

Chapter Four Derive Form and Meaning of Mandarin

Comparatives

4.1 DegP-shelled Structure and Degree-based Meaning

4.1.1 A DegP-shelled Analysis of Comparative Structure

The term “shell” in the title originates from a well-known structure proposed by Richard Larson in his article of 1988b, where “VP-shell” is coined to solve double object constructions, and then he takes full advantage of the philosophy behind shelled structures to fabricate English comparatives by projecting them into a form of DegP-shell, and schematically:

- (1) a. [VP... [DegP John [Deg' Deg⁰ as; [DegP tall [Deg' Deg⁰ as; [PP as Mary]]]]].
b. [VP... [DegP John [Deg' Deg⁰ er; [DegP tall [Deg' Deg⁰ er; [PP than Mary]]]]].

Larson’s DegP-shell structure is characteristic of two layers of Deg⁰s, identical to VP-shell. The functional Deg⁰, instantiated by “as” in equatives and “er” in comparatives, successively takes two arguments, PP and AP, within the minimal projection of lower DegP. As one layer of DegP offers no positions for subject arguments, an additional layer of DegP has to be added.

Enlightened by Larson’s DegP-shell structure, Xiang (2005), Guo (2012), Grano&Kennedy (2012) propose their own versions of shelled structures to analyze Mandarin comparatives with various adjustments to make DegP-shell structure fit for Mandarin better. Yet their analyses are not withstandable in front of problems such as the categorization of Mandarin Deg⁰ members and the derivation of differential phrases. For instance, Xiang (2005), Grano&Kennedy (2015) analyze “bi” and “chu(exceed)” as members of Deg⁰, or Guo (2012) regards “chu(exceed)” and “yiyang(as)” as a same type of components occupying Deg⁰ position. Their analyses will be dissected Section 4.3.1. In this part, the author attempts to argue that the DegP-shelled structure indeed offers an optimal solution to Mandarin comparatives in both syntactic and semantic aspects. Under DegP-shelled structure, the categorization of three potential candidates for Deg⁰s, i.e. “bi(than)”, “geng(more)”, “chu(exceed)”, will be settled reasonably, the position of “biP” and differential phrases will be assured with a feasible motivation, the collocation between differential phrases and gradable adjectives will be well arranged, and a correct linear order will finally be derived out. More importantly, the structure built from DegP shell will mostly cater for the semantic computation with a type-driven kernel (Montague,1973; Partee,1990; Krazer&Heim, 1998; Fang, 1997, 2000; Jiang&Pan, 2005, etc.).

The prototype of Mandarin comparative structure is given in (2), which covers crucial comparative components like gradable adjectives, degree adverbs, differential phrases, the carrier of standard degree, i.e. “biP(than)”, as well as the carrier of referent degree, i.e. subjects.

(2) [DegP biP [Deg' Deg⁰ [DegP DiffP [Deg' Deg⁰ [AP ...]]]]]



Firstly, gradable adjectives are universally licensed by a functional DegP on a par with DegP hypothesis, and it is non-exceptional to Mandarin. Secondly, the set denoted by Deg⁰ contains two types of morphemes, the positive ones like “pos” and the comparative ones like “geng(more)”, “bijiao(more)”, “duo(duo)” as well as a null “comp”. Though Mandarin comparatives do not belong to the sort adopting double markers, the “greater than” meaning is still indispensable to them in semantics, so that a null comparative morpheme “comp” is deemed existential and undertakes a neutral “greater than” meaning just like English “er/more”. Thirdly, differential phrases are generated at the specifier of lower DegP, under controls from the combination of “Deg⁰+A⁰”, i.e. “Deg⁰+A⁰” plays a decisive role in the type of differential phrases occurring in comparatives, and there are three types in total: small degree vague DiffPs, “yidian(bit)”, large degree vague DiffPs, henduo(many), and exact DiffPs, “2 mi(2 meter)”, “3 ben(3 CL)”, etc. Fourthly, “bi(that)” serves as a marker of Standards, selecting either NP or CP as complement, that is to say, Mandarin comparatives, just like their English counterparts, adopt both phrasal comparatives and clausal comparatives. Given VP-internal subject hypothesis, subjects are assumed to generate at the specifier of AP and move upward to the specifier of IP for case assignment. 提升规则插眼

For the sake of a clearer explication, (3a) and (3b) are selected to demonstrate details of the proto-schema in (2), whose structures are respectively displayed in (4a) and (4b).

(3) a. John bi Mary geng gao yidian.

John than Mary more tall a little

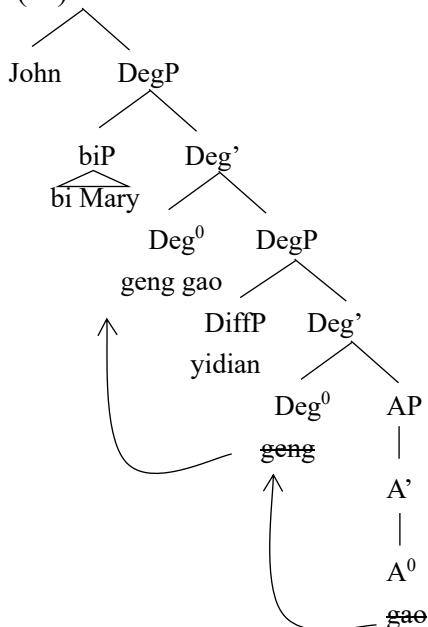
‘John is a little taller than Mary.’

b. John bi Mary comp gao 2 limi

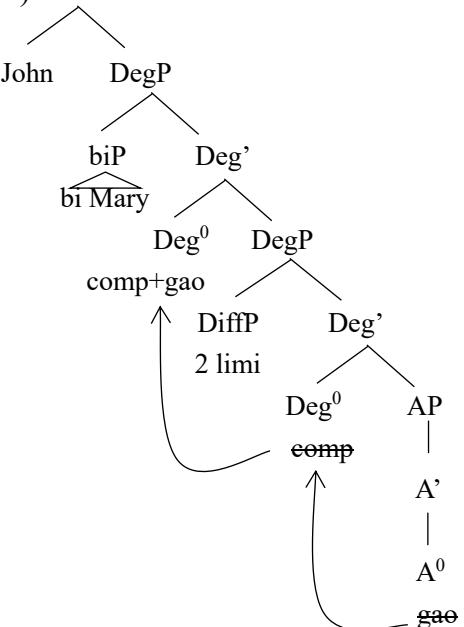
John than Mary more tall 2 cm

‘John is 2 cm taller than Mary.’

(4a) IP



(4b) IP



An illustration of structures in (4a) and (4b) will be implemented from bottom to top. “gao (tall)” as a typical gradable adjective, projects itself as the head of AP. The generative tradition is kept that adjectives are one-place predicates with their single arguments generated at the specifier of AP and assigned a theta role of experiencer, then they move to the specifier of IP for nominative cases. Under degree semantics, degree arguments are hypothesized as a compulsory argument of gradable adjectives, so that the existence of DegP is of vital importance in binding this degree variable. The motivation for setting a DegP in structure thus receives a perfect explanation from the aspect of semantics and meanwhile conforms to the basic philosophy behind DP hypothesis and IP hypothesis.

Mandarin degree adverb “geng” and the null morpheme “comp” are reckoned to occupy the head position of DegP in comparative constructions. The Deg⁰ position in (4b) cannot be empty, otherwise the degree variable encoded by gradable adjective will cause a type mismatch in semantics and the “greater than” meaning of comparatives finds no carriers. As a result, to assume a null form of “comp” is necessary, and further argumentation on the feasibility of “comp” will be unfolded in Section 4.2.2.2.

The generation of differential phrases is key to the analysis advocated in this dissertation. They are defined to occupy the specifier of lower DegP for two reasons: on the one hand, though DiffPs denote a “d” type argument, they impossibly function to saturate the degree variable of gradable adjective because DiffPs represent the differential between referent degree and standard degree instead of the degree of referents, or in an alternative description, DiffPs should be introduced by Deg⁰ heads with a “greater than” meaning, which leaves the specifier of DegP to be the optimal candidate. Although Mandarin shares with English to usher in DiffPs at the specifier of DegP, Mandarin DiffPs present a more elaborate categorization.

On the other hand, gradable adjectives and degree heads conspire to determine the distribution of DiffPs. Take “gao(tall)” in (3a) and (3b) as an example, the differential along the dimension of “gao(tall)” can be instantiated as exact DiffPs like “2 limi(2 cm)” because “gao(tall)” belongs to measurable adjectives, and meanwhile the differential can be instantiated as vague DiffPs, which branch into small degree vague DiffP like “yidian(bit)” and large degree vague DiffP like “henduo (many)”. It is self-evident that measurable adjectives can be modified by both exact DiffPs and vague DiffPs in semantics, while non-measurable adjectives can only be modified by vague DiffPs. Besides, in Mandarin, an overt form of “geng” or other Deg⁰ heads refutes to co-occur with exact DiffPs, and as shown in (3a), DiffPs can only be “yidian(bit)” or empty. Given above reasons, A⁰ is assumed to undergo a head movement into Deg⁰ position and combine with comparative morphemes there into a compound, which determines the type of DiffPs and possibly assigns a theta role and a case to DiffPs, if they need one (Zhang, 2002). A deeper exploration to the distribution between the compound “Deg⁰+A⁰” and DiffPs will extend in Section 4.2.4 and the argumentation for motivation behind A⁰ to Deg⁰ movement will be implemented in Section 4.2.3.

Under the core spirit of DegP-shell, “Deg⁰+A⁰” in lower Deg⁰ position will

continue to move into upper Deg^0 position for the introduction of comparing standards. As for the role of “bi”, it parallels to English “than” in selecting both phrases and clauses as complement. The occurrence of temporal adverbs like “mingtian(tomorrow)”, prepositional phrases like “zai jiali(at home)”, “V de” like “pao de(run de)”, verbal phrases like “chi pingguo(eat apples)”, etc., inside “biP” backs a clausal analysis of Mandarin comparatives in a reliable way.

Compared to the version of Larson’s DegP-shell in (1a) and (1b), the hallmarks of Mandarin are quite obvious: the licensing relation between DegP and AP is obeyed in structures of both positive forms and comparative forms with the former instantiated as $[\text{DegP pos } [\text{AP gao}]]$ and the latter $[\text{DegP comp } [\text{AP gao}]]$. But in Larson’s DegP-shell, AP is assumed to generate at the specifier of lower DegP, a projection not only giving up the universal schema “[$\text{DegP } [\text{AP} \dots]$]” held by DegP hypothesis, but also missing the theta relation between subjects and adjectives. As shown in (1a) and (1b), subjects and adjectives respectively occupy the specifier of lower DegP and upper DegP, that is to say, subjects and adjectives serve as the arguments of Deg^0 . It is apparent that this configuration breaks the connection between subjects and adjectives, leaving no possibility to judge their theta relations. If VP-internal subject hypotheses and DegP hypothesis are fully respected, the complement position of DegP should be the optimal position for AP, (4a) and (4b) are thus derived out. Besides, if AP is posited at the specifier of lower DegP, it will leave no room for differential phrases in Mandarin. Therefore, adjustments on the position of AP must be implemented to Larson’s DegP-shell with the purpose to make it fit for Mandarin better.

The structures presented in (4a) and (4b) conform to the consensus reached by degree semanticists that standard phrases and differential phrases are introduced by Deg^0 s. Semantically speaking, “thanP” and differential phrases respectively afford to saturate the standard degree and the differential degree encoded by “er/more”, which denotes a function with “greater than” relation as the semantic nucleus. And their semantic proximity should have an overt demonstration in syntax. For English, thanP, under different syntactic skeleton, is either selected by “er” in complement position (von Stechow, 1984; Heim, 2000) or in adjunct position (Kennedy, 1997), and differential phrases are also deemed to be introduced by “er” at the specifier position. The DegP-shelled structure of Mandarin comparatives manifests this proximity as well. Where in (4a) and (4b), differential phrases are base-generated at the specifier of lower DegP and “biP” at the specifier of upper DegP, both of which indicate Deg^0 s own a direct selection relation with DiffPs and biPs.

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4.1.2 A Degree-based Analysis of Comparative Meaning

The semantic computation of meanings is under the control of principle of compositionality, according to which, the sentence meaning is determined by the meanings of its components and the way how they combine with each other. As discussed in last section, the structure out of DegP-shell serves as the optimal solution to the combination of Mandarin comparative components. And in this section, the author will apply the well-established semantic analysis of comparatives under degree

semantics to Mandarin comparatives.

One of the nucleus hypotheses behind degree semantics is pertinent to the lexical entry of gradable adjectives. Generally speaking, gradable adjectives belong to the type of one-place predicates. Take “gao(tall)” as an example, it can be formalized into (5a), which denotes a set of individuals sharing a common feature “gao(tall)”. But such a transcription of gradable adjectives is not fine-grained enough to **differentiate gradable adjectives from non-gradable ones in semantics**. So Cresswell (1976) and many other semanticists attempt to encode “degree” into the representation of gradable adjectives, aiming to highlight the gradability of certain adjectives. (5b) is derived out for such a purpose. Gradable adjectives denote a partial relation (“ \geq ” relation) between individual and degree. Measure function “gao-du(x)” maps individuals onto a dense scale denoted by “gao (tall)”. The “ \geq ” relation identifies the scope of the degree of individuals and “d” offers an anchoring point where the scope starts from on the scale of “gao-du(height)”. As “John is 2 meters tall” does not deny 放他妈的屁 the possibility that John is taller than 2 meters, a “ \geq ” relation, instead of “=” relation is adopted here to expel the impact of quantity maxim.

$$(5) \text{ a. } [\![\text{gao}]\!] = \lambda x. \text{gao}(x)$$

$$\text{b. } [\![\text{gao}]\!] = \lambda d \lambda x. [\text{gao-du}(x) \geq d] \quad \text{“gao-du}(x)\text{”} \equiv \text{“height}(x)\text{”}$$

The lexical entry of gradable adjectives in (5b) not only blocks its combination with subjects in positive forms, but also refutes the combination with arguments denoted by “biP”(e type or $\langle d, t \rangle$ type). It is tempting to assume a null comparative morpheme in the Deg⁰ position, i.e. (4b), which parallels to degree adverbs like “geng(more)” in semantics, (not the implicit form of “geng”, Liu, 2011). To be exact, the null “comp” behaves more like English “er/more”, bearing a strict partial relation that “referent degree is greater than standard degree”. By contrast, “geng(more)” expresses one more evaluative meaning except for “greater than” meaning. The first version of semantic representations of “comp” and “geng” are offered in (6b) and (7b):

$$(6) \text{ a. } \text{John bi Mary comp gao.}$$

$$\text{b. } [\![\text{comp}_1]\!] = \lambda G_{\langle d, \langle e, t \rangle \rangle} \lambda y \lambda x. [\text{Max } d_1(G(x)(d_1)) > \text{Max } d_2(G(y)(d_2))]$$

$$\text{c. } [\![\text{(6a)}]\!] = \text{Max } d_1(\text{gao-du}(\text{John}')) \geq d_1 > \text{Max } d_2(\text{gao-du}(\text{Mary}')) \geq d_2$$

$$(7) \text{ a. } \text{John bi Mary geng gao.}$$

$$\text{b. } [\![\text{geng}_1]\!] = \lambda G_{\langle d, \langle e, t \rangle \rangle} \lambda y \lambda x. [\text{Max } d_1(G(x)(d_1)) > \text{Max } d_2((y)(d_2)) \wedge$$

$$\text{Max } d_2(G(y)(d_2)) \geq d_{\text{std}}$$

$$\text{c. } [\![\text{(7a)}]\!] = \text{Max } d_1(\text{gao-du}(\text{John}')) \geq d_1 > \text{Max } d_2(\text{gao-du}(\text{Mary}')) \geq d_2 \wedge$$

$$\text{Max } d_2(\text{gao-du}(\text{Mary}')) \geq d_2 \geq d_{\text{std}}$$

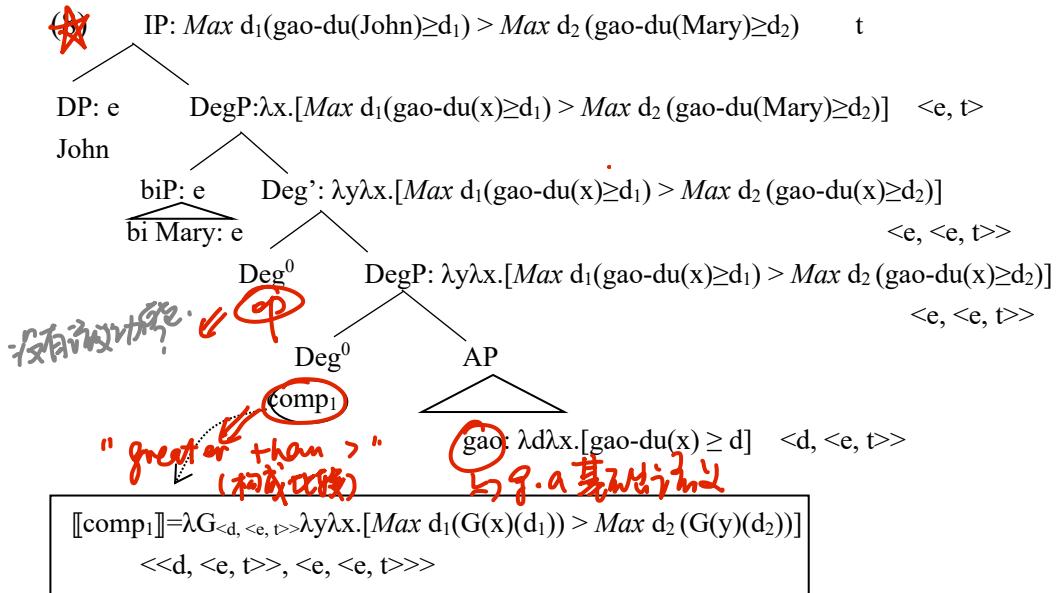
(6a) and (7a) belong to phrasal comparatives with no differential phrases, so that the functions denoted by “comp” and “geng” in (6b) and (7b) encode no degree variables corresponding to differential phrases. Since “bi(than)” is semantically vacuously, “biP” in these two cases should resemble NP rather than CP in semantics, and “ λy ” is adopted to indicate the phrasal status of “biP”. To recapitulate, “comp” denotes a function of three-place, which absorbs gradable adjectives, individual y, and individual x. “Max” represents a maximal operator in the sense of Rullmann(1995) and Lin(2009), which functions to ensure the degree identified by “G(x)(d₁)” refers to

有级的形容词要带个度量

复读机，复读一边为什么要有comp这个可能是空的位置，因为语义计算对不上，别复读了，球球了。

“Comp” : 7
(greater than meaning)

the real height of “x”. Suppose John’s height is 1.8m, then “ $G(x)(d_1)$ ” can be translated into “height (John)=1.8m $\geq d_1$ ”. The Max operator will assign “1.8m” to “ d_1 ”, i.e. the real height of John. Compared to “comp”, “geng” carries an extra evaluative meaning, translated as “ $\text{Max } d_2(G(y)(d_2)) \geq d_{\text{std}}$ ” in (9b). “ $\text{Max } d_2(G(y)(d_2)) \geq d_{\text{std}}$ ” is paraphrased as “the maximal degree of y exceeds or equals to the contextual standard degree”. With that said, (6c) as the final translation of (6a) is paraphrased as “the maximal degree to which John is tall is greater than the maximal degree to which Mary is tall.” And (7c) is paraphrased as “the maximal degree to which John is tall is greater than the maximal degree to which Mary is tall and the maximal degree to which Mary is tall exceeds or equals to the context standard degree”. For a clearer view of how (6c) is computed, (8) is offered as a sample.



(6a) and (7a) only exemplify the simplest version of Mandarin comparatives. On the basis of them, two more variants deserve a deeper exploration. One is comparatives with differential phrases, i.e. (3a) and (3b), which is subscribed as “ comp_2 ”; the other is comparatives with “bi(that)” selects a clause as complement, subscribed as “ comp_3 ”. As differential phrases act as an optional argument to the function denoted by Deg^0 heads, the lexical entry of “ comp_2 ” and “ geng_2 ” can be achieved by a simple operation of supplementing (6b) and (7b) with an extra degree variable, that is (9a) and (9b). For the existence of differential phrases, comparatives express kind of meaning that requires the degree of referent must be equal to or greater than the summation of the degree of standards and the degree of differential phrases, hence the strict partial relation “ $>$ ” is replaced by partial relation “ \geq ”. Same supplement applies to (9b) as well.

- (9) a. $[\text{comp}_2] = \lambda G_{<d, <e, t>>} \lambda d \lambda y \lambda x. [\text{Max } d_1(G(x)(d_1)) \geq \text{Max } d_2(G(y)(d_2)) + d]$ 弱智博士少写了一个
b. $[\text{geng}_2] = \lambda G_{<d, <e, t>>} \lambda y \lambda x. [(\text{Max } d_1(G(x)(d_1)) \geq \text{Max } d_2(G(y)(d_2)) + d) \wedge \text{Max } d_2(G(y)(d_2)) \geq d_{\text{std}}]$ \lambda d

Sometimes, “bi(that)” is argued to select a reduced clause as complement, e.g. multiple topics comparatives and verbal comparatives mentioned in chapter three, where in the former one, temporal adverbs “zuotian(yesterday)” and locational PP

“zai xuexiao(at school)” indicate the existence of AP “kaixin(happy)” and in the latter one, “pao de(run)” indicates the existence “kuai(fast)”. Semantically speaking, **both English and Mandarin comparative clauses denote a type of $\langle d, t \rangle$** , so the comparative clauses of multiple topics comparatives and verbal comparatives project a full form like (10a) and (10c).

Nevertheless, Mandarin comparative clauses resemble gapless relative clauses 这里认为biP instead of adjunct relative clauses. English comparative clauses undergo a process of relativization specific to the adjunct ones, where in (10b) and (10d), they derive into a $\langle d, t \rangle$ type property by wh word movement. “how” or “which” moves from the 语义类型是
 $\langle d, t \rangle$ 并且解释为什么。 adjunct position into the specifier of CP, leaving a trace at situ. This trace denotes a d type argument, saturating the degree variable of “happy”. “how” or “which” as an operator, will bind the degree argument again by “ λ - abstraction”. For Mandarin comparative clauses, they present similarities with gapless relative clauses in disallowing long-distance relativization. Though denoted a $\langle d, t \rangle$ type property, Mandarin involves no wh movement in the derivational processes. As shown in (10a) and (10c), “pos” bears to shift “kaixin(happy)” into a $\langle e, t \rangle$ type predicate by offering “kaixin(happy)” a degree argument, which is bound by an existential operator. When the semantic computation ends up with a t type proposition, the degree argument bound by “ \exists ” will cause a semantic tautology and it does not conform to the semantic type shared by relative clauses, so that “ \exists ” will be replaced by “ λ ” and a $\langle d, t \rangle$ type property of degree is derived out.

- (10) a. bi [CP λd Mary zutian zai xuexiao pos kaixin] $\langle d, t \rangle$
 b. than [how; to which; Mary was t_i happy at school yesterday] $\langle d, t \rangle$
 c. bi [λd Mary pao de pos kuai] $\langle d, t \rangle$
 d. than [how; to which; Mary ran t_i fast] $\langle d, t \rangle$

Since “bi(that)” in these two cases introduces a property of degree, the corresponding adjustment must be implemented to the original comparative morphemes. As shown in (11a) and (11b), the second argument changes into a property of degree on a par with the change from “bi+NP” into “bi+CP”. Theoretically speaking, the argument “D” in these two cases can be any properties of degree, not confined to the one denoted by “G”, and subcomparatives in English prove this. But **subcomparatives in Mandarin fail to be well-formed**, and in chapter three, the author argues that the failure of them has a close relation to the topic prominent feature of Mandarin, so that they are ruled out because gradable adjectives carry a comment feature, which causes a conflict with the topic feature of “biP”.

- (11) a. $[\text{comp}_3] = \lambda G_{\langle d, e, t \rangle} \lambda D_{\langle d, t \rangle} \lambda x. [\text{Max } d_1(G(x)(d_1)) > \text{Max } d_2(D(d_2))]$ 不是最终版本，最终版是13
 b. $[\text{geng}_3] = \lambda G_{\langle d, e, t \rangle} \lambda D_{\langle d, t \rangle} \lambda x. [\text{Max } d_1(G(x)(d_1)) > \text{Max } d_2(D(d_2)) \wedge \text{Max } d_2(D(d_2)) \geq d_{\text{std}}]$

Depending on (11) alone still cannot derive out the meaning of multiple topic comparatives, for neither “comp₃” nor “geng₃” offers a position for temporal argument or location argument. Given the fact that temporal argument and location argument appear optional to adjectives, a full version of semantic representation of gradable adjectives should cover them. Take “kaixin(happy)” as an example, these two types of arguments are encoded into its lexical entry, which are respectively

symbolized by “l” and “i” in (12a), and “l” for location, “i” for time. With (12a), (10a) is revised into (12b) via (12a) successively undergoing “pos”, “zai xuexiao (at school)” and “zuotian(yesterday)”.

- (12) a. $\llbracket \text{kaixin} \rrbracket = \lambda d \lambda l \lambda i \lambda x. [\text{happiness}(x, i, l) \geq d]$
 b. $\llbracket (10a) \rrbracket = \lambda d. [\text{happiness}(\text{Mary}', \text{yesterday}', \text{at school}') \geq d]$

On a par with adjustments to the lexical entry in (12a), (11a) needs to be supplemented with temporal variable and location variable, so (13a) is achieved (cf. Lin, 2009). It should be noted that both temporal argument and location argument are optional to gradable adjectives, so that they can be omitted without any influence to the well-formedness of positive forms. But when it comes to comparatives, temporal argument in matrix clause and in comparative clause must occur in a pair, so does location argument⁸. The final version of semantic representation of multiple topic comparatives thus can be inferred as (13b), and interpreted as “the maximal degree to which John was happy at home today is greater than the maximal degree to which Mary was happy at school yesterday”.

- (13) a. $\llbracket \text{comp}_4 \rrbracket = \lambda G_{<d, <l, <i, <e, t>>>} \lambda D_{<d, t>} \lambda l \lambda i \lambda x. [Max d_1(G(x)(i)(l)(d_1)) > Max d_2(D(d_2))]$
 b. $Max d_1(\text{happiness}(\text{John}', \text{today}', \text{at home}') \geq d_1) > Max d_2(\text{happiness}(\text{Mary}', \text{yesterday}', \text{at school}') \geq d_2)$

As for verbal comparatives, verb “pao(run)” can be treated as an argument of “kuai(fast)”. Just like “gao(tall/high)” in Mandarin, performing to **modify height**, **你也知道参数多啊 grade, blood pressure, temperature, etc.**, “kuai(fast)” is able to modify all verbs associated to speed, such as “you(swim)”, “kai(drive)”, “fei(fly)”, even “chi(eat)”. To manifest the semantic contribution of verbs, **as well as others bearing the same function to identify the concrete dimension of gradable adjectives, they are analyzed into a variable symbolized by “v” in (14a)**. Given the fact that one single adjective has the ability to modify more than one dimension, arguments of “v” type should not be omitted in both syntax and semantics. whereas arguments of this type are optional rather than compulsory to gradable adjectives. The reason may be related to the default collocation between adjectives and their modifiees. As in Mandarin, “gao” in “ta hen gao(he is tall)” refers to height by default, “piaoliang(beautiful)” in “ta hen piaoliang(she is beautiful)” refers to appearance by default, and “kuai(fast)” in “ta hen kuai(he is fast)” refers to the speed he runs by default.

- (14) a. $\llbracket \text{kuai} \rrbracket = \lambda d \lambda v \lambda x. [\text{fastness}(x, v) \geq d]$
 b. $\llbracket \text{comp}_5 \rrbracket = \lambda G_{<d, <v, <e, t>>>} \lambda D_{<d, t>} \lambda v \lambda x. [Max d_1(G(x)(v)(d_1)) > Max d_2(D(d_2))]$
 c. $Max d_1(\text{fastness}(\text{John}', \text{pao}') \geq d_1) > Max d_2(\text{fastness}(\text{Mary}', \text{pao}') \geq d_2)$

The addition of verb argument into the representation of gradable adjectives leads to a minute revision to “comp₃” in (11a), same type of “v” arguments being supplemented in (14b), thus verbal comparatives can translated into (14c), and interpreted as “the maximal degree to which John runs fast is greater than the maximal degree to which Mary runs fast”. It should also be noted that “v” symbolizes

⁸ “jintian(today)” and “xianzai(now)” are exceptional. they can be omitted when occurring in matrix clauses (Tsao, 1989).

kind of arguments instantiated as verbal heads like “pao(run)” rather than a compound form like “pao de(run de)”, where in the latter, “de” is semantically vacuous and its compounding with “pao(run)” traces back to the result of syntactic movement.

Mandarin is acknowledged to adopt multiple components to realize “greater than” relations. Except for “geng” and “comp”, the set of comparative Deg⁰s contains “hai(more)”, “bijiao(more)”, “shaowei(slight-more)”, “duo(more)”, etc., all of which share a common semantic nucleus of “greater than”, but differ from each other in secondary meanings they express or special syntactic distribution with other components. In Section 4.2.2, we will dig into hallmarks of these comparative morphemes.

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Deg⁰都有啥

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Larson (1991) proposed a version of semantic interpretation of comparative meanings in accordance with the DegP-shell structure. He develops his derivation from the strategy of Klein (1980, 1991) via a utilization of negative operator. As mentioned in chapter two, Larson does not get himself involved with differential phrases and his semantic representation of (15a), i.e. (15b) seems leave no possibility to incorporate differential arguments. One possible revision may be found in Schwarzschild (2005, p212), but with a drop of negative operator and regarding DiffPs as a generalized quantifier.

自己的成果有了，踩一脚前人，落井下石

- (15) a. John is (2 inches) taller than Mary.
b. $\exists d [\neg \text{tall}'(\text{Mary}, d) \wedge \text{tall}'(\text{John}, d)]$

In order to plug arguments denoted by differential phrases into the meaning of comparatives, a lexical entry of comparative morphemes as a strict partial function is adopted in this dissertation. Without too much burden, “comp₂” in (9a) is perceived as a variant of “comp₁”, solving the differential problem.

4.2 DegP and Comparative Morphemes

4.2.1 What is DegP

Abney in his famous doctoral dissertation “The English Noun Phrase in its Sentential Aspect” proposes two hypothesis, one is the well-known DP hypothesis, the other is DegP hypothesis, which states that DegP serves as a functional projection to license adjectives in syntax, and it embraces components like “this, that, so, as, too, how, enough, er, more”. Besides, it is assumed to adjoin at the above of AP, with modifiers like quantifier phrase “much” in (16a), measure phrase “six feet” in (16b), and differential phrases “2 inches” in (16c), base-generated at the specifier of DegP. The semantic requirement to bind the “degree” of gradable adjectives serves as the motivation behind DegP. Abney’s thought gets inherited and revised by Corver (1990, 1997), who contributes to separate Q⁰ from Deg⁰ by assuming two layers of functional projections (degree split system) above AP, i.e. [DegP [QP [AP ...]]]. QP acts as a projection accommodating comparative morphemes like “more, less, as”, while DegP performs to hold positive forms like “so, too, how, as”. Corver argues that Q⁰ in positive construction is always empty with measure phrases generated at the specifier of DegP, that is (17a). When an overt morpheme like “er”, “more”, etc. occupies Q⁰,

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DegP will be defined unnecessary so (17b) project no DegP above QP.

- (16) a. [DegP [QP much] [Deg' Deg⁰ too [AP deep]]]
- b. [DegP [MP six feet] [Deg' Deg⁰ as [AP tall]]]
- c. [DegP [DiffP 2 inches] [Deg' Deg⁰ er [AP tall]]]
- (17) a. [DegP [MP two meters] [Deg' too [QP e [AP tall]]]]
- b. [QP [DiffP 2 inches] [Q' er [AP tall than Mary]]]]

Kennedy (1997), Svenonius&Kennedy (2006), Levin&Kennedy(2007), Grano&Kennedy (2012), etc. construct the semantic representation of positive forms and comparative forms on the basis of the two layers of structure of Corver. In syntax, Kennedy *et al.* argue that Deg⁰ and Q⁰ cannot be conflated into one because adjectives like “young”, “short”, “light” etc., fail to co-occur with measure phrases in positive forms but encounter no problem when they are in a comparative form, see phrases in (19a)-(19d).

- (18) a. [DegP [MP six feet] [Deg' pos_{meas}[AP tall]]]
- b. [DegP [MP Ø] [Deg' pos_{non-meas}[AP beautiful]]]
- c. [DegP [DiffP two meters] [Deg' pos [QP er [AP tall]]]]
- (19) a. *six feet short
- b. six inches shorter
- c. *2 years young
- d. 2 years younger

Kennedy *et al.* assumes there is a null morpheme “pos” universally adjoined 规则插眼 above AP or QP, which can be further divided into measurable “pos” and non-measurable “pos”, the former at the complement position accommodating measurable adjectives or QP, and at the specifier position accommodating measure phrases or differential phrases, respectively shown in (18a) and (18c), while the latter only takes non-measurable adjectives as complements and allows no measure phrases, e.g. (18b). The semantics of “pos” is defined as a three-place function “ $\lambda G_{<e, d>} \lambda d \lambda x. [G(x) \geq d]$ ”, which successively takes an adjective argument, a degree argument and an individual argument. And the semantics of “er” is a measure of change function, “ $\lambda G_{<e, d>} \lambda y \lambda x. [G^{\uparrow}_{G(y)}(x)]$ ”, successively taking an adjective argument and two individual arguments.

Departing from the logic behind functional projection in formal linguistic field, a lexical NP, VP and AP must be respectively licensed by a functional D⁰, I⁰ or Deg⁰ in syntax, and then project themselves into DP, IP and DegP, schematically (20): 规则插眼

- (20) a. [DP D⁰ [NP ...]] restrict referentiality the/a
- b. [IP I⁰ [VP...]] restrict time ed
- c. [DegP Deg⁰ [AP...]] restrict degree so, this, too, more, as

These three types of functional morphemes are each instantiated as “the/a”, “-ed” and “so/er” in English. They share a common semantic function to bind the referentiality of lexical component they select. “referentiality” embodies itself respectively as the referent of nominal phrases, as the time of events (denoted by verbs), and as the degree of gradable adjectives. If such a setting applies universally, it should be plausible to extend it to Mandarin, and the facts present by Mandarin in (21) favors this. As shown, “zhe” in (21a) is expected to identify the referentiality of

nominal expressions (Huang et al., 2009; An&Pan, 2012, etc.), “le” in (21b) to anchor the time of event denoted by verb “pao(run)”(Deng, 2003; Li&Xu, 2010), as well as “zheme/name” in (21c) to bind the degree of gradable adjective “gao(tall)”.

- (21) a. [DP D⁰ zhe(this) [CIP C¹⁰ ge [NP nanhai(boy)]]]
 b. [IP le [VP pao(run)]]⁹
 c. Mary meiyou John [DegP Deg⁰ zheme/name [AP gao]]
 Mary not-have John this/that tall
 ‘Mary is not as tall as John.’

Mandarin, in contrast with English, employs no “too...to” constructions, “so...that” constructions or “A enough” constructions, but she does own degree adverbs expressing a similar meaning, for instance, “too” is translated into “tai” in Mandarin, “so” into “ruci” and “enough” into “zugou”. Whereas, these words are traditionally categorized as degree adverbs. Besides, if the null morpheme “pos” defined by Kennedy is universal to gradable adjectives across language, there should be one in Mandarin. Considering the parallelism between “pos” and “hen”, scholars analyze “hen” as the explicit instantiation of “pos” in Mandarin, and meanwhile, there may exist an implicit “hen” in certain cases (cf. Kennedy, 2007; Liu, 2010; Zhang, 2015). For the moment, we just give out a conclusion that “pos” applies to Mandarin positive forms as well, and it universally occupies the head of DegP. The explicit “hen” still maintains a role as degree adverbs, but is undergoing a grammaticalization, while the implicit “hen” does not exist. The argumentation on details will be unfolded in chapter six, where problems on whether or not degree adverbs fall in the set of degree heads as well as the relations among “hen” and “pos” will be dissected.

解释pos是跨語言的存在，在中文也引入

位置插眼

4.2.2 Comparative Morphemes in Mandarin

4.2.2.1 Parallelism between much/more/most and hen/geng/zui

English adopts one more set of degree adverbs “much, more, most” to express positive, comparative and superlative meanings, except for the famous “Ø, er, est”. Although “more” may be analyzed into a compound consisting of “er” and “much”(Bresnan,1973,1975; Bobaljik, 2012; Dunbar&Wellwood, 2016), many scholars do not agree with this analysis and equalize “more” with “er” in both syntax and semantics (Cresswell 1977, von Stechow 1984; Kennedy, 1997, etc.). Kennedy 位置插眼 (1997) places “more” in the head position of DegP, bearing a function to identify the “greater than” relation between referent and standard.¹⁰ “more”, in a classical part of speech, is grouped into adverbs¹¹, as which Mandarin “geng(more)” enjoys a same categorization. This may conspire to clear the way for regarding “geng(more)” as the equivalent of “more” and positing it at the head of Mandarin DegP. In addition,

⁹ “le” is customarily analyzed to occupy the head of Aspectual phrase (Jin, 2003), here it is simplified as a past tense, equating to “ed”. For more discussions on the IP layer of Mandarin, Hu, Pan&Xu(2001), Sybesma(1997, 2007), Lin(2006), Tsai(2008), etc.

¹⁰ In a Bresnian way, “more A” should be the base form and “er A” is derived through an additional compulsory operation of deleting “much” before adjectives like “tall”. Yet discrepancies between “more A” and “er A” should not be taken for granted, Wellwood (2019) attempts to analyze “more” as a measure function.

¹¹ Oxford Advanced Learner’s English-Chinese Dictionary, the 7th edition.

Mandarin and English present a high similarity in expressing positive meanings, comparative meanings, equative meanings and superlative meanings. Mandarin equative forms parallel to English in the manipulation of two types of markers with “as/he” introducing Standard and “as/yiyang” marking adjectives, see (22). Similar corresponding is also found in superlative forms, i.e. (23), with a single adverb “most/zui” adjoining to adjectives and an optional prepositional phrase supplying for the comparison class.

- (22) a. John he Mary yiyang congming.
 John and Mary as intelligent

b. John is as intelligent as Mary.

- (23) a. zai 1 ban, John zui congming.
 in One Class John most intelligent

b. John is the most intelligent in Class One.

Except for the analogy from English superlative forms and equative forms to Mandarin ones, Mandarin “geng(more)” and English “more” share similarity in constituting comparatives without an overt “bi(than)-phrase”. As shown in (24)-(26), “geng(more)” independently constitutes comparative constructions and expresses “the degree to which x is A (or gradable predicates) increases/decreases”, and what “increase/decrease” alludes to here presupposes a start point, which turns to “biP” for being anchored. From (25a) to (25c), an implicit “bi+yiqian(before)” can be uniformly supplemented, and the same supplementation applies to (26a) to (26c), via an insertion of standard arguments, which are picked out from the complementary set of referent arguments, that is, “Tian’an men Buildings in holiday” and “Tian’an men buildings not in holidays” in (26a), “bring him” and “not bring him” in (26b), “John comes” and “John doesn’t come” in (26c).

- (24) a. John geng congming.
 John more intelligent

b. John is more intelligent.

- (25) a. zhixia, wo dui ta geng chongbai le.

this time, I to him more admire Asp

‘For this time, I will be more admirable to him than before.’

- b. yushui guohou, hua-cao gengjia jiaonen le.

rain after flower-grass more delicate Asp

‘After the rain, flowers and grasses become more delicate.’

- c. gege dedao jingli de qizhong, gongzuo gengjia nuli le.

brother get manager de appreciation job more diligent Asp

‘After brother got the appreciation from his manager, he became more diligent to his job.’

- (26) a. jieri li de tian’an men chenglou xiande gengjia xiongwei zhuangli.

holiday Loc de tian’an men building look more elegant

‘Tian’an men building in holiday looks more elegant than in normal days.’

- b. dai ta qu zhishi weile rang qifeng geng qinqie yixie.

bring him along only for let air more cordial a bit

‘Bringing him along is to make the air a bit more cordial only.’

- c. John lai de-hua geng hao, bulai ye meiyou guanxi.
 John come topic-marker more good not come either not matter
 ‘If John came, it would be better, but if he did not, it would be alright as well.’

Some may deny (24) and (25) as comparatives since what (24) and (25) intuitively stress is a “degree increase” meaning rather than a comparative meaning. This doubt seems irrational because the prerequisite to implement the increase of degree necessitates a comparative relation that the degree of Referents is greater than the degree of Standards. As displayed in (24) and (25), the comparison between referents and standards actually refers to a comparison of the same target in present time and in other time (before, after, even a time in a possible world) or just alternative others in the same comparison class. What listed in (24) and (25) are also patterns of comparatives and lead to a conclusion that **Mandarin employs two types of single strategies to construct comparatives, i.e. preposition “bi(than)” as marker of Standards and adverb “geng(more)” as marker of adjectives.** From the sight of semantics, this conclusion comes out to be true for the reason that Mandarin demands both “bi(than)” and “geng(more)” to realize Standard introduction and “greater than” meaning. But regarding the syntax of analytic Mandarin, two markers look like a redundant strategy as any of them alone can help comparatives to stand out from the ocean of sentences. More similarities between Mandarin “geng(more)” comparatives and English “more” comparatives are observed in (27)-(31):

- (27) a. *John bi Mary hen geng congming.
 John than Mary very more intelligent

b. *John is very more intelligent than Mary

- (28) a. John bi Mary geng gao yidian/yixie

John than Mary more tall a little/a bit

b. John is three kilos more heavy than Mary.

- (29) a. John bi Mary geng + jia congming.

John than Mary more+ add intelligent

b. John is [er much] intelligent than Mary 夹带私货奥

- (30) a. xiangbi jufa-ke, geng + duo ren lai ting yuyike.

compared to syntax class more+many people come attend semantic class

b. [er many] student attended Semantic class than Syntax class.

- (31) a. John bi Mary geng congming. ⇒ Mary hen congming.

John than Mary more intelligent Mary very intelligent

‘John is more intelligent than Mary, and Mary is intelligent.’

b. John is more sad than Mary is happy.

c. John is more brilliant than Mary is.

Firstly, comparatives with “geng(more)” and “more” discriminate against positive modifiers like “hen(very)” and “very”, as shown in (27a) and (27b); **Secondly**, what “geng(more)” and “more” implement is just “greater than”, leaving the room for their differentials targeted by differential phrases like “yi-dian/xie(little/bit)” in (28a), and “three kilos” in (28b); **Thirdly**, as Wellwood (2019) suggests “more” can decompose into “er much” and “er many” when followed by adjective “intelligent”

强行解释为什么
24和25是
comparative而
不是degree
increase

规则插眼

夹带私货奥

akin是个什么玩意

and countable “students”, akin to which Mandarin own similar collocations by “geng+jia(add)” modifying “congming(intelligent)” and “geng+duo(many)” modifying “ren(people)”, listed in (29) and (30); Fourthly, both “geng” and “more” present particularities compared to customary patterns of comparatives. It is “more” not “-er” that co-occurs with extreme adjectives in (31c), where “brilliant” equals to “very+good”(Morzycki, 2012, 2015), or collocates with deviant comparative patterns like (31b). (31c) and (31d) share to indicate the positive meanings of “Mary is happy” and “Mary is brilliant”, while for Mandarin “geng(more)”, it also indicates a positive meaning of “Mary is tall”.

Identical as they may superficially be, “more” are not indifferent from Mandarin “geng(more)”. One of the most prominent distinctions lies on that English comparatives parametrically take a double marker strategy that two types of markers are manipulated, so that “more” behaves obligatory in syntax, while Mandarin comparatives adopt a single marker strategy that either “geng” or “bi” has the independent capability to fulfill comparatives in syntax.

规则插眼

复读句法上中文
比较是单mark

As far as (31) is concerned, “geng” and “more” behave specially in comparatives, but their special points are different. Mandarin “geng” additional indicates an intuition that “Mary is intelligent”, while English “more” express no positive meanings by itself but tends to co-occur with extreme adjectives, carrying positive meanings by themselves. “more” maintains a neutral meaning as “greater than”. But its equivalents in Mandarin usually carry extra meanings or have a special requirement in syntax, such as “geng(more)” indicating a positive meaning of Standards, “hai(more)” expressing a sense of anti-expectation, “shaowei(slightly-more)” highlighting a gap in a slight degree, “bijiao (more)” can only occur in a construction where Standards are introduced through topic markers like “bijqi(compared to)”. If the parallelism between English and Mandarin comparatives is strictly respected, Mandarin should have a component in equation to “more/er” with a pure meaning of “greater than”. Therefore, we assume a null comparative morpheme “comp” in (4b), realizing the pure “greater than” just like “er/more” in English.

想比英文more
的单纯，中文的
对应词一般都一
些暗指含义

对于comp位置
null的存在性的
又一个论证

- (32) a. *John bi Mary geng gao 2 mi.

John than Mary more tall 2 meter
'John is 2 meters taller than Mary.'

- b. *John he Mary yiyan gao 2 mi.

John and Mary as tall 2 meter
'John is 2 meters as tall as Mary.'

- (33) a. My coat is 2 dollars more expensive than yours.

b. This chunk of pork is 2 kgs more heavy than that one.
c. John is 6 feet as tall as Mary.

- (34) a.*John bi Mary geng congming henduo.

John than Mary more intelligent many
b. John is much/a little/a bit more intelligent than Mary.

Although “geng(more)” and “more” leave the room for the modification of differential phrases, the types of DiffPs modifying English “more” comparatives are much more than Mandarin “geng” comparatives. In (32a), “geng” refutes to be

更和more跟diffP
的时候，英文的自
由度更高

modified by exact DiffPs and same constraint applies to equative morpheme “yiyang(as)” in (32b). But “more” in (33a) and (33b) encounter no problem and similarly English equative morpheme “as” is able to co-occur with DiffPs. Besides, “geng” fails to be modified by large degree vague DiffPs like “henduo(many)” in (34a), while “more” is free to large or small degree vague DiffPs in (34b). But these distinctions do not challenge the parallelism between “geng” and “more”. Actually, the argument status of “much/a little/a bit” is not as reliable as Mandarin “yidian(bit)/henduo(many)” as the latter appears independently in an object position like “John chi-le yidian/henduo(??John ate a bit/many)”。
更多的diffP有的时候不能是大O，但是没有解释为什么

- (35) a. John yuqi shuo shangxin, dao buru shuo kaixin.
 John less is sad more is happy
- b. John is more happy than sad.
- c. John is more happy than Mary is sad.

English allows a comparison of anomaly between antonyms like (35b) and (35c), “more” is adopted in this kind of comparatives to realize the comparison between the degree to which John is happy and the degree to which Mary is sad. Contrastingly, Mandarin can only realize such kind of comparative meanings via two clauses, see (35a), as Mandarin prohibits components with comment feature from appearing inside comparative clauses, a conclusion demonstrated in chapter three.
反义词比较，英文可以在一句话里，中文得两个从句

To distinguish “geng(more)” as a functional head of DegP from as a degree adverb is hard as many of tests apply to both of them. Despite that, “geng” and “geng-like” components present three aspects of differences from typical degree adverb like “feichang(very)”. Initially, “geng” and “geng-like” components allow no repetitive forms, that is (36a), while for “feichang(very)”, it can be iterated in a free way. It should be noted positive degree adverb “hen(very)” in (36c) allows no repetitive form either. We will come back to the distinction between “hen(very)” and “feichang (very)” in chapter six. In (36a), even disyllable “bijiao(more)” and “shaowei(slightly more)” refute to be repeated.

- (36) a. *John bi Mary geng-geng/hai-hai/bijiao-bijiao/duo-duo gao.
- b. John feichang feichang gao.
- c. *John hen-hen gao.

Furthermore, “geng(more)” and “geng-like” components can be modified by differential phrases in (37a), and if what degree semanticists advocate is right, “geng(more)” must be a degree head, functioning to introduce differential phrases. By contrast, (37b) tells that “feichang(very)” refutes to co-occur with any types of differential phrases, even measure phrases, so does “hen(very)” in (37c).

- (37) a. John bi Mary geng gao yidian.
- b. *John yidian/henduo/2 mi feichang gao.
- c. *John 2mi hen gao.

Finally, In analogy with another typical functional morpheme “le(Asp)”, “geng(more)” parallels to “le(Asp)” in refuting to be questioned by wh word, that is (38a). In degree constructions, “duo (how much)” is often cited to interrogate degree adverbs like “feichang(very)” in (38b). In this aspect, English “more” refutes to be interrogated in the same way as “geng”, see (38c).

- (38) a. *John bi Mary geng gao? → *John bi Mary duo gao?
 John than Mary more tall John than Mary more tall
 ‘John is taller than Mary’ “*how is John tall than Mary?”
 b. John feichang gao. → John duo gao?
 John very tall John how tall
 ‘John is verty tall.’ ‘How tall is John’
 c. John is more heavy than Mary. → *how is John heavy than Mary.

In a nutshell, the parallelism between English and Mandarin degree constructions is deemed reliable, specifically for equatives and superlatives, both employing similar components and patterns to achieve their own meanings. Mandarin comparatives are hypothesized to conform to this parallelism but with a glaring feature that multiple components are utilized to implement the form and meaning of English “more”, and among them, a null “comp” turns out to be indispensable. 虽然有这么多大小小的区别，但是我们的理论依旧可靠哦= =

4.2.2.2 Null “comp(more)” as a Comparative Morpheme

When it comes to the null comparative morpheme “comp”, more evidence must be supported to testify its existence. Regarding the null nature of “comp” in syntax, it is tentatively assumed to exert no impact upon the selection of DiffP in comparatives, unlike “geng(more)” or “shaowei (slightly more)” restricting DiffP to be vague small degree, or “duo(more)” restricting DiffP to be exact numeral QP. This hypothesis is borne out via (39a) and (39b), where “gao(tall)”, as a measurable adjective, tends to accept modifications from exact DiffP “2 limi”, small degree vague DiffP “yidian/yixie”, or large degree vague DiffP “henduo”, while “piaoliang(beautiful)”, as a non-measurable adjective, gets aligned with modifications from small degree vague DiffP, large degree vague DiffP as well as times.

null comp对diffP 没有选择性

- (39) a. John bi Mary comp gao 2 limi/yidian/yixie/henduo.
 John than Mary more tall 2 cm a little some many
 ‘John is 2 cm/a little/much taller than Mary.’
 b. Mary bi Lucy comp piaoliang yidian/yixie/henduo/haoduobei
 Mary than Lucy more beautiful a little some many times
 ‘John is a little/much/many times more beautiful than Mary.’

Among various kinds of differential phrases, the particularity of “henduo(many)” deserves more appreciations because it can refer to gaps denoted by both measurable gradable adjectives and non-measurable ones, for instance, “gao henduo(much taller)” in (39a) and “piaoliang henduo (much more beautiful)” in (39b), meanwhile it rejects to collocate with comparative morphemes such as “geng(more)”, “bijiao(less more)”, “shaowei(slighly more)” or “hai(more)”, e.g. (40a) and (40b). In saying so, it is safe to conclude that the null “comp” can be proved existential by a test on whether “henduo(many)” can be supplemented or not.

在众多diffP 中，“很多”比较特殊，可以跟可测的adj也可以跟不可测的adj 规则插眼

- (40) a. *John bi Mary geng/shaowei/hai gao henduo.
 b. *bi qi Mary, John bijiao gao henduo.

In the field of Mandarin degree constructions, two types of null morphemes are assumed, one is the null positive head “pos”, the other is the null comparative head “comp”. For cases listed in (41a), (41b) and (41c), they are all ambiguous between

positive meaning and comparative meaning. But once “henduo(many)” is added, the positive meaning of (42a), (42b) and (42c) disappears. (42a) means to ask whether “John” or “Mary” that is much taller than the other one. (42b) highlights that John is the much taller one or both of them can be the much taller one. (42c) only indicates a comparative meaning by stressing John is much taller.

- (41) a. John he Mary, shui pos/comp gao?
 John and Mary, who pos/ more tall
 ‘John and Mary, who is tall/taller?’
 - b. John comp gao/ tamen dou pos gao.
 John more tall they all pos tall
 ‘John is taller/Bothof them are tall.’
 - c. biqi Mary, John pos/comp gao.
 compared to Mary, John pos/more tall
 ‘compared to Mary, John is tall/taller.’
- (42) a. John he Mary, shui gao henduo?
 ‘John and Mary, which one is much taller ’
 - b. John gao henduo/tamen dou gao henduo.
 ‘John is much taller/both of them are much taller’
 - c. biqi Mary, John gao hen duo.
 ‘compared to Mary, John is much taller.’

Since “comp” acts as a member of Deg^0 , it should parallel to “geng(more)”, on the one side, cannot compete to land at Deg^0 positions kept for gradable adjectives in positive forms; on the other side, must select a complement typed $\langle d, \langle e, t \rangle \rangle$. As (43a) displays, “geng(more)” fails to occur with “2 mi gao(2 meters tall)” because **measure phrase “2 mi(2 meter)” indicates the existence of a null positive morpheme “pos”, and “pos” conflicts with “geng(more)” in semantics.** (43b) tells that Deg^0 has already been occupied by positive “name(so)” so that comparative morpheme cannot land at the same position. In (43c) and (43d), intransitive verbs like “ku(cry)”, adjectives plus a nominal marker “gao-de(tall)” are typical one-place predicate with a $\langle e, t \rangle$ type, causing a type mismatch with “geng(more)”.

这是为何，感觉在胡扯，2m出现在compara里也没毛病

- (43) a.*John [DegP geng [DegP 2 mi [Deg pos [A' gao]]]].
 John more 2 meter tall
- b.*John meiyou Mary [DegP geng name [AP gao]].
 John not-have Mary more that tall.
- c. *John [IP geng [VP ku-le]].
 John more cry-Asp
- d. *John [DegP geng [AP gao-de]]¹².
 John more tall

Since “geng(more)” refutes to occur in sentences listed in (43), “comp” should present a similar distribution. But Due to the null nature of “comp”, it is hard to judge whether or not the failure in (44a) - (44b) is caused by “comp”. To make the argumentation more reliable, “henduo(many)” is added to (44) as an auxiliary method

¹² “de” here refers to nominal marker “的” not resultant marker “得”, which can be found in a pattern like “John shi gao de(John is tall)”.

to support this judgment in the light of the unique consistency between “henduo(many)” and “comp”. Under no surprise, sentences in (45) are all illicit. Therefore, it is safe to conclude the null “comp” is qualified as a comparative morpheme for it complies the idiosyncratic syntactic distribution and semantic restriction owned by comparative morphemes like “geng(more)”.

- (44) a. John comp 2 mi gao .
- b. John meiyou Mary comp name gao.
- c. John comp ku-le.
- d. John (shi) comp gao-de.

- (45) a. *John comp 2 mi gao henduo.
- b. *John meiyou Mary comp name gao henduo.
- c. *John comp ku-le henduo.
- d. *John comp gao-de henduo.

Liu(2007), Xiang(2005), Guo(2012), Grano&Kennedy(2012), etc. deem Mandarin suffix “chu(exceed)” and “guo(exceed)” as instantiations of Deg^0 , occupying the head position of DegP , since “chu” and “guo” appear in patterns exclusive to overt DiffPs and refute to co-occur with degree heads like “geng(more)”. Regarding the optional status of “chu/guo”, they have to assume another null “ \emptyset ” component, functioning to usher in DiffPs in (46a) when “chu/guo” is implicit. Such an analysis faces challenges from at least three aspects: First, as (46a),(46b) and (46c) tells the distribution of “chu/guo” is not universal, only several measurable adjectives like “gao(tall/high)”, “chang(long)”, “kuan(wide)”, etc. allow “chu/guo” to be overt, but left other measurable words like, “pang(fat)”, “zhong(heavy)”, even the antonym of “gao”, i.e. “ai(short)”, and non-measurable adjectives ill-formed. No persuasive reasons are offered to illustrate why “chu/guo(exceed)” has such a distribution.

- (46) a. John bi Mary gao [DegP chu/guo/ \emptyset [DiffP 2 limi]].

John than Mary tall exceed 2 cm

‘John is 2 cm taller than Mary.’

- b. John bi Mary pang *chu/*guo/ \emptyset 10 gongjin.

John than Mary fat exceed 10 kg

‘John is 10 kg fatter than Mary.’

- c. John bi Mary ai *chu/*guo/ \emptyset 2 limi.

John than Mary short exceed 2 cm

‘John is 2 cm shorter than Mary.’

Second, it causes puzzles to the classical comparative pattern in (47). The addition of “chu/guo” into (47) will lead to an ill-formedness. Since “ \emptyset ” is assumed to exist in analogy with “chu/guo”, it should also cause a crash to (47), but its null nature makes the judgment blurred. As the meaning of “greater than” must be implemented in both semantics and syntax, assuming a null morpheme in (47) sounds like the best of a bad bunch. But the problem arises why an overt form of “chu/guo” results in a crash, but a null form “ \emptyset ” does not. Compared to “ \emptyset ”, a null “comp” without overt forms sounds more appropriate than the implicit strategy of “chu/guo” or “geng”.

- (47) John bi Mary gao [DegP *chu/*guo/ \emptyset]

踩一脚前人对出和
过的位置理解不对

First, it is not universal
① not universal

② not universal

类似, 但不

③ “?”

Third, compared to the problematic adherence of “chu/guo” to gradable adjectives, Mandarin does own another type of suffix “le (state of change, Zhang, 1998, 1999; Jin, 2003)”, which is free to cliticize various types of adjectives in (48), where (46a) and (48a) are not only isomorphic in structure but also identical in meaning, hence “le(state of change)” can be assumed to occupy the same Deg⁰ position as “chu/ guo”. Under the framework of Xiang and Grano&Kennedy, DegP is specifically designed to accommodate “chu/guo”, but it turns out that “le (state of change)” becomes an optimal morpheme that lands at this position, because the appearance of “le” is irrelevant of types of adjectives, whereas “chu/guo” is highly limited in distribution.

- (48) a. John bi Mary gao le 2 limi.
- b. John bi Mary pang le 10 gongjin.
- c. John bi Mary ai le 2 limi.

Three key points must be reevaluated in order to tackle with the problem, ① suffixes like chu/ guo/le” are all optional and exert no influence upon the well-formedness of sentences; ② though (46a) and (48) may manifest a relation that “chu/guo/le” can only be successfully inserted with an overt DiffP, it is still not evident enough to secure the hypothesis that DiffP is directly introduced by suffixes “chu/guo/le”. (46b) and (46c) indicate that “chu/guo”, on its own, cannot determine whether it is grammatical to introduce differential phrases or not; ③ the decisive role played by adjectives in the introduction of DiffP should never be neglected.

Taking above three factors into consideration, the combination of “gao” and “chu/guo/le” is deemed as a morphological operation, happening in the lexicon. The ability for “chu/guo/le” to combine with adjectives varies from each other. “le” is more productive than “chu/guo”. As shown in the lexicon of Mandarin, compounds in a pattern of “A+le” are popular, e.g. “gao-le (become-tall)”, “ai-le(become-short)”, “pang-le(become fat)”, “shou-le(become thin)”, “piaoliang- le(become beautiful)”, “chou-le(become ugly)”, and so on so forth. By contrast, the combination between “A” and “guo/chu” is much more constrained than “A+le”, and they are confined to several positive measurable adjectives, such as “gao(tall)”, “chang(long)” and “kuan(wide)”¹³.

Compound “gao-chu/guo/le” deviates from the bare form of “gao” in the aspect that the former acts as a gradable verb that must assign its accusative case to differential phrases so that differential phrases cannot be omitted in these cases. As for the latter, “gao” as an adjective, does not require an obligatory differential phrase. The difference between “gao-chu/guo/le” and “gao” also explains why the former refutes to co-occur with “geng(more)”. In (49a), it is observed that “gao-chu/guo/le” can be modified by all three types of differential phrases, the exact “2 limi(cm)”, the small degree vague one “yidian(bit)”, and the large degree vague one “henduo(many)”, and the occurrence of them is obligatory. Among all comparative morphemes, only

¹³ The difference between “chu” and “guo” is intentionally neglected here. In Min dialect, it usually presents a comparative construction in the form of (15b), which may explain why (15b) is also accepted in Mandarin, but (13) is not(Li, 2003). “A+guo” compounds differ from “A+chu” compounds in the preference of standard phrases over differential phrase, e.g. “John gao guo Mary(John is taller than Mary)” and “John gao-chu 2 limi(John is 2 cm taller)”

“comp” can satisfy this requirement universally because its null nature renders it neutral to restrictions on differential phrases. Whereas, “geng (more)” refutes to introduce differential phrases of exact type and large degree type. Although the bare form “gao” can be modified by three types of differential phrases, it launches no obligatory requirement on differential phrases, the conflict between “gao” and “geng” is compromised by the implicitness of differential phrases. Since there are no compounds like “ai-chu (short-exceed)”, “pang-chu(fat-exceed)” in the lexicon, the reason why (46b) and (46c) fail is resolved.

(49) a. John bi Mary comp gao-chu/guo/le *(2 limi/yidian/henduo).

b. *John bi Mary geng gao-chu/guo/le 2 limi/yidian/henduo.

(50) a. John [DegP bi Mary [Deg' comp gao-chu [DegP 2 limi [Deg' ...]]]].

b. John gao-chu Mary 2 limi.

(49a) should have a deep structure in the form of (50a), where “2 limi” is generated at the specifier of lower DegP. It should be noted that though “gao-chu” has a selection relation with differential phrase “2 limi”, it does not mean that “gao-chu” selects “2 limi” at its complement, where in (50b), “Mary” can be inserted into the middle of them. From the perspective of semantics, “chu” exerts no alteration to the lexical entry of “gao”, i.e. “gao-chu” in comparatives still denotes a function from individual to degree. In this sense, “chu” plays a role like “in” or “of” in the case of “be interested in” and “be fond of”.

Finally, comparatives constituted by compounds sharing a semantic nucleus of “increase” or “decrease” are noteworthy. As shown in (51a), the compound “zeng-zhang(increase)” consists of a verb “zeng(add)” and an adjective “zhang(up)”, so does “jiang-di(decrease)” in (51b) and “zhang- gao(grow-tall)” in (51c). Since the differential phrase “10%” is optional, (51a) shows no idiosyncratic features in comparison with comparatives constituted by gradable adjectives, where Deg⁰ position is occupied by a null “comp” and “zeng+zhang” moved up to the higher layer of Deg⁰ through head movement V⁰-Deg⁰-Deg⁰.

(51) a. jinnian de GDP [DegP bi qunian [Deg' comp zeng-zhang-(le)]]

this year de GDP than last year more increase-Asp

[DegP (10%) [Deg' comp [VP [V zeng_v+zhang_A-(le)]]]]].
10%

‘This year’s GDP is (10%) greater than last year.’

b. jinnian de GDP [DegP bi qunian [Deg' comp jiang-di-le [DegP

this year de GDP than last year more increase-Asp
(10%)[Deg' ...]]].
10%

‘This year’s GDP is (10%) lower than last year.’

c. John (jinnian) [DegP bi (ta) qunian [Deg' zhang gao le [DegP (10 limi)]]

John this year than he last year grow tall Asp 10 cm
[Deg' ...]]].

‘John is 10 cm taller than last year.’

The key steps of the semantic computation of (51a) are listed in (52a-e). “zeng-zhang” denotes a function specifying the partial relation between degree and

individual. It should be noted that (52a) should be paraphrased as “the degree to which GDP raises to” instead of “the degree to which GDP raises by”. “comp” in (52b) identifies another partial relation between the maximal degree of x and the maximal degree of y plus the differential degree. So (51a) is finally translated into the representation in (52e), with an interpretation that “the maximal degree to which this year’s GDP raises is greater than (or equal to) the maximal to which last year’s GDP raises plus 10 percent”.

- (52) a. $\llbracket \text{zeng zhang} \rrbracket = \lambda d \lambda x. [\text{raise-ness}(x) \geq d]$
- b. $\llbracket \text{comp} \rrbracket = \lambda G \lambda d \lambda y \lambda x. [\text{Max } d_1(G(d_1, x)) \geq \text{Max } d_2(G(d_2, y)) + d]$
- c. $\llbracket \text{comp zeng zhang} \rrbracket = \lambda d \lambda y \lambda x. [\text{Max } d_1(\text{raise-ness}(x)) \geq d_1] \geq$
 $\text{Max } d_2(\text{raise-ness}(y) \geq d_2) + d]$
- d. $\llbracket \text{comp zeng zhang 10\%} \rrbracket = \lambda y \lambda x. [\text{Max } d_1(\text{raise-ness}(x)) \geq d_1] \geq$
 $\text{Max } d_2(\text{raise-ness}(y) \geq d_2) + 10\%]$
- e. $\llbracket (51a) \rrbracket = \text{Max } d_1(\text{raise-ness}(\text{GDP of this year})) \geq d_1] \geq$
 $\text{Max } d_2(\text{raise-ness}(\text{GDP of last year})) \geq d_2) + 10\%$

As for (51c), “zhang-gao” denotes a similar meaning as “zeng-zhang” by stressing “the degree to which John grows tall to” rather than “the degree to which John grows tall by”. In addition, the existence of temporal adverb “qunian(last year)” not only indicates the meaning of “zhang-gao” must encode a temporal variable, i.e. a comparison between John in this year and John in last year, but also implies a clausal status of “bi qunian” with a $\langle d, t \rangle$ type, which traces back from a full form of “bi ta qunian zhang gao le(than he grew tall last year)” in (53e). After the combination of “zhang-gao”, “comp” and “10 limi”, (53d) is thus produced to absorb a property of degree, a temporal argument and an individual argument. (53e) serves as an argument of (53d) and their combination generates (53f), which finally evolves into (53g) with a paraphrase as “the maximal degree to which John grew tall in this year is greater than (or equal to) the maximal degree to which John grew tall in last year plus 10 cm”.

- (53) a. $\llbracket \text{zhang gao} \rrbracket = \lambda d \lambda i \lambda x. [\text{grow-tallness}(x, i) \geq d]$
- b. $\llbracket \text{comp} \rrbracket = \lambda G \lambda d \lambda D \lambda i \lambda x. [\text{Max } d_1(G(d_1, x, i)) \geq \text{Max } d_2(D(d_2)) + d]$
- c. $\llbracket \text{comp zhang gao} \rrbracket = \lambda d \lambda D \lambda i \lambda x. [\text{Max } d_1(\text{grow-tallness}(d_1, x, i)) \geq$
 $\text{Max } d_2(D(d_2)) + d]$
- d. $\llbracket \text{comp zhang gao 10 limi} \rrbracket = \lambda D \lambda i \lambda x. [\text{Max } d_1(\text{grow-tallness}(d_1, x, i)) \geq$
 $\text{Max } d_2(D(d_2)) + 10 \text{ limi}]$
- e. $\llbracket \text{bi ta qunian zhang gao} \rrbracket = \lambda d. [\text{grow-tallness}(x, \text{last year}') \geq d] \quad \langle d, t \rangle$
- f. $\llbracket \text{bi ta qunian zhang gao comp zhang gao 10 limi} \rrbracket$
 $= \lambda i \lambda x. [\text{Max } d_1(\text{grow-tallness}(d_1, x, i)) \geq$
 $\text{Max } d_2(\text{grow-tallness}(x, \text{last year}') \geq d_2) + 10 \text{ limi}']$
- g. $\llbracket (51c) \rrbracket = \text{Max } d_1(\text{grow-tallness}(\text{John}, \text{this year}')) \geq d_1] \geq$
 $\text{Max } d_2(\text{grow-tallness}(\text{John}, \text{last year}') \geq d_2) + 10 \text{ limi}'$

By contrast, (54a) with “times” as differential phrases behaves slightly different from (51a) in requiring an obligatory “ x bei(x times)” for “fan(turn)” carries an accusative case that must be assigned out. In contrast, “times” in comparatives constituted by gradable adjective “duo(many)” is optional as adjectives launch no obligatory case requirement to DiffPs. “2 bei (2 times)” does not generate at the

complement position of “fan-le(turn-ed)” but at the specifier of lower DegP in (54a) because differential phrases are assumed introduced by comparative morphemes.

- (54) a. jinnian de GDP [DegP bi qunian (de GDP)[Deg' comp fan-le [DegP 2
this year de GDP than last year de GDP more turn-Asp 2
bei [Deg'...]]].
times
‘This year’s GDP is twice times larger than last year.’
- b. jinnian de GDP [DegP bi qunian (de GDP) [Deg' comp duo-le
this year de GDP than last year de GDP more large-Asp
[DegP (2 bei) [Deg' ..]]].
2 times
‘This year’s GDP is twice times larger than last year.’

Semantically speaking, the times that the GDP of last year undergoes are never non-trivial to (54a) as “2 bei(2 times)” indicates nothing but the differential between the value of this year’s GDP and the value of last year’s GDP. If “fan-le(turn-ed)” is translated into a function like (55a), where a relation between times n and individual x is established, the consequent semantic representation in (55b) turns out to express that “the maximal times to which this year’s GDP turned is greater than(or equal to) the maximal times to which last year’s GDP turned plus 2 times”. Some may doubt such kind of interpretation is not fine-grained enough to describe the comparison between the values of two years’ GDP. Suppose country A has a GDP of 10 billion in 2018 and 30 billion in 2019, then (54a) is uttered to describe this case from the perspective of “times” since “30 billion” is triple times of “10 billion”. As known, “times” as a coefficient must multiply a cardinal number. If “fan-le” owns a lexical entry like (55a), the value of “Max n₂(turn-times(GDP of last year)≥ n₂)” has to be fixed as “1 time” by common sense.

- (55) a. $\llbracket \text{fan-le} \rrbracket = \lambda n \lambda x. [\text{turn-times}(x) \geq n]$
b. $\llbracket (54a) \rrbracket = \text{Max } n_1 (\text{turn-times}(\text{GDP of this year}) \geq n_1) \geq$
 $\text{Max } n_2 (\text{turn-times}(\text{GDP of last year}) \geq n_2) + 2 \text{ times}$
- (56) a. $\llbracket \text{duo-le} \rrbracket = \lambda n \lambda x. [\text{Num}(x) \geq n]$
b. $\llbracket (54b) \rrbracket = \text{Max } n_1 (\text{Num}(\text{GDP of this year}) \geq n_1) \geq \text{Max } n_2 (\text{Num}(\text{GDP of last year}) \geq n_2) + 2 * \text{Max } n_2 (\text{Num}(\text{GDP of last year}))$

(54a) serves as an adequate description of the case above, but it is not the only one. (54b) with “duo” as a gradable adjective equally expresses such kind of meaning via a full usage of “values” instead of “times”. Judging from their English translations, (54a) and (54b) share an identical meaning. “duo” in Mandarin denotes a relation between the number of x, i.e. “n” and the individual “x”, shown in (56a). The semantic representation thus produced in (56b) utilizes the values offered by the context before, i.e. 30 billion and 10 billion. In the case of (54b), the differential phrase “2 bei(2 times)” can be replaced by “20 billion” without any impact to the meaning. Thus “fan(turn)” can only realize a comparison of two values in a mathematical method of times. By contrast, “duo(large)” is inclined to implement a comparison through values themselves, which caters for the requirement on a numeral differential phrase when “duo” acts as the head of DegP in comparatives.

4.2.2.3 “geng”-like Degree Adverbs as Comparative Morphemes

Mandarin has several other degree adverbs resembling “geng(more)” with a common semantic nucleus of “greater than” and a similar syntactic distribution, they are, “hai(more)”, “duo(more)”, “bijiao (more)” and “shaowei (slightly more)” (cf. Ma, 1988; Zhou, 1995; Li, 1997; Zhang, 2010). In syntax, these four morphemes present similarities with “geng(more)” as a functional category. Firstly, they cannot be repeated in a form like “hai-hai”, “duo-duo”, “bijiao-bijiao” or “shaowei-shaowei”; secondly, they cannot be interrogated by wh words, for instance, “John bi Mary duo gao (*How is John tall than Mary)” is not accepted; thirdly, they share to introduce certain types of differential phrase, such as “yidian/yixie(bit/some)”. Given above features, it is plausible to categorize them as comparative morphemes.

“duo(more)” will be independently analyzed in section 4.2.2.4. For this section, the focus is placed on the other three ones. Liu (2010b, 2018) proposes two different components, i.e. “geng (more)” and “bijiao (more)”, to undertake the “greater than” meaning in Mandarin. Although his analysis is far from perfection, it does shed an insightful light on the strategy adopted in this dissertation. Considering the indispensable role of “greater than” meaning to comparatives and the fact that Mandarin adopts no fixed comparative marker to correspond to English “er” in a superficial way, it is inferred that Mandarin may adopt multiple morphemes to implement “greater than” meaning. But deviating from the structure constructed by Liu, the author adopts a shell-based structure to analyze Mandarin comparatives. The structure of comparatives with “geng(more)” as degree head has been given in (4a), which is repeated in (57a). In an analogy, comparatives with “bijiao(more)”, “hai(more)” and “shaowei (slightly more)” as degree heads respectively project a structure in (57b), (58a) and (58b).

- (57) a. John [DegP [biP bi Mary][Deg' geng+gao [DegP (yidian) [Deg' geng+gao [AP gae]]]]].
 - b. [TopP bi qi Mary, [IP John [DegP Ø [Deg' bijiao+gao [DegP (yidian) [Deg' bijiao+gao [AP gae]]]]]].
- (58) a. John [DegP bi Mary [Deg' hai+gao [DegP (yidian) [Deg' hai+gao John than Mary more tall [AP gae]]]]].
‘John is taller than Mary.’
 - b. John [DegP bi Mary [Deg' shaowei + gao [DegP *(yidian) John than Mary slightly more tall a little [Deg' shaowei+gao [AP gae]]]]].
‘John is a little taller than Mary.’

“hai/bijiao/shaowei” are assumed to occupy the head of lower DegP, which attracts the head of AP to move upwards to form a compound “Deg⁰+A⁰”, then this compound further moves into upper DegP along the setting of shelled structure, functioning to introduce “biP” at its specifier. But they are not completely identical, or it will be too redundant for Mandarin to employ four different components to realize one single function. “bijiao(slightly more)” in (57b) carries a “greater than” meaning only, but refutes to accommodate “biP” at its specifier, hence the standards has to be

ushered in through a topic phrase “biji(相比)”. “hai(more)” in (58a) highlights an anti-expectation meaning with “Mary” being already tall to a large extent or being taller than most of others in context, so that it is surprising that John’s height even exceeds Mary’s height(Lu, 1980; Shen, 2001). “shaowei (slightly more)” differs from others in requiring an obligatory “yidian(bit)” in structure, and it expresses a “greater than” relation in a slight degree.

The lexical entry of “geng(more)” is repeated in (59a), and (57a) accordingly can be translated into (59b). “geng(more)” denotes a four-place function, taking gradable adjective G to identify the dimension being compared, taking differential d to identify the distance between the referent degree and standard degree, taking x and y to identify the targets being compared. As the truth of (57a) always entails “Mary hen gao (Mary is tall)”, this positive meaning is encoded into the lexical entry of “geng”, that is “ $\text{Max } d_2(G(y)(d_2) \geq d_{\text{stdnd}})$ ”. Thus (59b) can be paraphrased as “the maximal degree to which John is tall exceeds or equals to the maximal degree to which Mary is tall plus the differential ‘yidian(bit)’, and the maximal degree to which Mary is tall exceeds or equals to the contextual standard degree ”.

- (59) a. $[\![\text{geng}_1]\!]=\lambda G_{<\text{d}, <\text{e}, \triangleright}\lambda d\lambda y\lambda x.[(\text{Max } d_1(G(x)(d_1)) \geq \text{Max } d_2(G(y)(d_2))+d) \wedge \text{Max } d_2(G(y)(d_2) \geq d_{\text{stdnd}})]$
- b. $[\![\!(57\text{a})]\!]=\text{Max } d_1(\text{gao-du}(\text{John}') \geq d_1) \geq \text{Max } d_2(\text{gao-du}(\text{Mary}') \geq d_2) + d_{\text{yidian}} \wedge \text{Max } d_2(\text{gao-du}(\text{Mary}') \geq d_2) \geq d_{\text{stdnd}}$

Since “hai/bijiao/shaowei” share a common semantic nucleus, the skeleton of (4a) applies to them as well, but with minute adjustments to details. The lexical entry of “hai(more)” is derived in (60a), where the part “ $\text{Max } d_2(G(y)(d_2) \geq_{\text{far}} d_{\text{stdnd}})$ ” functions to express the maximal degree denoted by standard arguments along the dimension of adjectives far exceeds the contextual standard degree, which indicates that the degree of standard argument surpasses the majority of people in the context, and under such situation, the degree of referents is still greater than the degree of standards, so that an anti-expectation intuition arises with a surprising tone. The syntactic requirement that “bijiao (more)” refutes to introduce its standard at the specifier is embodied by an adjustment to the order of variable elimination. Since standards are introduced at the position higher than referents(subjects), the function denoted by “bijiao(more)” will absorb referent arguments first and then standard arguments, as shown in (60b). The feature of “shaowei (slightly more)” lies on the obligatoriness of degrees of differential phrase in (60c), indicated by an underline. Compared to others, this degree argument cannot be omitted.

- (60) a. $[\![\text{hai}]\!]=\lambda G_{<\text{d}, <\text{e}, \triangleright}\lambda y\lambda x.[(\text{Max } d_1(G(x)(d_1)) > \text{Max } d_2(G(y)(d_2))) \wedge \text{Max } d_2(G(y)(d_2) >_{\text{far}} d_{\text{stdnd}})]$
- b. $[\![\text{bijiao}]\!]=\lambda G_{<\text{d}, <\text{e}, \triangleright}\lambda d\lambda x\lambda y.[\text{Max } d_1(G(x)(d_1)) \geq \text{Max } d_2(G(y)(d_2))+d]$
- c. $[\![\text{shaowei}]\!]=\lambda G_{<\text{d}, <\text{e}, \triangleright}\underline{\lambda d}\lambda y\lambda x.[(\text{Max } d_1(G(x)(d_1)) \geq \text{Max } d_2(G(y)(d_2))+\underline{d})]$

The author by now has not a good answer but a quite rudimentary speculation to why “shaowei (slightly more)” requires “yidian(bit)” in an obligatory way, while others like “geng(more)” or “bijiao(more)” is free to such a restriction. The reason why “geng/hai/bijiao/shaowei” coexist in Mandarin may be pertinent to the specific semantic or syntactic features owned by them. Putting their extra features and

differential “yidian(bit)” aside, the “greater than” meanings introduced by these four comparative morphemes actually present a minute difference in hierarchy. Take sentences in (61) as an example, “Mary” serves as the standard argument for A, B, C and D in comparatives, and (61a), (61b), (61c) and (61d) respectively denote a representation in (62a), (62b), (62c) and (62d), according to which, the height of A, B, C and D queue up in an order shown by (63a). In another word, these four comparative morphemes present a hierarchy like (63b).

- (61) a. A bi Mary hai gao.
 - b. B bi Mary geng gao.
 - c. biji Mary, C bijiao gao.
 - d. D bi Mary shaowei gao *(yidian).
- (62) a. $\text{Max d}_1(\text{gao-du(A)} \geq d_1) >_{\text{hai}} \text{Max d}_2(\text{gao-du(Mary)} \geq d_2)$
 - b. $\text{Max d}_1(\text{gao-du(B)} \geq d_1) >_{\text{geng}} \text{Max d}_2(\text{gao-du(Mary)} \geq d_2)$
 - c. $\text{Max d}_1(\text{gao-du(C)} \geq d_1) >_{\text{bijiao}} \text{Max d}_2(\text{gao-du(Mary)} \geq d_2)$
 - d. $\text{Max d}_1(\text{gao-du(D)} \geq d_1) >_{\text{shaowei}} \text{Max d}_2(\text{gao-du(Mary)} \geq d_2)$
- (63) a. $\text{height(A)} > \text{height(B)} > \text{height(C)} > \text{height(D)}$
 - b. “ $>_{\text{hai}}$ ” → “ $>_{\text{geng}}$ ” → “ $>_{\text{bijiao}}$ ” → “ $>_{\text{shaowei}}$ ”
- (64) a. $\text{Max d}_1(\text{gao-du(A)} \geq d_1) \geq \text{Max d}_2(\text{gao-du(Mary)} \geq d_2) + d_{\text{yidian}}$
 - b. $\text{Max d}_1(\text{gao-du(B)} \geq d_1) \geq \text{Max d}_2(\text{gao-du(Mary)} \geq d_2) + d_{\text{yidian}}$
 - c. $\text{Max d}_1(\text{gao-du(C)} \geq d_1) \geq \text{Max d}_2(\text{gao-du(Mary)} \geq d_2) + d_{\text{yidian}}$
 - d. $\text{Max d}_1(\text{gao-du(D)} \geq d_1) \geq \text{Max d}_2(\text{gao-du(Mary)} \geq d_2) + d_{\text{yidian}}$

However, when differential “yidian” is involved, the semantic representation in (62a-d) has to be transformed into (64a-d), where those “greater than” relations in (62a-d) are replaced by a uniform “greater than or equal to” relation. The addition of “yidian(bit)” into comparatives in (61) blurs the hierarchy displayed by A, B, C and D in (63a) and accordingly the hierarchy in (63b) is no longer crystal. Such a change is exactly manifested by their semantic representations in (64), where the extra semantic or syntactic features become crucial in marking the identity of “geng/hai/bijiao/ shaowei”. As shown in (59a), the part “ $\text{Max d}_2(G(y)(d_2) \geq d_{\text{stnd}})$ ” indicates the degree head as “geng”, in (60a), the part “ $\text{Max d}_2(G(y)(d_2) \geq_{\text{far}} d_{\text{stnd}})$ ” indicates the degree head as “hai”, in (60b), the order of referent and standard indicates the degree head as “bijiao”, and in (60c), the obligatoriness of “yidian(bit)” indicates the degree head as “shaowei”.

4.2.2.4 “duo(more)” as a Comparative Morpheme

“duo(more)” as a comparative morpheme, presents idiosyncratic features in both syntax and semantics when it occupies the head position of DegP. Li (2015) observes a special comparative pattern built from “duo (more)”, e.g. (65a), which is featured with a comparison between the number of books that John bought and the number of books that Mary bought. It should be noted that “mai-le(bought)” and “2 ben shu(2 books)” in (65a) do not form a constituent because neither John nor Mary behaves truly to buy 2 books. To be exact, the numbers of books that John and Mary bought are never non-trivial in (65a). What can be guaranteed here only contains that John and Mary bought books with a certain number, which embodies itself in a form of “w

ben shu(books)", a numeral phrase with a free variable "w". "w ben shu(w CL books)" serves as the real objects of "mai-le(buy-Asp)", while "2 ben shu (2 CL books)" here acts as a differential phrase base-generated at the specifier of DegP rather than at the complement of VP, and the occurrence of DiffP in (65a) is compulsory.

- (65) a. John [DegP bi Mary [Deg' duo + mai-le [Deg' 2 ben shu [Deg' ~~duo+mai-le~~ [VP
 John than Mary more buy-Asp 2 CL book
~~mai-le~~ [DP w ben shu]]]]].
 ‘John bought 2 more books than Mary.’
- b. *John bi Mary duo mai-le 2 ben shu w ben shu.
 c. * John bi Mary duo mai-le w ben shu.
 d. *John bi Mary duo mai-le ~~w ben~~ shu.
 e. *John bi Mary duo mai-le ~~w ben shu~~.

Like the selection restriction performed by "shaowei (slight more)" to a small degree vague DiffP, "duo(more)", in a similar way, requires obligatorily a DiffP around numbers, for instance "2 ben shu (2 CL books)", "2 ge xiaoshi (2 CL hours)", or "liang ci (2 times)". But relying on "duo(more)" alone cannot decide what kind of DiffPs are finally anchored, as shown in (65a), "mai- le (buy-Asp)" must conspire with "duo" to select "2 ben shu (2 CL books)" and excludes "2 ge xiaoshi (2 CL hours)" or "liang ci (2 times)" as the latter two do not parallel to "w ben shu (w CL books)", i.e. the real object of "mai-le(buy-Asp)". Thus "mai-le(buy-Asp)" must undergo a V⁰-Deg⁰- Deg⁰ movement with the purpose to ensure that the choice of differential phrases match the gradable factors added to verbs. In (65a), "mai-le(buy-Asp)" moves from V⁰ to lower Deg⁰ and these two form a compound there, then they move further to upper Deg⁰, leaving "2 ben shu(2 CL books)" and " w ben shu(w CL books)" in proximity in linear order. And the latter must be deleted, or it will cause a crash at PF because of the free variable "w", as shown in (65b) and (65c). As "2 ben shu (2 CL books)" and "w ben shu(w CL books)" neighbor each other in linear order, "w ben shu(w CL books)" thus can be deleted under an identity with its preceding differential phrase "2 ben shu(2 CL books)". In conclusion, "2 ben shu(2 CL books)" plays a crucial role in the deletion of object of "mai-le (buy-Asp)". Without it, no deletion is going to happen, neither "w ben" in (65d) nor "w ben shu" in (65e) can be deleted successfully.

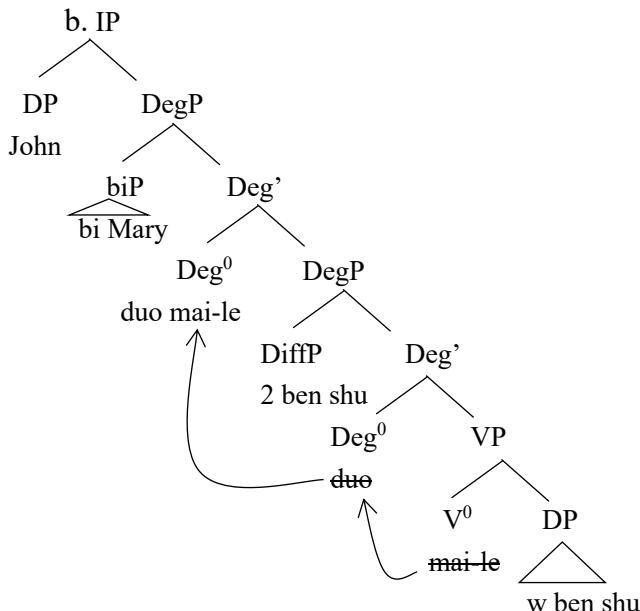
Since "duo" occupies the head position of DegP, it should share with "geng(more)" a common semantic nucleus of "greater than" and inherits the semantic selection of an expression denoting <d, e, t>. "duo(more)" is born to modify quantities, and quantities by themselves can come into a comparison along with the numbers. In this sense, the variable "n" is used to refer to the gradable arguments encoded by the function of "duo", and number arguments still remain a "d" type. As differential phrases enjoy an indispensable role in duo-comparatives, the function of "duo(more)" must encode a differential variable. To recapitulate, "duo(more)" denotes a function in (66a), which absorbs four arguments to obtain a truth, i.e. gradable predicate on the dimension of number, a differential number, two individuals. Given the number and type of its arguments, "duo(more)" denotes a complex semantic type,

i.e. << d, < e, t >>, < d, < e, < e, t >>>>.

- (66) a. $\llbracket \text{duo} \rrbracket = \lambda G_{< n, < e, t >} \lambda n \lambda y \lambda x. [\text{Max } n_1(G(x)(n_1)) \geq \text{Max } n_2(G(y)(n_2)) + n]$
 b. $\llbracket \text{mai} \rrbracket = \lambda y \lambda x. [\text{mai}(x, y)] \quad < e, < e, t >$
 c. $\llbracket \text{mai} \rrbracket = \lambda n \lambda Y \lambda x. [\text{mai}(x, Y) \wedge \text{Num}(Y) \geq n] \quad < d, < e, < e, t >$
 d. $\llbracket w \text{ ben shu} \rrbracket = \text{shu}^* \quad e$

But “mai(buy)” is traditionally acknowledged as a two-place predicate with a lexical entry in (66b), which fails to satisfy the semantic requirement of (66a) in a glaring way as no number variable is defined and a type mismatch is unavoidable, thus an adjustment to the lexical entry of “mai(buy)” is necessary. In the first place, “duo” must absorb a gradable predicate, so the gradability of “mai(buy)” should be overtly manifested. As a ditransitive verb, “mai(buy)” displays no gradability by itself, so it must resort to the assistance of objects, and these objects must be modified by numerals since “mai-le shu(buy-Asp books)” still fails to manifest a gradable feature. Only in this way, can a comparison between the quantities of referent and the quantities of standard be implemented in semantics. In (66c), “n” bears to identify the number of books being bought, equating to degree variables encoded by gradable adjectives. Aligned with the spirit of Link (1983) and Landman(2000) on plural forms, “w ben shu” in semantics is defined as a sum of individuals, being formalized into “shu*” in (66d), which is further instantiated as the capital “Y” in (66c). In another word, “Y” consists of individuals of books and gets saturated by “w ben shu(w CL books)”. Despite of a plural form, “Y” still denotes a simple “e” type. “Num(Y)” here serves as a measure function, taking a plural form “Y” and outputting a number to compare with “n”. Given the existence of “Y”, (66a) is revised into (67a) with a type of << d, < e, < e, t >>, < d, < e, < e, < e, t >>>>, and the computational process of (65a) is offered in (67b).

- (67) a. $\llbracket \text{duo} \rrbracket = \lambda G_{< d, < e, < e, t >} \lambda n \lambda Y \lambda z \lambda x. [\text{Max } n_1(G(x)(Y)(n_1)) \geq \text{Max } n_2(G(z)(Y)(n_2)) + n]$



Step 1:

$$\llbracket \text{duo mai-le} \rrbracket = \llbracket \text{duo} \rrbracket (\llbracket \text{mai-le} \rrbracket)$$

$$\begin{aligned}
&= \lambda G_{<d, <e, <e, t>>} \lambda n \lambda Y \lambda z \lambda x. [Max\ n_1(G(x)(Y)(n_1)) \geq Max\ n_2(G(z)(Y)(n_2)) + n] \\
&\quad (\lambda n \lambda Y \lambda x. [mai(x, Y) \wedge Num(Y) \geq n]) \\
&= \lambda n \lambda Y \lambda z \lambda x. [Max\ n_1(mai(x, Y) \wedge Num(Y) \geq n_1) \geq Max\ n_2(mai(z, Y) \wedge \\
&\quad Num(Y) \geq n_2) + n] \\
&\quad <d, <e, <e, <e, t>>>
\end{aligned}$$

Step 2:

$$\begin{aligned}
[\![\text{duo du-le 2 ben shu}]\!] &= [\![\text{duo mai-le}]\!] (2 \text{ ben shu}') \\
&= \lambda Y \lambda z \lambda x. [Max\ n_1(mai(x, Y) \wedge Num(Y) \geq n_1) \geq \\
&\quad Max\ n_2(mai(z, Y) \wedge Num(Y) \geq n_2) + 2 \text{ ben shu}' \\
&\quad <e, <e, <e, t>>>
\end{aligned}$$

Step 3:

$$\begin{aligned}
[\![\text{duo mai-le 2 ben shu w ben shu}]\!] &= [\![\text{duo du-le 2 ben shu}]\!] (shu^*) \\
&= \lambda z \lambda x. [Max\ n_1(mai(x, shu^*) \wedge Num(shu^*) \geq n_1) \geq \\
&\quad Max\ n_2(mai(z, shu^*) \wedge Num(shu^*) \geq n_2) + 2 \text{ ben shu}' \\
&\quad <e, <e, t>>
\end{aligned}$$

Step 4:

$$\begin{aligned}
[\![\text{bi Mary duo du-le 2 ben shu}]\!] &= [\![\text{duo du-le 2 ben shu}]\!] (bi Mary') \\
&= \lambda x. [Max\ n_1(mai(x, shu^*) \wedge Num(shu^*) \geq n_1) \geq \\
&\quad Max\ n_2(mai(Mary', shu^*) \wedge Num(shu^*) \geq n_2) + 2 \text{ ben' shu}' \\
&\quad <e, t>
\end{aligned}$$

Step 5:

$$\begin{aligned}
[\![\text{John bi Mary duo du-le 2 ben shu}]\!] &= [\![\text{bi Mary duo du-le 2 ben shu}]\!] (John') \\
&= Max\ n_1(mai(John', shu^*) \wedge Num(shu^*) \geq n_1) \geq \\
&\quad Max\ n_2(mai(Mary', shu^*) \wedge Num(shu^*) \geq n_2) + 2 \text{ ben shu}' \\
&\quad t
\end{aligned}$$

The computation, though seemingly complex, is under a strict control of compositionality, and steps forward in accordance with a type-driven engine. In Step 1, the verbal head “mai-le(buy-Asp)” first moves into the position of “duo(more)”, the compound form thus produced denotes a four-place function, which will successively absorbs “2 ben shu”, “w ben shu”, “Mary” and “John” to reach a truth value, i.e. Step 2 -Step 5. It should be pointed out that in Step 4 “w ben shu” happens to be deleted as it neighbors “2 ben shu” in the superficial order.

The comparison in (65a) is realized by quantities of things in object position, and similar models are also observed by implementing a comparison along the length of time or along the times of events happening. For the former type, Verbs like “pao(run)”, “shui(sleep)”, “you(swim)”, “wan(play)”, etc., present no gradability and fail to constitute comparatives without measure phrases in (68b). Consequently, the comparison in (68a) has to resort to the length of time that the referent and the standard conduct certain behaviors. For the latter one in (69a), the comparison is realized by the number of times that the referent and the standard operate certain events. Though the comparable components belong to measure phrases, (68a) and (69a) present an identical underlying structure with (65a), where “2 ge xiaoshi (2 CL hour)” and “liang ci (two times)” are deemed compulsory as “w ge xiaoshi (w CL hours)” and “w ci (w times)” must be deleted under identity with them in linear order.

- (68) a. John [DegP bi Mary [Deg' duo pao-le [DegP [DiffP 2 ge xiaoshi][Deg' duo
 John than Mary more run-Asp 2 CL hour
 [VP[V' pao-le [MP w-ge xiaoshi]]]]].
 w CL hour

‘John ran 2 hours more than Mary did.’

- b. *John bi Mary duo pao-le.

- (69) a. John [DegP bi Mary [Deg' duo qu-le [DegP [DiffP liang ci] [Deg' duo [VP[V'[MP
 John than Mary more go-to-Asp 2 times
 w-ei] [V' qu-le [DP Beijing]]]]].
 Beijing

‘John went to Beijing two times more than Mary did.’

- b. *John bi Mary duo qu-le Beijing.

The derivational process in (67b) applies to (68a) and (68b) in every aspect except for minute adjustments on the representations of verbs. As discussed above, “mai(buy)” as a transitive verb must select an object and the comparison of “mai(buy)” is just realized by the quantity of its objects. (66c) tells that the function denoted by “mai(buy)” includes two parts, the part “mai(x, Y)” bears to express a complete event with two indispensable arguments in subject and object position. For the other part “Num(Y) $\geq n$ ”, it functions as a measure function mapping the quantity of plural individuals denoted by object into the dimension of number, and “mai(buy)” thus achieves a gradable meaning, paving the road for a comparison between the quantities of things the referent bought and the standard bought. “pao(run)” resembles “mai(buy)” in encoding no gradable components in semantics and it denotes a function like “pao(x)” with a $\langle e, t \rangle$ type. Though as an intransitive verb, “pao(run)” is atelic(Vendler, 1967; Guo, 2002), which leads to an obligatory occurrence of a measure phrase on the length of time, so “pao(run)” is transformed into a two-place predicate by “i” bearing to present the gradability. In contrast with the plural object in (65a), which is gradable but cannot be compared directly, “i” by itself is both gradable and comparable. The function of “pao(run)” in (70c) hence contains no measure function in the form of “Num(Y)”. What’s more, measure phrase in (70a) is deemed to describe the length of time John spending on “running”, that is to say, it targets the whole event rather than any sub-part of it. Given these two points, “pao(run)” is abstracted into (70c), where “run-time(x)” is defined as a measure function, mapping individuals into the dimension of time lengths and “i” bears to restrict the range of time lengths that individuals run for. The newly-established representation of “pao(run)” in (70c) matches the type requirement of “duo” successfully.

- (70) a. John pao-le 3 ge xiaoshi.

John run-Asp three CL hour

- b. “John ran for three hours.”

- c. $[\![\text{pao}]\!] = \lambda i \lambda x. [\text{run-time}(x) \geq i] \quad \langle d, \langle e, t \rangle \rangle$

In the case of “qu-le(go-Asp)”, though as a transitive verb, its comparison is not implemented by the quantity of plural object but resorts to the assistance of another measure phrase on “cishu (times)”, see (71a). Neither “qu-le(go-Asp)” nor “qu-le Beijing (went to Beijng)” owns gradable arguments catering for the requirement of

“duo(more)”. With a purpose to incorporate “cishu (times)” into the meaning of “qu-le(go-Asp)”, a measure function is constructed in (71b), where “qu-times(x, y) \geq n” functions to map the event “x go to y” into a dimension of number of times, the new representation of “qu-le (go-Asp)” will denote a $\langle d, \langle e, \langle e, t \rangle \rangle \rangle$ type.

- (71) a. John qu-le san ci Beijing.
 John go-Asp three times Beijing
 ‘John went to Beijing three times.’

$$b. [[qu]] = \lambda n \lambda y \lambda x. [\text{go-times}(x, y) \geq n] \quad \langle d, \langle e, \langle e, t \rangle \rangle \rangle$$

(68a) and (69a) share to imply a meaning that John or Mary happens to do certain kind of acts for an interval of time or times, but the exact time length or times they experience is not concerned. Hence “w ge xiaoshi (w CL hours)” and “w ci (w times)” must be assumed to exist in deep structure, which renders the occurrence of differential phrases obligatory as “w ge xiaoshi (w CL hours)” and “w ci (w times)” with free variables has to be deleted at PF. “pao(run)” and “qu(go)” undergo some adjustments on the basis of “mai(buy)”, so that the representation of “duo” accordingly will undergo minute transformations on the type and the number of arguments, and as shown in (72a), “duo (more)” first absorbs a three-place predicate as argument, i.e. “pao(run)”, then it will successively take a degree-like “i” type argument, supported by differential phrases, and two individuals. Combining (72a) with (68a) will derive the final semantic representation, that is (72b), which can be paraphrased as “the maximal time that John ran for exceeds or equals to the maximal time Mary ran for plus two hours”.

- (72) a. $[[duo]] = \lambda G_{\langle d, \langle e, \langle e, t \rangle \rangle} \lambda i_1 \lambda y \lambda x. [\text{Max } i_1(G(x)(i_1)) \geq \text{Max } i_2(G(y)(i_2)) + i]$
 b. $[(68a)] = \text{Max } i_1(\text{pao-time(John')}) \geq i_1 \geq \text{Max } i_2(\text{pao-time(Mary')}) \geq i_2$
 $+ 2 \text{ ge xiaoshi'}$

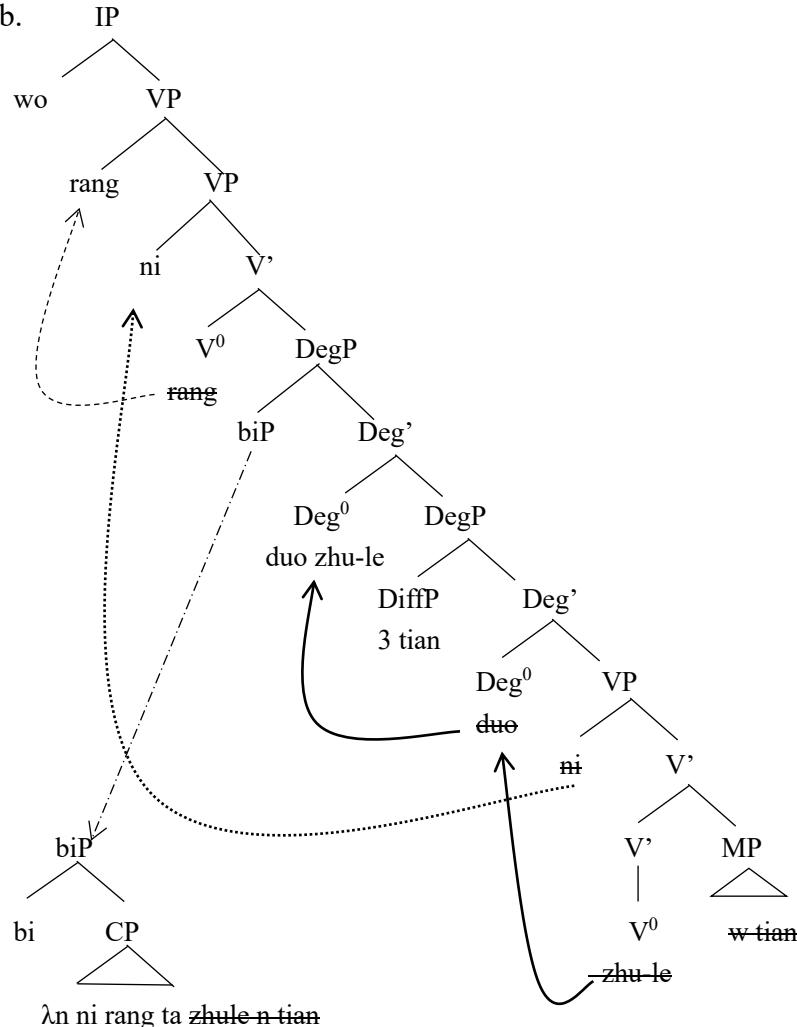
In the case of (69a), “duo(more)” will take a three-place “qu(go)” so that the subsequent arguments are adjusted to “n” for differential, “y” for object of “qu(go)”, “z” for standard and “x” for referent, i.e. (73a). The final representation of (69a) can be paraphrased as “the maximal times that John went to Beijing equals to or exceeds the maximal times Mary went to Beijing” in (73b).

- (73) a. $[[duo]] = \lambda G_{\langle d, \langle e, \langle e, t \rangle \rangle} \lambda n \lambda y \lambda z \lambda x. [\text{Max } n_1(G(x)(y)(n_1)) \geq \text{Max } n_2(G(z)(y)(n_2)) + n]$
 b. $[(69)] = \text{Max } n_1(\text{qu-times(John', Beijing')}) \geq n_1 \geq \text{Max } n_2(\text{qu-times(Mary', Beijing')}) + 2 \text{ ci'}$

The sentence in (74a) is proposed by Liu (2011) to refute the argument of Lin (2009) that Mandarin only presents a phrasal comparative. (74a), on its essence, belongs to a variant of (68a), mixed with a pivotal sentence, and schematically (74b):

- (74) a. wo rang ni bi ni rang ta duo zhu-le 3 tian .
 I let you than you let he more live-ASP three-day
 ‘I let you stay for three more days than you let me.’

(74) b.



In the lower VP domain, “zhu-le(live-Asp)” is modified by a measure phrase “w tian”. The verbal head “zhu-le (live-Asp)” undergoes a continuous head movement from V^0 to upper Deg^0 , respectively introducing DiffP “3 tian (3 days)” and biP “bi ni rang ta zhu le n tian (than you let him live n days)”. “ni(you)” is generated at the specifier of lower VP with respect to VP-internal subject hypothesis, being assigned an agent role, and it then moves to the specifier of VP for case assignment. By now, all components in the middle of “3 tian (3 days)” and “w tian (w days)” are moved out of their situ places, which leads to a proximity of them in linear order. “w tian (w days)” is thus deleted as it resembles DiffP “3 tian (3 days)”. The verbal status of “ni rang ta” inside “biP” supports a clausal analysis that “ni rang ta” should be reduced form from “ $\lambda n \, ni \, rang \, ta \, zhu \, le \, n \, tian$ (λn you let him live for n days)”. As “n” is a free variable, it should be bound by “ λ ” operator, a property of degree is thus produced with a $\langle d, t \rangle$ type.

From the semantic aspect, “zhu(live)” is transformed into a gradable predicate by incorporating into its lexical entry a comparable variable, instantiated as a number of days, i.e. (75a). As “biP” is reduced from a full clause “bi [$\lambda n \, ni \, rang \, ta \, zhu \, le \, n \, tian$] (than [λn you let him live n days])”, it is translated into (75b), a property of degree. But (74b) is not fine-grained enough to manifest the measure phrase “n tian (n days)” targets the verb “zhu(live)” instead of “rang(let)”. Hence it is further dissected into

(75c) via a Boolean conjunction. Considering the change on the complement introduced by “bi (than)”, “duo(more)” should encode an argument with a $\langle d, t \rangle$ type, thus (75d) is produced. A rudimentary combination “duo(more)” and its three arguments, i.e. “zhu-le (live)” “3 tian (3 day)” and “bi ni rang ta”, will derive (75e).

- (75) a. $\llbracket zhu \rrbracket = \lambda n \lambda x. [\text{live-days}(x) \geq n] \quad < d, e, t >$

b. $\llbracket bi \lambda n ni rang ta zhu-le n tian \rrbracket = \lambda n. [ni \text{ rang ta zhu-le n tian}] \quad < d, t >$

c. $\llbracket bi \lambda n ni rang ta zhu-le n tian \rrbracket = \lambda n. [rang(ni', ta') \wedge \text{zhu-time}(ta') \geq n] \quad < d, t >$

d. $\llbracket duo \rrbracket = \lambda G_{< d, e, t >} \lambda n \lambda D_{< d, t >} \lambda x. [Max\ n_1(G(x)(n_1)) \geq Max\ n_2(D(n_2)) + n]$

e. $\llbracket bi \lambda n ni rang ta duo zhu-le 3 tian \rrbracket$
 $= \llbracket duo \rrbracket (\llbracket zhu \rrbracket) (\llbracket 3 tian \rrbracket) (\llbracket bi \lambda n ni rang ta zhu-le n tian \rrbracket)$
 $= \lambda x. [Max\ n_1(\text{zhu-time}(x) \geq n_1) \geq Max\ n_2(rang(ni', ta') \wedge \text{zhu-time}(ta') \geq n_2) + 3 \text{ tian}']$

However, the variable “x” encoded in (75e) will get an immediate saturation by “ni(you)”, achieving a “t” type and simultaneously ending the computation with “wo(I)” and “rang(let)” untouched. (74a) as a pivotal sentence, owns a feature that the agent of “zhu(live)” meanwhile serves as the patient of “rang(let)”. To usher in these two arguments, same Boolean conjunction in (75b) is adopted to reform the function denoted by “duo”, thus a two-place predicate “P(z, x)” is added into (75d) via Boolean conjunction and correspondingly two more variable “P” and “z” are supplemented. (75f) as the final version of “duo(more)” gets “wo(I)” and “rang(let)” engaged and derives out the correct representation in (75g), which can be paraphrased as “the maximal days that I let you stay for exceeds or equals to the maximal days that you let him stay for”.

- (75) f. $\llbracket \text{duo} \rrbracket = \lambda G_{<\text{d}, <\text{e}, \text{t}>} \lambda i \lambda D_{<\text{d}, \text{t}>} \lambda x \lambda P \lambda z. [Max\ n_1(P(z, x) \wedge G(x)(n_1)) \geq Max\ n_2(D(n_2)) + n]$

g. $\llbracket (74a) \rrbracket = Max\ n_1(\text{rang}(wo', ni') \wedge \text{zhu-time}(ni') \geq n_1) \geq Max\ n_2(\text{rang}(ni', ta') \wedge \text{zhu-time}(x) \geq n_2) + 3 \text{ tian'}$

Except for the case that “duo(more)” occupies the Deg^0 position in the so-called “duo- comparatives” in (65a), it owns two more statuses as gradable adjectives and as numeral phrases, respectively shown in (76a) and (76b). When “duo(many)” performs as a gradable adjective, it denotes a function identifying a relation between individual and degree in (77a), and when “duo(many)” performs as a numeral phrase, it denotes a simplified d-type argument in (77b). From now on, these three types of “duo” will be indexed by subscripts “1, 2, 3” with “duo₁” referring to the one in Deg^0 position, “duo₂” to the one as gradable adjective, and “duo₃” to the one as numeral phrase. A unified analysis on the form and meaning of three types of “duo” will be a quite interesting topic, but unfortunately deviates from the mainstream thought of this dissertation. The author intentionally keeps it for future work and here just places our focus on the analysis of them within framework proposed in this dissertation. As the degree “to which x is many” is usually measured by number, the lexical entry of “duo₂” encodes a measure function to map x into the scale of number, that is “Num(x)” in (77a). “n” acts as a d type argument. “duo₃” is simplified as a numeral phrase with a primitive d type in (77b).

- (76) a. John de shu [DegP bi Mary de (shu) [Deg' comp duo₂ [DegP 3 ben
 [Deg' eomp [AP duo₂]]]].]
 b. John [DegP bi Mary [Deg' comp gao [DegP [DiffP hen duo₃] [Deg' eomp
 [AP gao]]]]]
- (77) a. [[duo₂]] = $\lambda n \lambda x. [\text{Num}(x) \geq n] < d, < e, t >$
 b. [[hen duo₃]] = $d_{\text{henduo}} \quad d$

Under a DegP-shelled structure, “duo₂” in (76a) is generated at the A⁰ position, and the DegP licensing it is occupied by a null “comp”. “duo₂” then undergoes a head movement from A⁰ to lower Deg⁰, and then to upper Deg⁰, ushering in differential phrases and standard phrases respectively. It should be noted that “de shu(de book)” or “shu(book)” inside “biP” can be optionally deleted(Zhu, 1983). (76b) is generated in an identical way as (76a) but only replacing DiffP “3 ben (3 CL)” into “henduo₃(many)”. For the overt appearance of differential phrases, “comp” should encode a differential variable into its representation, so the variant in (78a) is selected. Centered around (78a), the semantic representations of (76a) and (76b) are given in (78b) and (78c).

- (78) a. [[comp]] = $\lambda G_{< d, < e, t >} \lambda d \lambda y \lambda x. [\text{Max } d_1(G(x)(d_1)) \geq \text{Max } d_2(G(y)(d_2)) + d]$
 b. [[(76a)]] = $\text{Max } n_1(\text{Num}(\text{John's books}') \geq n_1) \geq$
 $\text{Max } n_2(\text{Num}(\text{Mary's books}') \geq n_2) + 3 \text{ ben}'$
 c. [[(76b)]] = $\text{Max } d_1(\text{height}(\text{John}') \geq d_1) \geq \text{Max } d_2(\text{height}(\text{Mary}') \geq d_2) + d_{\text{henduo}}$

Next, Let's see two more comparatives consisting of “duo”, i.e. (79a) and (79b), where in the former, “duo” appears to modify the degree that John's height exceeds Mary's height, resembling the resultant phrase in verb-resultant constructions, while in the latter, “duo” similarly describes the degree that John's height exceeds Mary's height, judging from their English translation. In this sense, they can be seen as instantiations of “duo₃”, kind of differential phrases. But “duo₃” usually appears in a disyllable form like “hen-duo” with “hen” supplying one more syllable to “duo₃”(cf. Lv, 1980; Zhang, 2008). Meanwhile, if “gao de duo” is deemed as a sub-type of “V-de” constructions, “duo” should be an adjective in parts of speech.

- (79) a. John bi Mary gao de duo.
 John than Mary tall de much
 ‘John is much taller than Mary.’
 b. John bi Mary gao duo le.
 John than Mary tall much SFP
 ‘John is much taller than Mary.’

The possibility of “duo” as an adjective can be initially precluded as “duo” in these two cases refutes to be modified by any degree heads. In an orthodox construction of “V de” like (80a) and (81a), the adjective “kuai(fast)” is optionally modified either by “hen(very)” or “geng(more)”. Yet (80b, c) and (81b, c) show that “duo” after “gao de” or flanked by “gao” and “le” shares nothing in common in this respect with “V de” constructions (cf. Huang, 1988, 1992).

- (80) a. John pao de hen kuai.
 John run de very fast
 ‘John runs fast.’

- b. *John gao de hen duo.
 - c. * John gao hen duo le.
- (81) a. John bi Mary pao de geng kuai.
 John than Mary run de more fast
 ‘John ran faster than Mary.’
- b. *John bi Mary gao de geng duo.
- c. *John bi Mary gao geng duo le.

The failure of (81b) and (81c) may arise from the complementary distribution between “duo” as a degree head and other types of degree heads, and this analysis obtains supports from (82), where the positive degree head “hen” occurs after “gao de”.

- (82) John gao de hen.
 John tall de very
 ‘John is very tall.’

As aforementioned, “duo” semantically requires an exact type of differential phrases on quantity, while gradable adjectives can only offer an exact type of differential phrases on degree. To avoid this conflict, differential phrases in these two cases are forbidden from appearing. Another noteworthy difference lies on the order of A^0 and Deg^0 in lower degree head position. In a customary way, it is Deg^0 preceding A^0 , but in (83a) and (83b), the order is reversed with A^0 preceding Deg^0 . Judging from meanings expressed by (79a) and (79b), “duo₁” in these two cases has a strong sense to describe the gap between John’s height and Mary’s height being large. To distinguish them, “duo₁” in (65a) is subscribed by “duo₁₁” and in (79a) and (79b) by “duo₁₂”, i.e. (83a) and (83b). The meaning that highlights the large gap between referent and standard can be manifested by either “ $>_{duo}$ ” in (84a) or “ $\wedge d$ is large” in (84b), the former indicating a “far greater than” relation, and the latter describing a large gap in a direct way.

- (83) a. John [Deg^P bi Mary [Deg^P gao de duo₁₂ [Deg^P duo₁₂ [AP gao de]]]]].
 b. [CP [IP John [Deg^P bi Mary [Deg^P gao duo₁₂ [Deg^P duo₁₂ [AP gao]]]]] C le].
- (84) a. $\llbracket \text{duo}_{12} \rrbracket = \lambda G_{<d, <e, t>} \lambda y \lambda x. [\text{Max } d_1(G(x)(d_1)) >_{duo} \text{Max } d_2(G(y)(d_2))]$
 b. $\llbracket \text{duo}_{12} \rrbracket = \lambda G_{<d, <e, t>} \lambda y \lambda x. [\text{Max } d_1(G(x)(d_1)) \geq \text{Max } d_2(G(y)(d_2)) + d \wedge d \text{ is large}]$
- (85) a. $\llbracket (21a) \rrbracket = \text{Max } d_1(\text{height(John')}) \geq d_1 >_{duo} \text{Max } d_2(\text{height(Mary')}) \geq d_2$
 b. $\llbracket (21b) \rrbracket = \text{Max } d_1(\text{height(John')}) \geq d_1 \geq \text{Max } d_2(\text{height(Mary')}) \geq d_2 + d \wedge d \text{ is large}$

The semantic representation in (85a) can be paraphrased as “the maximal degree to which John is tall is far greater than the maximal degree to which Mary is tall”, while (85b) can be paraphrased as “the maximal degree to which John is tall exceeds or equals to the maximal degree to which Mary is tall plus a differential d , and d is large”.

4.2.3 A^0 to Deg^0 Movement

Aligned with the philosophy of functional projection in Chomsky (1995), Corver

(1997) assumes that the head of QP in positive forms remains always “empty” for A⁰ to move into via a head to head movement, as shown in (86a), where “e” symbolizes the empty status of Q⁰. When comparative morphemes such as “er”, “more” or “as”, appear in Q⁰ position, the corresponding structures project no DegP, e.g. (86b).

- (86) a. [DegP [MP two meters] [DegP too [QP e [AP tall]]]] (positive forms)

*Corver (1997): b. [QP [DiffP 2 inches] [Q er [AP tall than Mary]]]] (comparative forms)
c. *[DegP too [QP er [AP tall]]]*

The motivation for the head movement from A⁰ to Q⁰, in Corver’s argument, is pertinent to avoid a crash caused by theta-binding. Analogously, the functional heads I⁰ and D⁰ are considered operators to bind the “referential” argument of verbs and nouns. Q⁰ plays a same role to bind the “referential” or “degree” argument of adjectives in a minimal complement position. Hence “tall” in (86a) will undergo a raising operation. By contrast, “er” in Q⁰ is in charge of binding degree argument of A⁰ and since one variable cannot be bound by two operators simultaneously, the appearance of “too” in (86c) becomes superfluous, thus excluded.

The motivation behind A⁰ to Deg⁰ movement in Mandarin comparatives is different from what Corver advocates. Before explaining how it happens in Mandarin, let’s first retrospect another similar movement involved with heads, i.e. (87a) and (87c). According Hale&Keyser (1993, 1997), Larson (1988b), Huang (1997), Lin (2001), Wen&Cheng (2007), etc., the adjectival head “clear” undergoes a head movement from A⁰ to lower V⁰ then to upper V⁰, where in the lower V⁰, “clear” and the light verb “BECOME” form a compound, and this compound further moves up to upper V⁰ and forms with “CAUSE” a new compound “CAUSE+BECOME+clear”. While in Mandarin, the unaccusative verb “po-le(broke)” is assumed to undergo a head movement from V⁰ to lower V⁰ then to upper V⁰, similar head movement as what “clear” goes through in (87b). In the position of upper V⁰, a compound “CAUSE+BECOME+ po-le” is generated with “CAUSE” instantiated as “da” and “BECOME” as an implicit morpheme, so that a phonetic form “da pao-le” is spelled out. One of the key motivations behind (87b) and (87d) lies on the introduction of arguments and theta role assignment. In (87b), “the screen” and “John” are respectively generated at the specifier of lower VP and upper VP, where “BECOME+clear” assigns a patient to “the screen” and “CAUSE+ BECOME+clear” assigns a causer to “John”. Analogously, “chuangzi(window)” and “John” are respectively introduced by “BECOME” and “CAUSE” and assigned a patient role and a causer role.

- (87) a. John cleared the screen.

- b. [IP ... [VP John [V⁰ CAUSE [VP the screen [V⁰ BECOME [AP clear]]]]]]

- c. John da sui le boli.

John hit break Asp glass

‘John hits the glass broken.’

- d. [IP ... [VP John [V⁰ CAUSE da [VP chuangzi [V⁰ BECOME [VP po-le]]]]]]

- (88) a. John [DegP bi Mary [Deg' comp gao [DegP yidian [Deg' comp gao [AP gao]]]]]. (lower)
-
- b. John [DegP bi Mary [Deg' geng gao [DegP yidian [Deg' geng gao [AP gao]]]]]. (lower)
-

In an analogy with (87b) and (87d), a head movement from A^0 to Deg^0 to Deg^0 in comparatives is deemed feasible. The motivation triggering the movement of “gao(tall)” to lower Deg^0 can be attributed to the introduction of differential phrases, e.g. “yidian(bit)” in (88a) and (88b). If “yidian (bit)” requires a theta role, “comp gao” or “geng gao” will be charged to assign one. Since “comp gao” or “geng gao” bears the responsibility to introduce differential phrases, it is justifiable to explain why degree head and gradable adjectives play a decisive role on the selection of differential phrases in a cooperate way. Then “comp gao” or “geng gao” moves to upper Deg^0 to usher in “biP”. D6?

Assuming differential phrases to occupy the specifier of $DegP$ not only conforms to where differential phrases in English are posited, but also prevents them from being selected by gradable adjectives directly. Although Mandarin differential phrases occur after gradable adjectives in linear order and differential phrases are deemed to denote a simple d type argument, they cannot serve to saturate the degree variable of gradable adjectives ($\langle d, e, t \rangle$). Their immediate combination will cause a wrong semantics because the degree variable determines the degree of gradable adjectives, while differential phrases point to the differential between two individuals along the dimension denoted by gradable adjectives. In contrast, a shell-based analysis of structures of Mandarin comparatives circumvents this problem, in one respect, reckoning differential phrases as the argument of comparative morphemes, and in the other respect, clarifying the distribution of differential phrases with comparative morphemes.

4.2.4 Differential Phrases

DifPP (categorization)

Mandarin differential phrases are hypothesized to occupy the specifier of lower $DegP$, and they are categorized into two major groups depending on their lexical meanings, i.e. exact differential phrases and vague differential phrases, the former contains degrees like 2 limi(2 cm), 2kg, etc. and quantities like 2 ben shu(two CL books), 2 ge xiaoshi(two CL hours), 2 ci(two times), etc.; while the latter contains “yidian/yixie(a little)”, “henduo(many)”, “haoduo-bei(multiple times)” etc. The latter can be further divided into small degree differential phrases with “yidian/yixie(a little)” as members and large degree differential phrases with “henduo(many)”, “haoduo-bei (multiple times)” as members.

As shown in (4a) and (4b), gradable adjectives are assumed to move from situ into the Deg^0 position where gradable adjectives plus Deg^0 determine which type of differential phrases should be selected at the specifier of $DegP$. As observed by Svenonius & Kennedy (2006), He (2018), etc., gradable adjectives are grouped into measurable ones and non-measurable ones with “gao(tall)” and “piaoliang(beautiful)” as the typical instantiations respectively. Judging from their lexical meanings, measurable gradable adjectives can be modified by both exact and vague differential

gradable
adjectives

measurable
non-measurable (tall)

→ as iff P has (P221) (b) in 104

phrases, i.e.(89a), while non-measurable gradable adjectives can only be modified by vague differential phrases, i.e. (89b). Except for measurable gradable adjectives, certain non-gradable verbs can be measured and compared via plural objects in (90a) or measure phrases in (90b) and (90c).

- * *non-gradable verbs* (1-in-what's-~~what's~~)
- (89) a. John bi Mary comp *gao* 2 limi/yidian/henduo. *measurable g.a.*
John than Mary more tall 2 cm/a bit/ many
'John is 2 centimeters/a bit/much taller than Mary.'
- b. John bi Mary comp *congming* *2 du/yidian/henduo. *non-measurable g.a.*
Mary than Mary more smart 2 degrees/a bit/many
'Mary is *2 degrees/a bit/much more smart than Mary.'
- (90) a. John bi Mary duo mai-le 2 ben shu.
John than Mary more buy-Asp 2 CL book
'John bought two more books than Mary.'
- b. John bi Mary duo pao-le 2 ge xiaoshi.
John than Mary more run-Asp 2 CL hour
'John ran two more hours than Mary.'
- c. John bi Mary duo qu-le 2 ci Beijing.
John than Mary more go-Asp 2 times Beijing
'John went to Beijing 2 more times than Mary.'

In English, "er/more" is universal and indispensable in syntax, so that it exerts no prejudice against the type of differential phrases, and gradable adjectives or gradable predicates, on their own, determine differential phrases, exact type or vague type. As shown in the translation of (89a) and (89b), the lexical entries of "tall" and "smart" respectively determine whether or not they can accept exact differential phrases. As for non-gradable verbs in the translation of (90a), (90b), and (90c), "more" introduces quantities or numbers at its specifier to express the differential between the referent and the standard. In contrast with English, Mandarin employs multiple comparative morphemes to realize "greater than" relation in syntax. Diversity must indicate idiosyncrasy, otherwise it will be redundant to have more than one component implemented a common meaning. The idiosyncrasies of Mandarin comparative morphemes not only lie on the hierarchical discrepancies in semantics but also on the restrictions over differential phrases in syntax. As Table 4 and Table 5 tell that comparative morphemes like "geng" "bijiao", and "shaowei" only allow modifications from small degree vague differential phrases, but deny large degree vague differential phrases and exact differential phrases, irrelevant of the contrast between measurable gradable adjectives and non-measurable ones. Similar selection restriction is found applicable to equative morpheme "yiyang(as)". It also should be noted that "shaowei (slightly more)" performs particularly in demanding an obligatory occurrence of "yidian (a bit)". The author offers a rudimentary explanation to this in last section, but the reason why "geng(more)", "bijiao(more)" are confined to small degree vague differential phrases is still mysterious, it will be left for future explorations and more discussions can be found in Li (1997) and Lin (2014).

Table 4 Distribution of DiffP and “Deg+A_{measurable}”

measurable gao(tall)	exact DiffPs	small degree vague DiffP	large degree vague DiffP
	2 limi(2 cm)	yidian(a little)	henduo(many)
comp (more)	comp gao 2 limi	comp gao yidian	comp gao henduo
geng (more)	*geng gao 2 limi	geng gao yidian	*geng gao henduo
bijiao(more)	*bijiao gao 2 limi	bijiao gao yidian	*bijiao gao henduo
shaowei(slight-more)	*shaowei gao 2 limi	shaowei gao yidian	*shaowei gao henduo
yiyang(as)	*yiyang gao 2l imi	*yiyang gao yidian	*yiyang gao henduo

Table 5 Distribution of DiffP and “Deg+A_{non-measurable}”

non-measurable piaoliang(beautiful)	exact DiffPs	small degree vague DiffP	large degree vague DiffP
	2 du(2 degree)	yidian(a little)	henduo(many)
comp (more)	*comp piaoliang 2 du	comp piaoliang yidian	comp piaoliang henduo
geng (more)	*geng piaoliang 2 du	geng piaoliang yidian	*geng piaoliang henduo
bijiao(more)	*bijiao piaoliang 2 du	bijiao piaoliang yidian	*bijiao piaoliang henduo
shaowei (slight-more)	*shaowei piaoliang 2 du	shaowei piaoliang yidian	*shaowei piaoliang henduo
yiyang(as)	*yiyang piaoliang 2 du	*yiyang piaoliang yidian	*yiyang piaoliang henduo

If differential phrases are determined by Deg^0 and A^0 together, comparatives headed by the null morpheme “comp” behave peculiarly as it is transparent to the identification of differential phrases. The reason can be attributed to that “comp” as a null morpheme is neutral in syntax, so that in the cases of comparatives with “comp”, it is gradable adjectives that actually bear the task to ensure the type of differential phrases, though “comp” still forms a compound with “A⁰” at lower DegP.

- (91) a. John bi Mary duo mai-le ji ben/ yixie/ henduo shu.
 John than Mary more buy-Asp several CL/ some/ many book
 ‘John bought several/some/many more books than Mary.’
- b. John bi Mary duo pao-le jige xiaoshi/ yihuier/ henchang shijian.
 John than Mary more run-Asp several hours/ some time/ much time
 ‘John ran several/some/many more hours than Mary’
- c. John bi Mary duo qu-le jici / henduo ci Beijing.
 John than Mary more go-Asp several times/many times Beijing
 ‘John went to Beijing several/many more times than Mary.’

- (92) a. John bi Mary gao de duo.
 b. John bi Mary gao duo le.

Besides “geng(more)”, the case of “duo” is also distinctive. As a comparative morpheme specific to verbs, “duo(more)” requires an obligatory differential phrase on quantity or number, or the comparative constructions will be excluded for the reason given in Section 4.2.3.4. Since the occurrence of “duo(more)” is compulsory for comparatives built upon non-gradable verbs, it should resemble English “more/er” in being free to the type of differential phrases. This can be borne out in (91a), (91b) and

(91c), where small degree vague differential phrases like “ji(several)”, “yixie(some)” and “yihuier(some time)” and large degree vague differential phrases like “henduo(many)” and “henchang(much time)” can plug in comparatives without any problems. “duo(more)” can barely serve as the degree head of gradable adjectives except for cases in (92a) and (92b), where “duo” selects “gao de(tall de)” or “gao(tall)” as complement. But different from “duo” with non-gradable verbs, this “duo” encodes an extra meaning that highlights the gap between referent degree and standard degree is large, so that this extra meaning refutes other differential phrases. This explains why (92a) and (92b) disallows differential phrases.

- (93) a. John bi Mary comp gao-chu 2 limi/yidian/henduo.
 John than Mary more tall-exceed 2 cm/a bit /many
 ‘John is 2 centimeters/a bit/much taller than Mary.’
 b. *John bi Mary comp ai-chu 2 limi.
 John than Mary more short-exceed 2 cm
 ‘John is 2 centimeters shorter than Mary.’

One last notable point is concerned with the null “comp” and “gao-chu(tall-exceed)” in (93a). As aforementioned, “ai-chu(short-exceed)” in (93b) is ruled out in the lexicon. Differential phrases in (93a) must be overt, because “gao-chu(tall-exceed)” behaves as a verb that must assign a case to differential phrases. Among all comparative morphemes, only “comp” satisfies this requirement, others like “geng(more)”, “hai(more)”, “bijiao(more)”, or “shaowei (slightly more)” share to refute exact differential phrases “2 limi(2 cm)” and large degree vague differential phrases “henduo (many)”.

4.2.5 Mandarin Typologically as a Single Marker Language

Mandarin comparatives are assumed to parallel to their English counterparts in employing two types of morphemes to implement “greater than” and “Standards introduction” respectively. But given the fact that English comparatives are reckoned as a language adopting double markers, it seems that Mandarin is also attributed into the set of double marker languages, contra to the typological agreement that Mandarin only uses one single marker “bi(than)” on Standards. To get an overall view of this problem, the world atlas of language structure is scrutinized for a brief retrospect of comparative strategies in Table 6 and Table 7 below.

Stassen (1985, 2005), Chappell (2015), etc. observe two types of markers are usually utilized by world languages to form comparatives, the marker of Standard and the marker of gradable adjectives. The majority of languages adopt the single marker strategy by either marking Standards or marking gradable adjectives, and compared to the latter, Standard markers are much more preferred. Languages, which adopt the double marker system, account for only a small proportion in total. One of the most frequent instantiations of Standard markers is prepositions, such as “yu(at)” in ancient Chinese (Guo, 1997), or “yori (from)” in Japanese (Li, 2011). For double marker languages, the part of speech attached to Standards are also prepositions, i.e. “than/dan/mint/que”. Thai belongs to the single marker type featured with a suffix of

“exceed” meaning, being cliticized to adjectives. Languages of double marker types differ from each other in the bound or free status of comparative morphemes. English adopts both types of morphemes, i.e. “er” and “more”, while Dutch and Hungarian only use bound suffixes like “er” or “bb”, and French employs free morpheme “plus”.

Table 6 Comparative Constructions across Languages

Language	example	Standard marker	Adjective marker	Number
Mandarin	John bi Mary gao.	✓: bi	✗	1
Ancient Chinese	John gao yu Mary	✓: yu (at)	✗	1
Japanese	John wa Mary yori takai.	✓: yori (from)	✗	1
Thai	kăw sūuŋ kwă kon túk kon he tall exceed man each man 'he is taller than anyone' Warotamasikkhadit 1972: 71	✓: kwă (exceed)	✗	1
English Dutch Hungarian	John is taller than Mary John is langer dan Mary John magasa-bb mint Mary ()	✓: than dan mint	✓: er er bb	2
English French	John is more intelligent than Mary John est plus intelligent que Mary	✓: than que	✓: more plus	2

Table 7 tells that similar distributions are observed in dialects and languages of minorities in China (Dai, 1998; Zhao, 2002; Li, 2003; Liu, 2003, 2008; ect.). As manifested, double-marker strategies are observed in languages under Sino-Tibetan family, such as Cantonese, employing Standard marker “比” and adjective marker “过”, Jingpho language cliticizing tha²³³ to Standards, and kʒau²³³ to adjectives. More patterns of double markers are enumerated in Deng (2010, p133-139), all of which share to use two types of markers but with distinctions on what order they appear in superficial structure. Regarding the linearized order of comparatives, Dong language presents a quite specific feature with resorting to a fix order of “Referent Adjective Standard”, no markers being present.

Table 7 Comparative Constructions across Dialect in China

Language	example	Standard marker	Adjective marker	Number
Mandarin	John bi Mary gao.	✓: bi	✗	1
Laizhou dialect	这个屋子暖和起那个屋子 'this room is warmer than that one.' Qian, ed., 2001, p292	✓: 起	✗	1
Min dialect	汝恰/较/解悬我。 'you are taller than me.'	✗	✓: 恰/较/解	1

	Cai, 2018, p683			
Cantonese	佢比你过高 'he is taller than you.' Li, 2003, p218	✓: 比	✓: 过	2
Jingpho Language	kǎ ³¹ nau ³³ kǎ ³¹ phu ³¹ tha ²³³ kǒau ³³ 弟弟 哥哥 M1 M2 tset ³¹ ai ³³ 勤快 SF 'Litter brother is more diligent than elder brother.' Dai, 1998, p291-293	✓: tha	✓: kgau	2
Dong Language	他小我 'He is younger than me.' Shi, 1997, p63-65	✗	✗	0

Lai zhou dialect places a suffix “起” into the middle position of adjectives and Standards, just like Thai. Min dialects adopt degree adverbs like “恰/较/解” to constitute comparatives. Except for dialects in Min district, Naxi language and Lagu language are found to manipulate a strategy of comparatives via degree modifiers, as shown in (94) and (95). In Naxi language, with Standard implicit or supplied by context, degree words like “la³³ha⁵⁵” “nJia²⁴ ma²¹” “zua³³” independently implement comparative meanings. While for Lagu language, it directly employs “ke⁴(geng)” as the sole maker of comparatives.

- (94) a. t^hw³³ Jir⁵⁵ la³³ha⁵⁵ ngy³³
3SG money more have
Not 'he has more money' but 'he more has money'
'他更有钱,'
- b. t^hw³³ (nw³³) nJia²⁴ ma²¹ ngir²¹ ts^hu²¹.
3SG DAM more run fast
'he runs much faster.'
'他跑得快得多。'
- c. ny²¹ t^ha²⁴ me⁵⁵me²¹ phir²¹ zu³³.
1SG 3POSS sister like more
'I like her sister more'
'我更喜欢她姐姐。' Lv&Mu, 2018, p598-599
- (95) a. zo³ ve¹ li⁵do¹ ja² ve¹ a⁵ ke⁴ ma³.
he de book I DE OM geng many
'His book is more than mine'
'他的书比我多'
- b. ffa²va⁵ le¹ ffa³zɔ² a⁵ ke⁴ ɔ²qho⁵ r⁷.
John SM Mary OM geng age big
'John is older than Mary.'
'John 比 Mary 年纪大' Deng, 2010, p131-132

Given the distribution of the two types of markers, it is agreed that markers of Standard with various origins are the primary method adopted by comparatives and the majority of languages take it as the sole marker. By contrast, only a handful of languages adopt adjective markers as the exclusive morpheme to constitute comparatives. Telling from Table 6 and 7, Thai, Cantonese and many dialects in Min district belong to such a type. Besides, adjective markers are too often found in languages adopting double markers with English as the most typical one. Setting the semantic division of “more” and “than” aside, two types of markers in syntax are actually not economical since single markers, either the one attached to Standards or the one attached to adjectives are prominent enough to mark the comparative constructions, which explains why languages by single markers accounts for a larger proportion in the reservoir of world languages in comparison with languages of double markers.

It must be underlined here that the framework of degree semantics develops from English, a language employing double markers, whose semantic division is quite clear with “more” denoting a function with a complex type and “than” only facilitates to introduce or mark Standards. “more” is deemed fatal to the meaning of comparatives as the function it denotes determines the number and the type of arguments, as well as the way how arguments combine with each other. With no “more”, all components of comparatives will impossibly combine with each other to make up a well-formed comparative construction. In contrast, the semantic contribution of “than” is vacuous with a semantic type $\langle x, x \rangle$, specific to components in charge of linking function. Thus “more” is deemed to enjoy a more important status than “than” in semantics.

The emphasis of degree semantics on “greater than” meaning will cause an immediate conflict with the wider distribution of languages adopting prepositions as the single marker. In a normal logic, the more contributions a component makes to meanings, the more prominent it should behave in syntax. If the analysis of degree semantic is on the right track, components bearing “greater than” relation should spread more extensively than Standards markers. Yet the true proportion among world languages runs counter to this prediction. Then how to explicate the mismatch between the syntactic preference over Standard marker and the semantic emphasis on “greater than” meaning becomes a key to the adequacy of degree semantics. In particular, Mandarin comparatives undertake such a conflicting strategy that Standards are overtly marked by preposition “bi(than)”, while the carrier of “greater than” meaning can be null in structure.

As English syntactically requires two types of overt components to form comparatives, the consequence caused by the syntactic and semantic mismatch to English is not that serious. Despite that, English still fails to manifest the positive correlation between the semantic contribution and the syntactic indispensability. Given the semantic contribution of “more”, it should be more prominent in syntax than “than”. The fact is “more” and “than” share an equal non-cancellable status. English “more” owns the ability to constitute comparatives independently in a form “John is more intelligent (than Mary)” or “(compared to Mary), John is more intelligent”, but it will be too hasty to claim that “more” is syntactically more

important than “than”. Actually, comparative morphemes in English behave more like an obligatory rule of syntax, rather than a requirement on an overt expression of “greater than” relation. In particular, comparative constructions share identical patterns exist in world languages, but with no “more” adopted, for instance, comparatives in ancient Chinese present a form like “John gao yu Mary”, which superficially parallels to “John tall than Mary”. Then it must be admitted that to compare the syntactic significance of “more” and “than” sounds like a mission with no substantial value.

The problem thus arises on how to demonstrate that the framework of degree semantics indeed fits for Mandarin comparatives. A logical explanation on the mismatch will play a key role. Initially, the judgment the semantic contribution correlates with syntactic indispensability in a positive way turns out to be only partially correct. Admittedly, “like” in a regular SVO construction denotes a function like (96b), which contributes the most crucial meaning to the semantic computation of (96a), and correspondingly “like” occupies the head position of VP (with IP and CP intentionally omitted here). Nevertheless, components that are semantically translated as functions do not naturally indicate a higher status in syntax. For instance, the generalized quantifier “every” in (97a) and the degree modifier “often” in (98a), both are defined as functions, determining the number and the type of arguments as well as the way how they combine. Just like “more”, their semantic contribution is indisputably larger than others, whereas their roles in syntax are not as prominent as “like” in (96a), for “every” and “often” share to appear in sentences optionally instead of compulsorily. Besides, they are all confined to take effect in a limited domain, such as “every” only works to restrict NP and “often” modifies VP. (97) and (98) conspire to boost an argument that the semantic contribution of components has no direct relation with their syntactic status.

- (96) a. [vp John [v likes [NP Mary]]].
b. $\llbracket \text{like} \rrbracket = \lambda y \lambda x. [\text{like}(x, y)]$

是對的！

- (97) a. Every boy loves Mary.
b. $\llbracket \text{like} \rrbracket = \lambda y \lambda x. [\text{like}(x, y)]$
c. $\llbracket \text{every} \rrbracket = \lambda P \lambda Q. \forall x [P(x) \rightarrow Q(x)]$
- (98) a. John often plays basketball.
b. $\llbracket \text{often} \rrbracket = \lambda P \lambda x. [\text{often}(P)(x)]$

Logically speaking, the positive correlation between semantic contribution and syntactic status will indicate the feasibility of the correlation in a negative direction, i.e. the less contribution a component makes, the less indispensable it will behave in syntax. As (99a) and (99b) display, the prediction cannot be right. The preposition “of” in (99a) is vacuous in semantics because it contributes nothing to sentence meanings but only charges to introduce arguments, so it denotes a linking type as $\langle e, e \rangle$. But “of” is indispensable in syntax as it bears to assign “Mary” an accusative case. Same syntax and semantic mismatch applies to the indefinite article “a” in (99b) as well. “a” must be overt in syntax, or the sentence will be illicit. But its semantic contribution turns out to be vacuous, and its semantic type, $\langle\langle e, t \rangle, \langle e, t \rangle\rangle$, symbolizes another kind of components undertaking a linking function.

- (99) a. John is fond of Mary.

- b. Mary is a teacher.

多音节形容词

By now, it is safe to cut off the correlation between semantic contribution and syntactic status. The larger proportion of languages with a single marker adjoined to Standards can only manifest these components are more preferred by syntax to form comparatives, possibly out of reason that they are stable enough and simple enough. But it is unnecessary for them to shoulder the most crucial part of sentence meanings, and meanwhile, components that contribute a lot to meanings unnecessarily enjoy a more prominent status in syntax. Mandarin comparatives just reflect such a situation where “bi(than)” behaves more prominent in syntax, but bears a vacuous meaning in semantics, “comp” bears a crucial “greater than” meaning, but is null in syntax.

The obstacle lies on the road to parallel Mandarin comparatives to English ones can be partially removed for “bi(than)” merely bears an introduction function in semantics. Nevertheless, the hypothesis to assign “greater than” meaning to a null “comp” in Mandarin still deserves more words. Actually, null morphemes are not rare in world language. Under generative grammar, NP is hypothesized to be licensed by a functional projection DP (determiner projection), whose head functions to restrict the referentiality of NP. As shown in (100b), “the” before “boy” and “restaurant” can neither be deleted nor present a null form. Its semantic representation in (100c) indicate “the” will exert substantial influence on sentence meanings. Yet in (100a), bare NP “fandian(restaurant)” appears licit in the object position of Mandarin sentences. If the syntactic DP projection and the semantic requirement on binding referentiality apply universally to all languages, a null D morpheme then must be assumed to bear corresponding functions in Mandarin. The null morpheme for present tense in English and Mandarin serves as another piece of evidence. Moreover, IP(TP) is hypothesized to license VP in structure and functions to anchor the time of events denoted by verbs. In English, tense heads are instantiated as “-ed” for past tense in (101b), a null morpheme for present tense in (102b). Mandarin analogously adopts “le” for past tense in (101a), and a null morpheme for present tense in (102a). To indicate the existence of the null morpheme for present, English utilizes an overt agreement system between subject and verbs, i.e. “-es”, by contrast, Mandarin employs an obligatory occurrence of temporal adverbs, e.g. “jingchang(often)”. The semantic contribution of the null present tense is undoubtedly non-vacuous, but it still presents a null form in both English and Mandarin.

- (100) a. na ge nanhai zoujin-le fandian
that CL boy come into-Asp restaurant

- b. The boy came into the restaurant.

- c. $[\![\text{the}]\!] = \lambda P. \exists x [P(x)]$

- (101) a. John zuotian da-le lanqiu
John yesterday play-Asp basketball

- b. John played basketball yesterday.

- (102) a. John jingchang da lanqiu.
John often play basketball

- b. John often plays basketball.

In conclusion, to endow a null morpheme with a comparatively prominent meaning is not completely impossible for languages, especially when certain kinds of meanings are universal, such as referential meanings of nominal expressions, temporal meanings of events, as well as degree meanings of gradable predicates. The syntactic preference over single markers may only indicate a positive influence exerted by economy principle upon the structure of languages, which comes out as: since one marker in languages is prominent enough to distinguish comparatives from others in syntax, two or more markers will become redundant. But the principle of economy does not force languages to give up the strategy of double markers, or there will be no languages of English types. Actually, it is languages of double markers that offer a powerful evidence for the independence of “greater than” meaning and the semantic division between adjective markers and Standard markers.

As mentioned in last section, Mandarin presents a highly parallelism to English in comparing system. Both of them share an almost identical system of degree adverbs in expressing positive meaning, comparative meaning, equative meaning as well as superlative meaning. Both of them utilize a double-marker strategy to form equative constructions, these two markers respectively attached to adjectives and Standards. Besides, English and Mandarin superlative constructions are constructed out of a degree adverb “zui(most)”. With all these in mind, it is plausible to infer that Mandarin employs a similar strategy as English to form comparative construction with “bi(that)” prominent in syntax but vacuous in semantics and a comparative morpheme “comp” null in syntax but bears a key “greater than” meaning in semantics. Such a claim does not deny Mandarin comparatives as a single marker type, and on the contrary, it fully reflects the contribution of degree adverbs in Mandarin comparatives. In conclusion, Mandarin adopts two types of single markers, “bi(that)” and degree adverbs, with any of them alone being able to mark comparative constructions.

4.3 Decipher Puzzles in Previous Studies

4.3.1 Other Versions of DegP-shelled Analysis

Xiang (2005) inaugurates the enterprise to apply DegP-shell structure to the analysis of Mandarin comparatives. Though confronted with criticisms by subsequent scholars (Lin, 2009; Liu, 2011), her attempts are undoubtedly inspiring and in a large extent lay the foundation for another two important studies of Grano&Kennedy (2012) and Guo (2012). As their analyses have been introduced in chapter two, their structures are cited here directly in (103a), (103b) and (103c), for a contrast with the structure fabricated in this dissertation, i.e. (103d).

- (103) a. John [Deg_P Deg⁰ bi [AP Mary_j [A' A⁰ gao+ exceed_i [Deg_P t_k [Deg' Deg⁰ t_i [Diff_P 2 limi]]]]]]. Xiang (2005)
- b. John [Deg_P Deg⁰ bi [AP Mary [A' ACOMP gao+μ_i [Deg_P Deg⁰ t_i [Diff_P 2 limi]]]]]. Grano&Kennedy (2012)

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- c. John [DegP bi Mary[Deg' Deg⁰ (gao_i+exceed)_j [DegP [DiffP 2 limi] Deg⁰ t_j [AP t_i]]]].

Guo (2012)

- d. John [DegP bi Mary [Deg' Deg⁰ (comp+gao_i)_j [DegP [DiffP 2 limi][Deg' Deg⁰ t_j [AP t_i].

分析：

Structures in (103a), (103b) and (103c) share to assume a null Deg⁰ head exclusively in charge of the introduction of differential phrases, either at its complement position or specifier position, all of which are instantiated as “chu(exceed)” in Mandarin. Admittedly, these structures offer an accommodation for “chu(exceed)” in an overt form, but it meanwhile brings about a flaw that a null “chu(exceed)” must always be there, whose existence, however, gets challenged empirically from (104a), (104b) and (104c). As discussed in Section 4.2.2.2, Negative adjective “ai(short)”, measurable positive adjective “zhong (heavy)” as well as non-measurable positive adjective “piaoliang (beautiful)”, all refute to co-occur with an overt “chu(exceed)”. If the status of “chu(exceed)” remains reliable, an apparent selection restriction launched by “chu(exceed)” to adjectives is observed. But in (103a) and (103b), it is AP that selects DegP as complement, which even self-conflicts the hypothesis proposed by Svenonius&Kennedy(2006) that a measurable degree head selects a measurable adjective and a non-measurable degree head selects a non-measurable adjective.

Xiang (2005)
Grano &
Kennedy (2012)
缺陷1

- (104) a. *John bi Mary ai **chu** 2 limi.
 b.* John bi Mary zhong chu 2 gongjin.
 c. *John bi Mary piaoliang **chu** henduo.

Another inadequacy originates from the head-complement relation between “chu(exceed)” and differential phrases, which will indicate that “chu(exceed)” has a selection restriction over differential phrases independent of gradable adjectives. Whereas this goes against the semantic intuition that gradable adjectives should have a direct restriction on the choice of differential phrases, for instance, “piaoliang(beautiful)”, on its own, determines that it cannot be modified by exact differential phrases. Besides, “gao(tall)” determines its differential phrases to be degree of height and “zhong(heavy)” determines its differential phrases to be degree of weight. But the pattern [DegP chu [DiffP ...]] undesirably cut off the relation between them.

Xiang
Grano &
Kennedy
缺陷2

Same problem applies to the structure of standard analysis under degree semantics, where “er” selects “thanP” as complement and DiffP as specifier. By contrast, the structure proposed by Corver (1997) circumvents this inadequacy by assuming “er” selects gradable adjective at the complement and DiffPs at the specifier, i.e. [QP [DiffP 2 inches] Q⁰ er [AP tall]], a structure followed by (103c) in Guo (2012) and (103d) in this dissertation. In addition, given the clitic feature of “er”, “tall” can be assumed to move into Q⁰ position, where a more direct relation between “taller” and “2 inches” is established. Such a head movement is also assumed to happen in Mandarin comparatives telling from (103c) and (103d). Svenonius&Kennedy(2006) and Kennedy& Levin(2007) note this flaw as well and on the basis the same structure of Corver, they propose a pair of null morphemes, featured with a binary selection of measurable and non-measurable gradable adjectives in a schema like [DegP [DiffP 2

inches] pos_{measurable} [QP er [AP tall]]]. This mechanism is not as economical as the one mastered by Corver because it need assume an extra layer of function projection, which gives rise to an indirect relation between gradable adjectives and differential phrases. Besides, the head of this extra functional projection unfortunately remains always occupied by a null “pos”, i.e. no instantiations in world languages.

Though Guo (2012) adopts a same structure as Corver, she still keeps the degree head position for “chu(exceed)”, and in her analysis, the same position also accommodates degree adverb “yiyang(as)”. It is apparent that “chu(exceed)” and “yiyang(as)” do not belong to the same category with the former being a bound suffix and the latter a free morpheme. But this challenge is not lethal as English “er” performs as a bound suffix and “more” as a free morpheme, and they are assumed to occupy the same Deg⁰ position. The most crucial discrepancy between “chu(exceed)” and “yiyang (as)” or English “er/more”, lies on their selection restriction on gradable adjectives. As shown in (104), “chu(exceed)” presents kind of extra restrictions on the type of gradable adjectives, but the same restrictions are not found in “yiyang(as)” or “er/as”. For instance, “yiyang(as)” is free to appear in “John he Mary yiyang gao/zhong/piaoliang(John is as tall/heavy/beautiful as Mary)”, so does English “er/more” or “as”. Another disadvantage of Guo’s analysis happens to engage no semantic computation.

Given above analysis, “chu(exceed)” should be picked out from the set of Deg⁰s, leaving the Deg⁰ position occupied by a null “comp” in the case of (103d). “gao” then moves into the Deg⁰ position and forms with “comp” a compound there deciding the type of differential phrases. As for the combination of “gao(tall)” and “chu(exceed)”, they are deemed to compound in the lexicon as “chu(exceed)” not only tailing adjectives but also verbs like “chao-chu(exceed-exceed)”, “sheng- chu(win-exceed)”, etc. Except “chu(exceed)”, other suffixes like “guo(pass)” and “le (state of change)” can also adhere to adjectives and even spread more popularly than “chu(exceed)”.

4.3.2 Lin (2009): “bi(than)” Conflating “er” and “than”

In section 3.4.3, we have an analysis on the problems of Lin’s argument comparison, which mainly focuses on his improper treatment of “V de” constructions and the semantic division between greater than meaning and Standard introduction. In this section, the focus will be placed on the adequacy of “bi(than)” as a functional degree head. Unfortunately, no scholars have ever given a full list of degree heads in Mandarin by now, the apple of discord for the chaos in the field of Mandarin comparatives. As seen from previous studies, three types of components are acknowledged as instantiations of comparative morphemes, and they are prepositions “bi(than)”, degree adverbs like “geng(more)” as well as suffix “chu(exceed)”. Except Lin, Xiang (2005), Grano&Kennedy (2012) also posit “bi (than)” at the same position as English “er/more”, though Lin deems “biP” as an adjunct phrase and Xiang, Grano&Kennedy regard it as a functional head. They do not give out powerful evidences to support the functional status of “bi(than)”, what they advocate looks more like an *ad hoc* equivalent of their English counterparts. At least judging from

their parts of speech and syntactic distribution, it is hard to find “bi(than)”, “geng(more)” and “chu(exceed)” perform any kind of similarities. It should be noted that the discussion on the status of “bi(than)” should not be extended to whether prepositions are functional or not.

In the field of English comparatives, there are two types of analyses on the role of “er” developing in parallel, one type represented by the standard analysis in chapter two, “er” behaving like a quantifier¹⁴, the other type represented by Abney, Corver, Kennedy, etc., “er” as a functional degree element. Lin (2009) inherits the idea of “er” as kind of quantifier, conflating the functions shouldered respectively by “er” and “than” into one single “bi(than)”. “bi” deviates from “er” in whether or not accommodating differential phrases at the specifier position. If differential phrases in Mandarin are imagined to land at the specifier of “bi(than)”, a correct word order will become impossible because Mandarin differential phrases always follow adjectives in linearization. The role of differential phrases caters for the lexical entry of “er” as a generalized quantifier. In (105a), “er” presents a standard type of generalized quantifier (Cresswell, 1977; von Stechow, 1984; Heim, 1985, 2000; Bhatt&Pancheva, 2004; etc.). The “greater than” relation that “er” encodes is naturally transformed into a “exceed or equate to” relation via an addition of degree denoted by differential phrases, i.e. (105b). Bhatt& Takahashi (2011), based on (105a), constructs a new lexical entry in (106a) to deal with phrasal comparatives. Though the newly-built lexical entry looks bizarre in comparison with the typical generalized quantifier, it at least presents a synchronization in the success of adding differential phrases in (106b).

- (105) a. $[\![\text{er}]\!] = \lambda G_{<\text{d}, \text{t}} \lambda D_{<\text{d}, \text{t}}. [\text{Max d (D(d))} > \text{Max d (D(d))}]$ (generalized quantifier)
 $\qquad\qquad\qquad <<\text{d}, \text{t}>, <<\text{d}, \text{t}>, \text{t}>>$

b. $[\![\text{er}]\!] = \lambda G_{<\text{d}, \text{t}} \lambda d \lambda D_{<\text{d}, \text{t}}. [\text{Max d (D(d))} \geq \text{Max d (D(d))} + d]$ (\Leftarrow Boff P)
 $\qquad\qquad\qquad <<\text{d}, \text{t}>, <\text{d}, <<\text{d}, \text{t}>, \text{t}>>>$

(106) a. $[\![\text{er/bi}]\!] = \lambda y \lambda G_{<\text{d}, <\text{e}, \text{t}} \lambda x. [\text{Max d (D(d)(x))} > \text{Max d (D(d)(y))}]$
 $\qquad\qquad\qquad <\text{e}, <<\text{d}, <\text{e}, \text{t}>>, <\text{e}, \text{t}>>>$

b. $[\![\text{bi}]\!] = \lambda y \lambda d \lambda G_{<\text{d}, <\text{e}, \text{t}} \lambda x. [\text{Max d (D(d)(x))} \geq \text{Max d (D(d)(y))} + d]$ (\Leftarrow Boff P)
 $\qquad\qquad\qquad <\text{e}, <\text{d}, <<\text{d}, <\text{e}, \text{t}>>, <\text{e}, \text{t}>>>>$

In Lin's argument, "bi(than)" presents an identical form as "er" in (106a), so it should have a variant in the form of (106b), accommodating the degree argument denoted by differential phrases in the second place. (106b) is difficult to maintain in Mandarin because "bi(than)" projects no selection restriction on differential phrases. In analogy with English differential phrases, they are assumed to occupy the specifier of *DegP* in syntax, yet the specifier of "biP" never accommodates Mandarin differential phrases as the latter can never derive out a correct word order.

The problem of “bi(than)” as a degree head g appears more prominent in the structure constructed by Xiang (2005) and Grano&Kennedy (2012), where “bi(than)” is assumed to occupy the upper Deg^0 and a null morpheme “chu(exceed)” occupy the

¹⁴ “er” in standard analysis of degree semantics is treated as a generalized quantifier with a standard $\langle\langle d, t \rangle, \langle\langle d, t \rangle, t \rangle \rangle$ type. Heim (1985) and Bhatt&Takahashi (2011) recast the lexical entry of “er” above, to interpret phrasal comparatives directly. And to be exact, Lin’s proposal originates from “er” in this version.

lower Deg^0 . They offer no independent arguments on why “bi(than)” and “chu(exceed)” are posited into the same category of Deg^0 . What’s more, Xiang involves herself with no discussions on the semantic division of “bi(than)” and “chu(exceed)”, which constitutes another challenge to her analysis as “bi(than)” and “chu(exceed)” cannot denote a function centered by “greater than” at the same time, otherwise a crash in LF is unavoidable. But assuming any of them to be semantically vacuous will violate the original intention to set up DegP , as well as other function projections, DP and IP, which can be null in syntax, but never be vacuous in semantics.

In section 3.4.3 and 4.1.2, we have offered an alternative analysis to (107), featured with “bi Mary pao de” as a clause deleting “kuai(fast)”. In our analysis, it is verb “pao” that acts as an argument, not “pao de”. Following this line of thought, we will display how its semantic computation is realized on a par with the structure in (107).

- (107) John [VP pao [deP de [DegP [biP bi λd Mary pao de pos kuai]
 $\quad (\text{comp}+\text{kuai}_j)_k [\text{DegP } t_k [\text{AP } t_j]]]]]]$.

For an expository purpose, the well-established lexical entries of “kuai(fast)” and “comps” are repeated from Section 4.1.2 into (108a) and (108b). “kuai(fast)” is acknowledged to modify all verbs measured by speed, so the lexical entry of it should encode an argument to identify what speed “kuai(fast)” designs to modify, that is “v” in (108a).

- (108) a. $[\text{kuai}] = \lambda d \lambda v \lambda x. [\text{fastness}(x, v) \geq d]$
b. $[\text{comps}] = \lambda G_{\langle d, \langle v, \langle e, t \rangle \rangle \rangle} \lambda D_{\langle d, t \rangle} \lambda v \lambda x. [\text{Max } d_1(G(x)(v)(d_1)) > \text{Max } d_2(D(d_2))]$

The combination of “comps” and “kuai(fast)” derives (108c):

- (108) c. $[\text{comps kuai}] = [\text{comps}]([\text{kuai}])$
 $= \lambda D_{\langle d, t \rangle} \lambda v \lambda x. [\text{Max } d_1(\text{fast-ness}(x, v) \geq d_1)) > \text{Max } d_2(D(d_2))]$

In (108d), “pos” bears to shift the type of “kuai(fast)” from $\langle d, \langle v, \langle e, t \rangle \rangle \rangle$ into $\langle v, \langle e, t \rangle \rangle$ by offering “kuai(fast)” a free degree argument. The combination of “kuai(fast)” and “pos” inside “biP” derives out (108e). “de” is semantically vacuous, only facilitating to introduce DegP or CP in “V de” constructions. Thus (108f) undergoes no change in semantics. “pao(run)” in this case is no longer a one-place predicate but an argument with a simple “v” type, resembling the individual “e” type. In (108g), “pao” gets rid of the variable “v”, then it takes the individual argument “Mary” and produces a t-type proposition in (108h). (108h) is semantically vacuous and as a clause, it should denote a $\langle d, t \rangle$ type, the “ \exists ” operator is replaced by “ λ ” operator in (108i). “bi” as a marker of standards, is also semantically vacuous, so the lexical entry of “biP” is finally translated into (108j).

- (108) d. $[\text{pos}] = \lambda P \lambda v \lambda x. \exists d [P(x)(v)(d)] \quad \langle \langle d, \langle v, \langle e, t \rangle \rangle \rangle, \langle v, \langle e, t \rangle \rangle \rangle$
e. $[\text{pos kuai}] = [\text{pos}]([\text{kuai}]) = \lambda v \lambda x. \exists d [\text{fastness}(x, v) \geq d] \quad \langle v, \langle e, t \rangle \rangle$
f. $[\text{de pos kuai}] = \lambda v \lambda x. \exists d [\text{fastness}(x, v) \geq d] \quad \langle v, \langle e, t \rangle \rangle$
g. $[\text{pao de pos kuai}] = [\text{de pos kuai}](\text{pao}') = \lambda x. \exists d [\text{fastness}(x, \text{pao}') \geq d] \quad \langle e, t \rangle$

- h. $\llbracket \text{Mary pao de pos kuai} \rrbracket = \llbracket \text{Mary pao de pos kuai} \rrbracket (\text{Mary}')$
 $= \exists d [\text{fastness}(\text{Mary}', \text{pao}') \geq d]$
- i. $\llbracket \lambda d \text{ Mary pao de pos kuai} \rrbracket = \lambda d. [\text{fastness}(\text{Mary}', \text{pao}') \geq d]$
 $\quad \lambda \text{ abstraction } \langle d, t \rangle$
- j. $\llbracket \text{bi } \lambda d \text{ Mary pao de pos kuai} \rrbracket = \lambda d. [\text{fastness}(\text{Mary}', \text{pao}') \geq d] \quad \langle d, t \rangle$

Now, it is time to combine (108c) and (108j) with the former as function and the latter as argument, and the output of them is present in (108k). Neglecting the vacuous “de” in the matrix clause, (108k) will take “pao” and “John” one after another, and finally derives out the representation of (107) in (108l), which is paraphrased as “the maximal degree to which John ran fast is greater than the maximal degree to which Mary ran fast.”

- (108) k. $\llbracket [\text{bi } \lambda d \text{ Mary pao de pos kuai}] \text{ comp}_5 \text{ kuai} \rrbracket = \llbracket \text{comp}_5 \text{ kuai} \rrbracket$
 $= \llbracket \text{bi } \lambda d \text{ Mary pao de pos kuai} \rrbracket)$
 $= \lambda v \lambda x. [\text{Max } d_1 (\text{fast-ness}(x, v) \geq d_1) >$
 $\quad \text{Max } d_2 (\text{fastness}(\text{Mary}', \text{pao}') \geq d_2)]$
- l. $\llbracket (107) \rrbracket = \llbracket \text{John pao de} [\text{bi } \lambda d \text{ Mary pao de pos kuai}] \text{ comp}_5 \text{ kuai} \rrbracket$
 $= \llbracket \text{pao}' (\text{John}') \rrbracket$
 $= \text{Max } d_1 (\text{fast-ness}(\text{John}', \text{run}') \geq d_1) >$
 $\quad \text{Max } d_2 (\text{fast-ness}(\text{Mary}', \text{run}') \geq d_2)$

Another functional analysis of “bi” comes from Liao (2005), who puts that “bi(than)” is a complementizer like “than”, both facilitating to introduce a full clause. “than” in modern English is argued to undertake an evolution from Old English “than(ne), thon(ne), thaen(ne)” to Middle English “then”, where during this process no prepositional usage (like Japanese yori) or verbal usage (like Mandarin bi) can be borne out. Hence it is plausible to define “than” as a complementizer issuing a subcategorization for clauses (cf. Bhatt&Takahashi, 2011). However, there is no independent evidence in Mandarin to support “bi(than)” as a complementizer. As known in generative enterprise, CP behaves as a crucial functional layer adjoined on the top of all finite clauses, whose head “complementizer” embodies itself as “that” or a null element in English. When it comes to Mandarin, two main branches of opinions are derived with Ning(1993), Si(2002, 2004) etc. treating “de” as a complementizer and Deng(2006), Li(2008), Pan&Lu(2013), Lu&Pan(2019), etc. refuting “de” as a complementizer but only combining with its preceding phrases to form a DeP. Despite the contention, a safe conclusion can be assured that “bi(than)” is far away from becoming a potential candidate for Mandarin complementizer.

4.3.3 Liu: Implicit Deg⁰ and explicit Deg⁰

One of the most prominent ideas proposed by Liu (1996, 2007, 2010a, 2010b, 2011, 2018) is the assumption of two comparative morphemes distinguished by explicit or implicit at PF, for instance, explicit “geng₁” vs. implicit “geng₂”, explicit “bijiao₁” vs. implicit “bijiao₂”, as well as explicit “guo₁” vs. implicit “guo₂”. Meticulous and significant, Liu’s studies shed lights on the theme of this dissertation that Mandarin adopts multiple morphemes to implement “greater than” meanings, a

crucial point, though Liu himself does not specify it straightforwardly, is implied by his analysis of “geng(more)”, “bijiao(more)” and “guo(exceed)”. In addition, his proposal that Mandarin comparatives undergo a hybrid types of comparative, i.e. phrasal comparatives and clausal comparatives is possibly on the right track, being inherited and maintained in this dissertation as well. Notwithstanding, his analyses are still confronted with challenges: 1) the assumption of implicit comparative morphemes looks more descriptive than explanatory, and some stipulations are too loose to rule out overlapped cases; 2) “biP” and “geng” does not fall in one constituency; 3) the “minimal c-commanding” relation defined by Liu to preclude Mandarin subcomparatives and embedded comparatives is not reliable.

The motivation behind Liu stipulating implicit and explicit comparative morphemes lies on the stress of compositionality (Frege’s principle), which roots as the foundation of formal semantics, that is, the meaning of a compound proposition consists of all component meanings and the way how they are combined. Holding this principle in mind, it is not hard to understand why Liu prefers to the strategy making full use of implicit morphemes. If a sentence expresses certain kind of meanings which find no carriers at PF, it must imply the existence of implicit morphemes, which bear that meaning in an invisible way. In both English and Mandarin comparatives, the “greater than” meanings are indispensable, and English adopts an overt system of “er” and “more”. Since “geng(more)” is rendered as the equivalent of “er” and “more”, Liu just assumes an implicit “geng” when the explicit “geng” is not overt. Same logic is found in the implicit and explicit “bijiao(more)” and “guo(exceed)”.

Though sounds reasonable, Liu’s implicit strategy fails to stand up to the test of data. The challenge on top of the list is falsification (New Descriptivism, Hu, 2018). For expository purpose, the first pair of “geng₁” and “geng₂” is cited from Liu (2011, p1779). Judging from his glossing in (109a) and (109b), “geng₁” means “even-more” and “geng₂” means “more”, both of which not only introduce “biP” at their specifier, but also select a gradable adjective phrase at the complement.

- (109) a. John bi Mary geng₁ gao. *explicit*
 John than Mary even-more tall
 ‘John is even taller than Mary.’
- b. John bi Mary geng₂ gao. *implicit*
 John than Mary more tall
 ‘John is taller than Mary.’

Liu attaches an explanation below his examples, which reads, “bi and geng₁ form a pair of correlative words. The occurrence of bi entails the occurrence of the comparative degree morpheme, and vice versa. So it is not necessary for both of them to occur in the bi comparative simultaneously. However, since the covert comparative morpheme geng₂ does not have the phonetic form, it must co-occur with the word bi(Liu, 2011, p1779).” If the statement of Liu is understood in a correct way, he means “John bi Mary gao” is ambiguous, one referring to (109a) with “geng₁” omitted at PF, the other referring to “geng₂” an implicit morpheme at PF. Unfortunately, Liu’s explanation is not accurate because the first type of meaning is actually agnostic for

the superficial form “John bi Mary gao”, which neither denies the positive meaning of Mary, nor affirms the positive meaning of Mary. It is just judged true in a condition that “if and only if John’s height exceeds Mary’s height”, and no extra condition is added. To be exact, the meaning implied by “John bi Mary gao” is exactly the meaning of (109b), or in another word, (109b) serves as the underlying structure of “John bi Mary gao”. (109b) not only suggests “Mary is tall” is possibly accepted, but also suggests “Mary is short” or “John is short” is possibly accepted as well¹⁵. Besides, as (109a) displays an entailment to (109b) in meaning, those suggestive meanings can only be maintained in a suggestive stage, indicating a fact that it is “geng₁” that brings positive meanings of standard arguments to comparatives. Thus, “John bi Mary gao” is not ambiguous, it only projects an underlying structure in the form of (109b).

In Liu’s explanation, the implicit “geng₂” must be licensed by “bi(than)”, or in an alternative way, with no “bi(than)”, the implicit “geng₂” cannot be proved existential. This stipulation fails to cover the case in (110), where the meaning of (110a) wobbles between positive and comparative, for both (110b) and (110c) are qualified to answer (110a). As seen in (110a) and (110b), there is no “bi” to license “geng₂”. Though Liu may argue that “geng₂” can be licensed by “he(and)” or an implicit “bi” as (110b) may be recovered into a full form like “John bi Mary geng₂ gao”, these rescuing arguments are undesirably descriptive, peripheral to explanatory.

- (110) a. John and Mary, shui (geng₂/pos) gao¹⁶

John and Mary, who more/pos tall

‘John and Mary, who is tall(er)?’

- b. John geng₂ gao.

John more tall

‘John is taller.’

- c. tamen dou pos gao.

they all pos tall.

‘Both of them are tall.’

Furthermore, the contrast between geng₁+ DiffP and geng₂+DiffP is disputable. In (111a), the explicit “geng₁” refutes to appear with “2 limi(2 cm)”, while the implicit “geng₂” does not in (111b). It is seemingly impossible for Liu to find out a feasible explanation on why “geng₁” and “geng₂”, as a minimal pair, present such a syntactic discrepancy. Consequently, he has to stipulate that “geng₁” and “geng₂” not only differ from each other in meanings but also in distribution, a conclusion too stipulative to be accepted, especially for the fact that other geng-like degree heads in (111c), (111d) and (111e) refute to co-occur with differential phrases.

- (111) a. *John bi Mary **geng₁** gao 2 limi.

b. John bi Mary **geng₂** gao 2 limi.

c. *John bi Mary **hai** gao 2 limi.

d. *biji Mary, John **bijiao** gao 2 limi.

e. *John bi Mary **shaowei** gao 2 limi.

¹⁵ Aligned with the strict partial relation ($>$) between referent and standard, it is inferred that if Mary is tall is licit, John is tall must be licit; if Mary is short is licit, John may be short or may not be short.

¹⁶ Liu (2010a) assumes an explicit hen₁ and an implicit hen₂ in Mandarin, the form corresponding to “very”, the latter to “pos”.

Liu in 2007 and 2018 defines another two comparative morphemes, i.e. “bijiao(more)” and “guo(exceed)” in Mandarin comparatives. Let's see the pair of explicit “bijiao₁” and implicit “bijiao₂” first. According to Liu, “bijiao₂” can only occur in a comparative construction where an overt standard of comparison is syntactically introduced by “bi(than)”, whereas the overt one occurs in a comparative construction without an overt standard of comparison(Liu, 2018, p77)”, so that (112a) is “bijiao₁” and (112b) “bijiao₂”. In addition, the explicit “bijiao₁” refutes to co-occur with “biP” for not violating Constraint on Multiple Foci (Tang, 2001). Soon afterwards in the same article, he claims that (113a) and (113b) are of instantiations of “bijiao₂” as the standard “Mary” is syntactically overt, though not marked by “bi(than)”.

- (112) a. biqi Mary, John bijiao₁ gao.
- b. John bi Mary bijiao₂ gao.
- c. *John bi Mary bijiao₁ gao.

- (113) a. John he Mary, shui bijiao₂ gao?
- b. John bijiao₂ gao.

Liu's claims on the distribution of “bijiao₁” and “bijiao₂” is problematic on the judgment of “overt standard of comparison”. On the one hand, the word “only” should be underlined that “overt standard of comparison” initially refers to those introduced by “bi” syntactically, that's why (112b) is licit, but (112c) is ruled out. This criterion yet becomes loosened because “bijiao₂” can appear in patterns like (112a), (113a) and (113b). Similarly, “bijiao₁” can appear in patterns like (113a) and (113b). To recapitulate, “bijiao₁” only differs from “bijiao₂” in the case of (112c) with an overt standard introduced by “bi”, or in a direct way, “biP” and “bijiao₁” just cannot co-occur with each other, confined to no restrictions from the so-called “overt standard of comparison”.

As mentioned, Liu has ever assumed an implicit “geng₂” in the case of (112b), that is to say, there are two implicit components competing for the position of comparative degree head. Then the question arises that how to determine which one on earth occupies the degree head position in the pattern like “John bi Mary gao”. Liu finds no way to assure the distribution of “geng₂” and “bijiao₂” as both of them are implicit, not only sharing an identical meaning like “more”, but occurring in identical patterns like (112a), (112b), (113a) and (113b), where “bijiao₂” can be replaced by “geng₂”. Based on above analysis, it is tempting to assume a universal null comparative morpheme, i.e. “comp”, on the one hand respecting the particularity that “geng” indicates a positive meaning of standards and “bijiao” denies to co-occur with “biP”, on the other hand, getting rid of puzzles on the distribution of implicit “geng₂” and “bijiao₂”.

Besides the implicit “geng₂” and “bijiao₂”, Liu (2007, p74-79) defines a third pair of explicit “guo₁(exceed)” and implicit “guo₂(exceed)”. “guo₁” is featured with an optional differential phrase and an obligatory standard, as shown in (114a). On the contrary, “guo₂” requires an obligatory differential phrase and an optional standard, that is (115a). Meanwhile, the explicit “guo₁” can tail non-measurable gradable adjectives such as “piaoliang(beautiful)” but refutes to co-occur with negative

gradable adjectives like “ai(short)”, respectively shown in (114b) and (114c). By contrast, “guo₂” presents a distribution allowing negative gradable adjectives, and meanwhile disallows non-measurable ones. The syntactic distribution of “guo₁(exceed)” and “guo₂ (exceed)” can be generalized into (116a) with a different selection requirement on standards and differential phrases. Moreover, Liu disagrees with the generative relation between (116b) and (116a), and he argues “gao(tall)” in (116a) is selected by a functional projection headed by “guo_{1/2}” and further moves into the position of “guo_{1/2}”.

- (114) a. John gao guo₁ *(Mary) (2 limi)

John tall exceed Mary 2 cm

‘John is 2 centimeters taller than Mary.’

- b. Mary piaoliang guo₁ Lucy.

Mary beautiful exceed Lucy

‘Mary is more beautiful than Lucy.’

- c. *Mary ai guo₁ John 2 limi.

Mary short exceed John 2 cm

‘John is w centimeters shorter than Mary.’

- (115) a. John gao guo₂ (Mary) *(2 limi).

John tall exceed Mary 2 cm

‘John is 2 centimeters taller than Mary.’

- b. John ai guo₂ Mary 2 limi.

John short exceed Mary 2 cm

‘John is 2 centimeter shorter than Mary.’

- c. *John piaoliang guo₂ Mary 2 du.

John beautiful exceed Mary 2 degree

‘*John is 2 degree more beautiful than Mary.’

- (116) a. John [GuoP[Guo'[Guo gao_i guo_{1/2}] [AP Mary[A'[A t_i][DiffP 2 limi]]]]

- b. John bi Mary gao 2 limi

It is obvious that “guo” in (114)-(116) charges to implement “greater than” meanings. The reason why “guo₁” and “guo₂” present a difference in syntactic distribution lies on the fact that “guo₂” belongs to a weak version of “er” with a bleached *exceeding* meaning, so that it is not strong enough to restrict the degree(interval) argument of adjectives. Since Mary is an individual argument, it neither undertakes such a task. Consequently, only differential phrases are able to neutralize the degree (interval) argument of adjectives thus becoming non-cancellable. Liu’s explanation sounds more like an *ad hoc* solution with no independent evidence. Firstly, he hypothesizes the existence of implicit “guo₂” and uses the distribution of overt “guo₁” as criteria to testify the difference of “guo₂” from “guo₁”. His line of thought is at the risk of a lethal bug, that is, he does not offer direct evidence to prove the existence of “guo₂”, even if there is indeed something implicit tailing certain gradable adjectives, he still cannot guarantee this implicit morpheme be “guo₂” instead of others suffixes, especially “le (state of change)”, which presents an identical performance as “guo₂” in (115a)-(115c). In addition, “le (state of change)” brings a more natural explanation to why differential phrases in (115a) is obligatory

but standards are optional than Liu's weak version of "guo₂". The tailing of "le (state of change)" to adjectives indicates a transformation from adjectives to ditransitive verbs, for instance, "song(send)" in (117), where it is the direct object "yi zhi hua(one CL flower)" that cannot be cancelled, not the indirect object "Mary".

- (117) John song-le (Mary) *(yi zhi hua).
 John send-Asp Mary one CL flower
 'John sent Mary one flower'

Though bi-comparatives present no generative relations with guo-comparatives, the fact should never be forgotten that "guo(exceed)", marked by "guo₃", can tail adjectives in bi-comparatives. As shown in (118a), "guo₃(exceed)" can optionally follow "gao(tall)" in linear order, while with no differential phrases, its occurrence becomes illicit in (118b). Besides, (118c) and (118d) show that "guo₃(exceed)" fails to co-occur with negative "ai(short)" and non-measurable "piaoliang(beautiful)".

- (118) a. John bi Mary gao (guo₃) 2 limi.
 John than Mary tall exceed 2 cm
 'John is 2 centimeters taller than Mary.'
 b. *John bi Mary gao guo₃.
 c. *John bi Mary ai guo₃ 2 limi.
 d. *John bi Mary piaoliang guo₃ 2 du.

It is apparent that the syntactic distribution of "guo₁" and "guo₂" in Liu's term does not fit for patterns listed in (118). In contrast with "guo₂", "guo₃" requires an obligatory differential phrase but fail to plug in comparatives of negative gradable adjectives. Similarly, "guo₃" resembles "guo₁" in denying comparatives of negative words, but it differs from "guo₁" in requiring an obligatory differential phrase and refuting to co-occur with non-measurable gradable adjectives. Given the variant distributions of one single morpheme, more allomorphs like "guo₃", "guo₄", have to be assumed in Liu's logic, which may, in some degree, reaches a purpose of exhaustive description, but is definitely far from an optimal solution, at least from the principle of economy.

In this dissertation, the independent projection headed by "guo(exceed)" or "chu(exceed)" is discarded for the burden it brings to prove the existence of implicit correlates and to clarify their distinctions in both syntax and semantics. Taking the suffix role of "le/guo/chu" into consideration, the compounding of gradable adjectives and "le/guo/chu" is deemed to happen in the lexicon, with "le" owning the widest distribution, which can tail all gradable adjectives, i.e. "gao-le(tall-Asp)" "ai-le(short-le)" as well as "piaoliang-le(beautiful-Asp)", with "guo" the secondary, confined to positive ones and non-measurable ones, such as "gao-guo(tall-exceed)" "piaoliang-guo(beautiful- exceed)", with "chu" the narrowest, only co-occurring with positive ones like "gao-chu(tall- exceed)".

- (119) a. John bi Mary gao le/guo/chu *(2 limi).
 b. John bi yiqian gao le.
 c. John gao guo Mary.

These three suffixes share to transform one-place adjectives into two-place verbs so that differential phrases must be obligatory in order to receive the case assigned by

the compound verbs. But there are two exceptional cases, where in (119b), “bi(than)” introduces a standard, who is the same person as the referent, but in the past time, “gao-le(tall-Asp)” thus highlights kind of meaning on “change of state” not “exceed”. In this case, “gao-le(tall-Asp)” still maintains kind of adjective usage so that is deemed licit. While for (119c), “gao guo(tall-exceed)” evolves into a complete verbal usage regarding “Mary” as object and “John” as subject.

(2) Liu (1996, 2011) holds a clausal analysis of (120a) by positing “bi(than)” and “geng(more)” into one constituent. In 1996, he followed the tradition of classical degree semantics and thought that DegP was generated at the adjunct of AP, headed by “geng” and meanwhile selected “biP” at specifier, i.e. the structure in (120a). Then, in 2011, he reanalyzed DegP as the functional projection above gradable adjective on a par with the basic spirit of Corver (1997) and Kennedy (1997), and the new structure accommodates biP at its specifier.

- (120) a. [IP John jintian zai jia [AP[DegP[biP bi op_i Mary zuotian zai xuexiao d_i kai
xin][[Deg' geng]][A' kaixin]]. Liu, 1996 *DegP → [Adjunct, NP]*
b. [IP John jintian zai jia [DegP[biP bi op_i Mary zuotian zai xuexiao d_i kai-xin]
[Deg' geng [A' kaixin]]. Liu, 2011 *DegP → FP above g.a.*

The structure that “biP” and “geng” project into an adjunct phrase encounters threats from modal auxiliaries like “yao(should)” and interrogatives. As shown in (121a), “yao(should)” is located in the middle of “bi Mary” and “geng”, an order that should not be possible because “bi...geng” constitute an island preventing “biP” from moving out. But (121a) is undoubtedly well-formed. Same deviation happens to interrogatives in (121b), where “shui(who)” cannot move out of DegP at LF to check wh features as DegP acts as an adjunct island. Yet (121b) is licit without any problem.

- (121) a. John bi Mary yao geng gao.
John than Mary should more tall
'John should be taller than Mary'
b. John [AP [DegP [biP bi shui] [Deg' geng]] [A' gao]]
John than who more tall
'who is John taller than.'

In contrast with (120a), the structure in (120b) saves the generations of (121a) and (121b) by assuming DegP as a function projection above AP with “biP” occupying the specifier of it, so that “biP” is legitimate to move upwards to check topic features or wh-word “shui(who)” to check wh features. Nevertheless, (120b) still faces a problem that DegP offers no room to hold differential phrases, except leaving them to the complement of AP. As aforementioned, differential phrases should serve as the argument of comparative morpheme instead of gradable adjectives in semantics because the former offers a position via a natural transformation from “>” to “≥” for arguments denoted by differential phrases and the latter, on the contrary, produces a wrong interpretation of gradable adjectives.

The problem of minimal “c-command” has been discussed in Section 3.4.1, where (122) is cited as a counterexample to Liu’s analysis. Liu actually offers an explanation that the failure of (123a) and (123b) is also under the control of “minimal c-command”. In (123a) and (123b), “John” minimal c-commands “mifan(rice)”,

which presents a mismatch in semantics and category with the former being human and subject, while the latter non-human and object. His analysis is based on the classification of (123a) as a phrasal comparative, so that “mifan(rice)” acts as a nominal phrase rather than a reduced form from (122a).

- (122) a. *John [bi John xihuan mifan] geng xihuan rou.
b. John xihuan rou.
c. John xihuan mifan.
- (123) a. *John [bi mifan] geng xihuan rou.
John than rice more like meat
‘John likes meat more than rice.’
b. *rou, John bi mifan xihuan.

Nevertheless, a question arises on why “mifan(rice)” is categorized into a phrase rather than a reduced form from full clauses. Liu offers not an explanation but another stipulation that when “bi(than)” selects one constituent, the comparatives thus produced are phrasal; when “bi(than)” selects more than one constituent, the comparatives correspondingly become clausal. It must be admitted that this criterion still behaves more like a prescriptive rule rather than a descriptive one, let alone an explanatory one. As “mifan(rice)” is only one constituent, (123a) then must be of phrasal type. His line of thought logically lacks a crucial argumentation on why “one constituent” cannot be regarded as a reduced form of full clauses. Back to (123a), the problem becomes glaring that Liu only stipulates that “mifan(rice)” is a nominal phrase and he gives no evidence to deny “mifan(rice)” as a reduced form from (122a). This point, however, is extremely important to his “minimal c-command” requirement because if (123a) presents an underlying structure like (122a), it can be divided into two clauses in the form of (122b) and (122c), both of which undesirably present a perfect match in category, semantics and basic syntactic structure. Consequently, (122a) should be licit, contra to facts.

In addition, Liu only rules out (123a) and (123b) via “minimal c-command” requirement and leaving another similar but licit pattern untouched, i.e. (124). Perhaps he just thinks (124) abides by this rule for “rou(meat)” parallels to “mifan(rice)” in category and semantics. Actually, they are not because “rou(meat)” in (124) originates from the object position of “xihuan(like)” through topicalization or focalization, so that “rou(meat)” should differ from “mifan(rice)” in carrying a topic or focus feature. The licitness of (124) once again threatens Liu’s analysis.

- (124) John rou bi mifan geng xihuan. Liu, Danqing, 2012

Compared to Mandarin, English allows comparison between objects, i.e. (125a). English also presents an ambiguity on phrasal comparatives and clausal comparatives, so that (125a) owns two deep structures, listed respectively in (125b) and (125c), where “mifan(rice)” is regarded either as a nominal phrase or a reduced phrase from a full clause. The deletion rule behind (125c) is different from the one behind comparisons between subjects. As it exerts no impact to the problem we are going to discuss, the deletion rule of (125c) is taken for granted. (125a) and its two deep structures are cited here for the purpose to argue that (125b) is impossible in the framework of degree semantics. In another word, comparison between objects must

undertake a clausal pattern rather than phrasal pattern.

(125) a. John loves Mary more than Lucy.

b. John loves Mary more than [NP Lucy]

c. John loves Mary more than [he loves Lucy].

For an expository purpose, lexical entries of "love" and "more" are given in (126a), (126b) and (126c). The type of "love" is raised from $\langle e, \langle e, t \rangle \rangle$ to $\langle e, \langle d, \langle e, t \rangle \rangle \rangle$ for the gradability encoded by verbs of this type. The two variants of "more" are respectively responsible to accommodate phrases and clauses as arguments, where in (126b) the second variable is saturated by individuals, while in (126c) the second variable is saturated by properties of degree.

(126) a. $\llbracket \text{love} \rrbracket = \lambda y \lambda d \lambda x. [\text{love-ness}(x, y) \geq d]$

$\langle e, \langle d, \langle e, t \rangle \rangle \rangle$

b. $\llbracket \text{more}_1 \rrbracket = \lambda G \lambda y \lambda x. [\text{Max } d_1 (G(x)(d_1)) > \text{Max } d_2 (G(y)(d_2))]$

c. $\llbracket \text{more}_2 \rrbracket = \lambda G \lambda D \lambda x. [\text{Max } d_1 (G(x)(d_1)) > \text{Max } d_2 (D(d_2))]$

If "more₁" is applied to (125b), a semantic crash is under predication as the representation produced by the combination of "more₁" and "love Mary" leaves no room for the introduction of "Lucy". As shown in (127a), the representation in charge of standard degree, i.e. " $\text{Max } d_2 (...)$ " is occupied by "Mary", while this position should be kept for "Lucy" as "Lucy" serves as the standard of comparison. It is impossible for "Lucy" to plug into the representation as the two variables "y" and "x" in (127b) can only be saturated by agent or subject of "love". Unfortunately, no revision can save the crash if "Lucy" maintains its phrasal status. In (127c), the first gradable argument G is restricted to bind variables inside the representation of referent part. Though "Lucy" as an individual is located at the right position inside the standard part representation, the identification of "D" argument becomes impossible because no arguments in (125b) facilitates to take this task.

(127) a. $\llbracket \text{loves Mary more}_1 \rrbracket = \llbracket \text{more}_1 \rrbracket (\llbracket \text{loves Mary} \rrbracket)$

$= \lambda y \lambda x. [\text{Max } d_1 (\text{love-ness}(x, \text{Mary}') \geq d_1) >$

$\text{Max } d_2 (\text{love-ness}(y, \underline{\text{Mary}'}) \geq d_2)]$

b. $\llbracket \text{loves Mary more}_1 \text{ than Lucy} \rrbracket = \llbracket \text{loves Mary more}_1 \rrbracket (\llbracket \text{than Lucy} \rrbracket)$

$= \lambda y \lambda x. [\text{Max } d_1 (\text{love-ness}(x, \text{Mary}') \geq d_1) >$

$\text{Max } d_2 (\text{love-ness}(y, \underline{\text{Mary}'}) \geq d_2)] (\text{Lucy}')$

c. $\llbracket \text{more}_3 \rrbracket = \lambda G \lambda D \lambda y \lambda x. [\text{Max } d_1 (G(x)(d_1)) > \text{Max } d_2 (D(x)(y)(d_2))]$

The crash is saved if "Lucy" is restored into a clause in (128a), where "John" and "Mary" are independently incorporated into the representation separated from the combination of "more₂" and "loves Mary" in (128b). As seen in (128c), (128a) serves to reduce the D variable inside "loves Mary more₂", and derives out a legitimate and correct semantic computation.

(128) a. $\llbracket \text{than } \lambda d \text{ John pos loves Lucy} \rrbracket = \lambda d. [\text{love-ness}(\text{John}', \text{Lucy}') \geq d]$

b. $\llbracket \text{loves Mary more}_2 \rrbracket = \llbracket \text{more}_2 \rrbracket (\llbracket \text{loves Mary} \rrbracket)$

$= \lambda D \lambda x. [\text{Max } d_1 (\text{love-ness}(x, \text{Mary}') \geq d_1) > \text{Max } d_2 (D(d_2))]$

c. $\llbracket \text{loves Mary more}_2 \text{ than John loves Lucy} \rrbracket$

$= \llbracket \text{loves Mary more}_2 \rrbracket (\llbracket \text{than } \lambda d \text{ John pos loves Lucy} \rrbracket)$

$= \lambda D \lambda x. [\text{Max } d_1 (\text{love-ness}(x, \text{Mary}') \geq d_1) > \text{Max } d_2 (D(d_2))]$

$(\lambda d. [\text{love-ness}(\text{John}', \text{Lucy}') \geq d])$

$$= \lambda x. [Max d_1 (\text{love-ness}(x, \text{Mary}') \geq d_1) > \\ Max d_2 (\text{love-ness}(\text{John}, \text{Lucy}') \geq d_2)]$$

The failure of phrasal analysis of (129a) is under expectation as it parallels to English (125b) in both structure and lexical entries. By contrast, the failure of (129b) is an accident as it should have been feasible in semantics in analogy with (128a) to (128c). The author offers an analysis of mismatches between Mandarin and English subcomparatives by stipulating a rule that components in the domain of comment should be deleted at PF, or the comment feature it carries will give rise to a conflict with the topic feature of “biP”. If “mifan(rice)” maintains its role as part of remnant of “ai chi mifan(like eating rice)”, it must carry a comment feature, which leads to a failure in syntax. As we discussed in section 3.1.1, (129b) can be rescued via moving “rou(meat)” out of its situ by topicalization, and meanwhile, “mifan(rice)” undergoes a topicalization inside “biP”. As a result, the comment feature in “mifan(rice)” is replaced by a topic feature and “aichi(like eating)” is deleted under identity with “aichi(like eating)” in the matrix clause. As Mandarin allows two potential positions for topics, either above or below the topic position of “John”, both (129d) and (129e) are accepted.¹⁷

(129) a. *John [bi mifan] geng ai chi rou.

b. *John [bi John ai chi-mifan] geng ai chi rou.

c. John rou; [bi mifan, John ai chi-t] geng ai chi t. *rou. (D. John*

d. ?John rou bi mifan geng ai chi. *rou. John. 内*

e. ? rou (ne), John bi mifan geng ai chi.

The deep structures of (129d) and (129e) also crater to the semantic computation constructed in this dissertation. Since “rou(meat)” is postponed to join in the computation, the order of variable reduction is adjusted to (130a) with the argument denoted by objects saturated at the last. The lexical entry of “geng” undergoes corresponding changes and is revised into (130b). The representation of “geng ai-chi” is thus produced in (131a), which successively absorbs “mifan(rice)”, “rou(meat)” and “John” in an order of (129c) or “mifan(rice)”, “John” and “rou(meat)” in an order of (129d).

(130) a. [[ai-chi]] = $\lambda d \lambda y \lambda x. [\text{like-eating-ness}(x, y) \geq d]$

b. [[geng]] = $\lambda G \lambda D \lambda w \lambda x. [Max d_1 (G(x)(w)(d_1)) > Max d_2 (D(d_2))]$

(131) a. [[geng₁ ai chi]] = [[geng₁] ([[geng₁ ai chi]])

= $\lambda D \lambda w \lambda x. [Max d_1 (\text{like-eating-ness}(x, w) \geq d_1) > Max d_2 (D(d_2))]$

b. [[bi λd mifan, John pos aiehi]] = $\lambda d. [\text{like-eating-ness}(\text{John}', \text{mifan}')] \quad$

c. [[bi λd mifan, John pos aiehi] geng₁ ai chi]]

= $\lambda D \lambda w \lambda x. [Max d_1 (\text{like-eating-ness}(x, w) \geq d_1) > Max d_2 (D(d_2))]$

$(\lambda d. [\text{like-eating-ness}(\text{John}', \text{mifan}'))]$

= $\lambda w \lambda x. [Max d_1 (\text{like-eating-ness}(x, w) \geq d_1) >$

$Max d_2 (\text{like-eating-ness}(\text{John}', \text{mifan}') \geq d_2)]$

d. [[John rou [bi λd mifan, John pos aiehi] geng₁ ai chi]]

= [[bi λd mifan, John pos aiehi] geng₁ ai chi] ([[rou]])([[John]])

¹⁷ Though (129c) and (129d) may sound odd, they are still accepted with (129c) observed by Liu (2012). Liu (2011) considers (129d) hopeless, but with a topic marker “ne”, it improves a lot.

=Max d₁ (like-eating-ness(John', rou')≥d₁) >

Max d₂ (like-eating-ness(John', mifan')≥d₂)]

1. clause
complement
<cl,t>

To the end of this part, the criterion adopted in this dissertation to distinguish phrasal comparatives from clausal ones in Mandarin is concluded. When the complement of "bi(than)" overtly includes one or more than one components from temporal adverbs, prepositional phrases, verbs or components in object position, the comparative thus produced is defined as clausal for these components indicate the existence of a complete clause; when the complement of "bi" overtly includes only one NP, denoting a "e" type, the comparative thus produced is defined as phrasal. It should be noted, certain phrasal comparatives like "John bi Mary gao (John is taller than Mary)" are attributed into this type just because a phrasal analysis is more economical in syntax and semantics than that of clausal analysis. No direct evidence stops them from being restored into a full clause. By contrast, another type of phrasal comparatives is phrasal literally as they truly fail to revive a pattern same as the matrix clause, for instance "John bi Mary gao 2 limi(John is 2 centimeters taller than Mary)".

?

② phrasal complement
[1° due to economy
2° et phrasal analysis
2° truly phrasal

