI}_{\text{high}}$
- a.  $[\text{DegP HAI}_{\text{high}} [\text{DegP Subject} [\text{Deg}' \text{bi-phrasal} [\text{Deg}' [\text{Deg} [\text{AP} [\text{A} ]]]]]]]]$
- b.  $\|\text{HAI}_{\text{high}}\| = \lambda C_{\langle st, t \rangle} . \lambda p_{\langle s, t \rangle} . \lambda w_{\langle s \rangle} . \exists q [q \in C \wedge q = \neg p \wedge p \prec_{\text{likely}} q] . p(w)$   
 The prejacent  $p$  is less likely to be true than its alternative  $q$  in  $w$ , with respect to a given context  $c$ ; When defined, the prejacent  $p$  is true in  $w$ .
- (15) The syntax and semantics of  $\text{HAI}_{\text{low}}$
- a.  $[\text{DegP Subject} [\text{Deg}' \text{bi-phrasal} [\text{Deg}' [\text{Deg} \text{HAI}_{\text{low}} [\text{AP} [\text{A} ]]]]]]]]$
- b.  $\|\text{HAI}_{\text{low}}\| = \lambda C_{\langle d, t \rangle} . \lambda G_{\langle e, d \rangle} . \lambda y_{\langle e \rangle} . \lambda x_{\langle e \rangle} . \exists d [d \in C \wedge d \geq d_s \wedge G(x) > d \wedge G(y) > d]$   
 $G(x) > G(y)$   
 The degrees to which individual  $x$  and individual  $y$  hold respectively w.r.t. the gradable property  $G$  are above the contextual standard  $d_s$ ; when defined, the  $G$ -ness of  $x$  is greater than the  $G$ -ness of  $y$ .

Two remarks are in order. First, it is worth emphasizing that the semantics of scalar HAI is correlated with its syntactic position: while  $\text{HAI}_{\text{high}}$  operates on the domain of propositions based on the scale of likelihood,  $\text{HAI}_{\text{low}}$  on the domain of degrees based on the dimension of gradable predicates. Put differently, the presuppositional condition varies with the semantic domain that HAI is operating on, which in turn varies with the syntactic position of HAI. Second, the semantic contribution of scalar HAI is purely presuppositional: it does not contribute to the assertive content.

With (14) and (15) in hand, we are ready to see how the three contrasts can be explained. First, let's consider the case of  $\text{HAI}_{\text{high}}$ . Recall that  $\text{HAI}_{\text{high}}$  shows the following three properties: (i) no positive inference is observed; (ii) the assertive content contravenes the speaker's expectation; (iii) other focus particles may appear in the position of  $\text{HAI}_{\text{high}}$ . (16) is a sentence with  $\text{HAI}_{\text{high}}$ . (17) presents the relevant LF and truth-conditions of (16).

- (16) Zilu HAI bi Lisi gao.  
 Zilu HAI than Lisi tall  
 'Zilu is taller even than Lisi.'
- (17) a. LF:  $[\text{DegP HAI}(C) [\text{DegP Zilu is taller than Lisi}]]^{12}$   
 b. Assertion:  $\text{tall}(\text{zilu}) > \text{tall}(\text{lisi})$   
 c. Presupposition:  $\exists q [q \in C \wedge q = \neg p \wedge p \prec_{\text{likely}} q]$

As shown in (17a),  $\text{HAI}_{\text{high}}$  is a phrasal modifier. Assuming that other focus particles like *shenzi* 'even' and *zhi* 'only' are also phrasal modifiers (adjoined to DegP), this explains why they have a similar distribution as  $\text{HAI}_{\text{high}}$ . Next, as shown in (17c), the contravention of the speaker's expectation arises because the assertive content is presupposed to be less likely than its alternative  $\neg p$ :  $\text{tall}(\text{zilu}) \leq \text{tall}(\text{lisi})$ . Finally, the absence of a positive inference in (16) is also explained, because the scalar presupposition concerning the likelihood of the prejacent in (17c) does not necessarily guarantee that both *Zilu* and *Lisi* are above the contextual standard of tallness.

Let's turn to the case of  $\text{HAI}_{\text{low}}$ . Recall that  $\text{HAI}_{\text{low}}$  shows the following two properties: (i) a positive inference is observed; (ii) other focus particles may not appear in the position of  $\text{HAI}_{\text{low}}$ . (18) is a sentence with  $\text{HAI}_{\text{low}}$ . (19) presents the relevant LF and truth-conditions of (18).

- (18) Zilu bi Lisi HAI gao.  
 Zilu than Lisi HAI tall  
 'Zilu is even taller than Lisi.'

<sup>12</sup> For simplicity, I assume that the subject is interpreted at its base position. Moreover, I assume the standard marker *bi* 'than' is semantically vacuous and only plays the role of introducing the comparative standard. Nothing crucial to the purposes of this paper hinges on these assumptions.



- (19) a. LF: [<sub>DegP</sub> Zilu [<sub>Deg</sub> than Lisi [<sub>Deg</sub> [<sub>Deg</sub> HAI (C) [<sub>AP</sub> [A tall ]]]]]]]  
 b. Assertion: *tall (zilu) > tall (lisi)*  
 c. Presupposition:  $\exists d [d \in C \wedge d \geq d_s \wedge \textit{tall} (zilu) > d \wedge \textit{tall} (lisi) > d]$

As shown in (19a), HAI<sub>low</sub> occupies the position of the degree head. With the same assumption that other focus particles like *shenzhi* ‘even’ and *zhi* ‘only’ are phrasal modifiers (adjoined to DegP), it follows that they are banned from the position of HAI<sub>low</sub>. Next, as shown in (19c), the positive inference arises in (15) because both Zilu and Lisi are presupposed to be above the contextual standard of tallness. Finally, it is worth noting that given the present analysis, (16) and (18) virtually make the same assertive content while differ in their presuppositional content.

#### 4 Conclusions

This paper investigates the syntax and semantics of the scalar particle HAI combined with Chinese *bi* comparatives. Several empirical facts are presented and discussed. First of all, two syntactic positions of HAI are identified: syntactically, the scalar particle HAI can either precede the comparative standard (HAI<sub>high</sub>) or follow it (HAI<sub>low</sub>) in the Chinese *bi* comparative. Second, HAI<sub>low</sub> leads to a positive inference while HAI<sub>high</sub> does not. Third, although many focus particles may appear in the position of HAI<sub>high</sub>, they are categorically banned from the position of HAI<sub>low</sub>. Finally, HAI<sub>high</sub> conveys that the assertive content contravenes the speaker’s expectation.

The core proposal made in this paper is summarized as follows. Syntactically, HAI<sub>high</sub> is an adjunct adjoined to the degree phrase while HAI<sub>low</sub> occupies the degree head. Assuming other focus particles are phrasal modifiers (adjoined to the degree phrase), it immediately explains why they can appear in the position of HAI<sub>high</sub> but not in the position of HAI<sub>low</sub>. Semantically, the scalar HAI involves two core ingredients: a scale and some presuppositional conditions based on the type of the scale. In particular, HAI<sub>high</sub> employs the scale of likelihood (similar to English *even*) and presupposes that the prejacent *p* is less likely than its alternative  $\neg p$ : the negation of the prejacent. By contrast, HAI<sub>low</sub> takes the scale provided by gradable predicates and presupposes that both the comparative target and the comparative standard are ordered above the contextual standard of the scale. This explains why the use of HAI<sub>high</sub> indicates that the assertive content contravenes the speaker’s expectation and why the use of HAI<sub>low</sub> leads to the positive inference in the comparative. Finally, it is proposed that the semantics of the scalar HAI is constrained by its syntactic position: while HAI<sub>high</sub> operates on the domain of propositions based on the scale of likelihood, HAI<sub>low</sub> on the domain of degrees based on the dimension of gradable predicates.

If the present analysis of the scalar particle HAI is correct, it makes two suggestions. First, a positive inference does NOT arise from the scale of likelihood. This is evidenced by the contrast between HAI<sub>high</sub> and HAI<sub>low</sub>. Recently, Greenberg (2015, 2016) shows that English *even* similarly leads to a positive inference in comparatives (see also footnote 3) and analyzes *even* in terms of some contextually-determined scales such that both comparative target and comparative standard belong to the same region at the scale; moreover, she presents empirical data posing a challenge to the canonical view of *even* in terms of the scale of likelihood. This paper is compatible with Greenberg’s position on English *even*. If this paper is correct on the source of the positive inference, then it further lends an indirect support for Greenberg’s call on an alternative analysis of the semantics of English *even*, in order to explain why English *even* similarly triggers the positive inference in the comparative. Second, many studies on German *noch* (e.g., Umbach 2009, 2012, Beck 2016) have attempted to explain why and how one single particle leads to different uses (e.g., discourse order and additive use like *also*; temporal precedence and temporal use like *still*). Like German *noch*, Chinese HAI also has additive use and temporal use (see Zhang & Ling 2016 for a perspective from discourse structure). To anticipate a unified account, this paper identifies two parameters in the semantic core of scalar particles: the scale they operate on and the presuppositional conditions they impose based on the scale. More studies are needed to see how different uses of HAI can be connected with one core meaning and how the two semantic parameters improve our cross-linguistic understanding of scalar particles.

Finally, the investigation of the scalar HAI in Chinese *bi* comparatives shows that the semantics of a scalar particle is constrained by its syntactic position. Put differently, even one single sca-

lar particle demonstrates a three-way ambiguity; the three-way ambiguity may not be expected to show up whenever the scalar particle is used, regardless of the syntactic environments. To be more specifically, if the ambiguity of a scalar particle is due to the accessibility to different semantic domains (and thus the operation on different scales), such accessibility presumably has its corresponding syntactic environments. Seeing in this light, this in turn leads to another parameter of variation in the cross-linguistic semantics of scalar particles, since syntax (LF) indicates the scope of scalar particles, thereby regulating the relevant semantic input in the computation.

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Department of Linguistics  
Rutgers University  
New Brunswick, NJ 08901-1184  
[yc565@linguistics.rutgers.edu](mailto:yc565@linguistics.rutgers.edu)