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ORIGINAL PAPER

Property Theory, Adjectives, and Modification in Chinese

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Abstract It has been observed that there is a complementary distribution between simple adjectives (SAs) and complex adjectives (CAs) in Chinese in both the adnominal and predicate positions (Huang, 1997, Some remarks on adjectives in Mandarin Chinese. Paper delivered at the International Association of Chinese Linguistics-6 (IACL-6), Leiden, June 19–21, 1997, The Netherlands; Shen, 1997, *Zhongguo Yuwen, 259*, 242–250; Zhu, 1956, Xiandai Hanyu Xingrongci Yanjiu [Studies of adjectives in modern Chinese]. *Yuyan Yanjiu* 1. Also published in Zhu Dexi (1980) *Xiandai Hanyu Yufa Yanjiu* [Grammatical studies of modern Chinese], pp. 3–41). This article makes two major claims: (a) there are two subgroups of CAs; while one is in total complementary distribution with SAs, the other is in partial complementary distribution with SAs; and (b) the total/

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partial complementary distribution noted in (a) can be explained by a property-theoretic conjunction/intersection analysis of modification structures which ensures not only type matching but also sortal matching between the modifier and modifiee. Evidence from dialectal studies (Zhu, 1993, *Fangyan,* 2, 81–100) is provided as strong support for this hypothesis.

Keywords Chinese · Adjectives · Modification · Chinese dialects

1 Introduction: Simple Adjectives and Complex Adjectives in Chinese

In a series of influential works on adjectives published in China, Zhu Dexi argued for a distinction between two groups of adjectives in Chinese (Zhu, 1956, 1961, 1983, 1993):[1]

(1) **Group A:** Simple Adjectives
da 'big', *hong* 'red', *hao* 'good', *zhai* 'narrow', *gui* 'expensive',
zang 'dirty', *ganjing* 'clean', *weida* 'great'
Group B: Complex Adjectives
This group of adjectives is constructed from the simple adjectives which undergo some changes either at the word level or at the phrasal level. The resultant complex adjectives describe a state or situation in a more lively, or vivid, or more intensified manner. The following is a sample of such complex adjectives.

(a) reduplicated forms:
xy → xxyy: *laoshi* '*honest*' → *laolao shishi* 'honest and frank';
ganjing'clean' → *gangan jingjing* 'thoroughly clean'
xy → x-**li**-xy: *hutu* 'muddled' → ***hu-li-hu-tu*** 'good and muddled';
guguai 'eccentric' → ***gu-li-gu-guai*** 'really eccentric'
(b) those with "lively" suffixes:
x → x-**honghong**: *luan* 'messy' → *luan-**honghong*** 'chaotic and noisy'; *chou* 'stinky' → *chou-**honghong*** 'rampantly stinky';
x → x-**buliuqiu**: *hui* 'gray' → *hui-**buliuqiu*** 'drab and grayish'
(c) those with intensifying prefix-like elements:
***bing**-liang* '**ice**-cold', ***tong**-hong* 'red **through and through**',
***peng**-xiang* '**puffing**-sweet and aromatic'
(d) forms with adverbs of degree and in coordination:
***hen** hao* '**very** good', ***you** gao **you** da* '**both** tall **and** big'

Zhu (1956) shows that in the modifier position adjectives in Group A (simple adjectives, henceforth SAs) characterize the head nouns with some permanent properties and those in Group B (complex adjectives, henceforth CAs) describe

[1] Here I basically follow the citation and translation from Chao (1968, pp. 676–677) with a few changes and additions all from Zhu's original work.

the head noun with more temporary properties. In the predicate position, SAs tend to show intrinsic or permanent qualities while CAs show potential changeability.[2] In terms of restrictions on distributions, SAs do not appear in the predicate position unless they have a contrastive reading. CAs have no such restriction.

Huang (1997) and Shen (1997) sharpened the dichotomy by further observing that there is a complementary distribution between SAs and CAs: if unassisted (or unmarked), SAs can appear only in the modifier position and CAs only in the predicate position.[3] The following data from Huang (1997) illustrate the distributional patterns:

In the modifier position:
Simple Adjectives:

(2) zang shui 'dirty water'
hong fangzi 'red house'
gaodang che 'high-end car'
piaoliang yifu 'pretty clothes'[4]

Complex Adjectives

(3) hen zang *(**de**) shui 'very dirty *(DE) water'
hen hong *(**de**) fangzi 'very red *(DE) house'
hen gaodang *(**de**) che 'very high-end *(DE) car'
hen piaoliang *(**de**) yifu 'very pretty *(DE) clothes'

Simple and Complex Adjectives in the predicate position:

(4)a. Zhangsan *(hen) gao.
Zhangsan very tall
'Zhangsan is (very) tall.'

[2] The Chinese term for Group A is *xingzhi xingrongci* 'attributive adjectives', adjectives that characterize nature or attributes, and the Chinese term for Group B is *zhuangtai xingrongci* 'temporary-state adjectives', adjectives that describe temporary properties. The latter group is also called *xingrongci de shengdong xingshi* 'vivid-form adjectives'. NB: The difference between the two groups of adjectives mirrors that between individual-level predicates and stage-level predicates, but the correspondence is not perfect. I simply want to make a note of this analogy without further discussion in this article.

[3] The facts presented here can be found scattered all over the place in the literature on various aspects of Chinese adjectives. However, as far as I know, Shen (1997) and Huang (1997) represent the first systematic attempts at explaining the distributional patterns under discussion.

[4] These examples consist of monosyllabic adjectives and nouns, and disyllabic adjectives and nouns. Cross pairings yield four combinations. This is done to show that the requirement on *de* is not due to prosodic effects. It has been observed in the literature (Fan, 1979; Shen, 1997; Zhang, 2000; among others) that monosyllabic adjectives tend to be attributive (Group A), and trisyllabic adjectives are all descriptive (Group B), and disyllabic adjectives may fall in either group. The consensus among Chinese scholars is that monosyllabic adjectives are building blocks for non-monosyllabic adjectives. We will not concern ourselves here with group status of individual lexical items but concentrate instead on the semantic differences between the two groups and let these semantic characteristics decide the group membership.

b. Zhangsan *(bi Lisi) lei.
Zhangsan compared-to Lisi tired
'Zhangsan is more tired than Lisi.'

c. Lisi *(zui) congming.[5]
Lisi most smart
'Lisi is the smartest.'

This complementary distribution pattern is succinctly captured in the following table from Shen (1997, p. 242):[6]

(5)

	Modifier Position	Predicate Position
SAs	unmarked	marked
CAs	marked	unmarked

In Huang (1997), it is proposed that the complementary distribution between SAs and CAs is a result of the difference in their semantic types, with SAs being of type *e* and CAs being of type <*e,t*>.[7,8] It is furthermore suggested that there is a type matching constraint in NP modification structures which requires that the modifier and the modifiee be of the same semantic type. Assuming that bare nouns in Chinese are of type *e* (Chierchia, 1998a), a modifier must therefore also be of type *e* under this hypothesis. Simple adjectives being of type *e* are able to occur in the modifier position with the head noun since such a combination results in no type conflict. However, when the modifier is a complex adjective of type <*e,t*> (they are <*e,t*> as they can be used in the predicate position), the difference in semantic type between the modifier and modifiee necessitates a type-shifting marking on the modifier, converting it into a type that is identical with the head noun.

[5] The three adjectives are chosen to represent three types of adjectives: *gao* 'tall' for dimensional adjectives, *lei* 'tired' for stage-level predicates, and *congming* 'intelligent' for individual-level predicates, all of which are compatible with *hen*. The intention here is to show that the obligatory use of a degree modifier on the adjectival predicate is not restricted to certain types of adjectives. A normal intonational pattern is assumed here, for stressing the adjectival predicate may create a contrastive reading on the adjective, in which case the adjectival predicate may appear in bare form (Zhu, 1956). In Huang (1997) I suggested that the application of stress is a special case of degree modification on the adjective and therefore no additional explanation is provided. Feng (2003) offers a prosody based account on bare adjectives in the predicate position.

[6] There is a difference between the two bodies of work. Huang (1997) considers *hen* as a licenser of SAs in the predicate position (See Huang, 1996 for discussions following Parsons, 1990), whereas Shen uses the *shi*…Adj…*de* construction to exemplify the marking of bare adjectives in predicate position. Shen's description of the facts brings out the symmetrical pattern of the distribution better. The deeper difference between the two analyses is that in Huang's account, only SAs form the adjectival class; CAs are derived from SAs that form adjectival phrases. In Shen's work, the adjectival class consists of both SAs and CAs (but see Footnote 7 below). This difference, however, does not affect the general claim about the complementary nature of the distribution of the two groups, but more will be said on this topic later.

[7] The term ''complementary distribution'' is used here only to draw attention to the fact that the two groups of adjectives do not appear in the same position in their original form. In borrowing this expression from phonology there is no intention to imply that the two groups of adjectives are two variants of the same underlying form, at least not semantically, as will become clearer later.

[8] What is implied by this ''dichotomy'' of semantic types but not explicitly stated in Huang (1997) is that in fact one has to make a further distinction between Group A and Group B adjectives: the former are lexical and the latter are sometimes phrasal. For simplicity's sake, I will continue to call Group B CAs when they are adjectival phrases.

In this article, I would like to suggest that the type matching constraint on nominal modification structures follows quite straightforwardly from a property-theoretic conjunction/intersection analysis of nominal modification and provide further theoretical justification and empirical evidence to strengthen such a proposal. On the theoretical side, it will be shown that in addition to type matching there is also 'sortal matching'. On the empirical side, it will be pointed out that in addition to the observation of complementary distribution between CAs and SAs, it is necessary to divide CAs into two distinct subgroups due to their behavior in the predicate position. The paper also presents a review of Zhu (1993) that covers a wide range of dialectal data directly supporting the subgrouping of CAs and the analysis of the paper in general.

The organization of the paper is as follows. Section 2 is a presentation of the account developed in Huang (1997) of the complementary distribution of SAs and CAs based on Property Theory as developed in Chierchia (1984, 1985). A subsection is devoted to the type shifter *hen*, which is normally a degree adverb, and another section is on *de*, traditionally called a ''nominalizer.'' Both are treated as type shifters in the present analysis. The last subsection in Sect. 2 deals with an important issue that arises if one treats bare nouns as type *e*—the question of how they may be able to serve as restrictors on quantification. Here I follow Krifka (1995) and Chierchia (1998b) in assuming that classifiers type-lift bare nouns from type *e* to type <*e,t*>, that is, from kinds to individuated instances, thus assuring proper restriction on quantification. Section 3 offers a discussion of the argumental status of some CAs, which reveals a sortal matching constraint. It is then shown that this can naturally be built into the conjunction/intersection analysis without the need for any further stipulation. In Sect. 4, the paper takes a close look at Zhu's treatment of *de*, in particular Zhu (1993), where dialectal data indicates that there are two distinct elements 'de2' and 'de3', as Zhu (1956) had originally claimed, with de2 marking predicates and de3 marking modifiers in NPs.[9] An interesting fact revealed by the data is that CAs are divided into two subgroups depending on whether they are marked with de2 in the predicate position. Zhu's Group B (a) and (b) (in (1)) form one subgroup, which requires de2; his Group B (c) and (d) (also in (1)) form another subgroup as they can function as predicates without de2. The existence of different lexical items corresponding to de2 and de3 in various dialects and their juxtaposition in modifier position lends support to the generalization that NP-internal modifiers must be nominal. Patterns observed in Zhu (1993) lead to the suggestion that *de* in Beijing Mandarin is in fact a fused form of de2 and de3. Section 5 discusses a number of remaining issues, such as non-intersective adjectives. It is suggested that ideas along the lines of Larson (1998) might be developed to bring adjectives such as *former* under the rubric of the hypothesis of the paper.

2 Property Theory and Nominal Modification in Chinese

2.1 Property Theory

The background theory adopted in this paper is (a form of) Property Theory. In particular, following Chierchia (1984, 1985), it is assumed that properties exist in two

[9] This distinction finds historical resonance too in that de2 corresponds to dì, and de3 corresponds to dǐ. See Lü (1984) and Zhu (1982), and also discussions in Zhu (1993).

forms. On the one hand, there are propositional functions. These are argument taking, unsaturated structures (of functional type <*e,t*>). On the other hand, there are nominalized properties, to be thought of as entities (non argument taking). For each propositional function P, there is a corresponding nominalized property nom(P); and for each nominalized property x, there is a corresponding propositional function pred(x). One major consequence of this theory is that syntactic expressions that denote properties, such as verb phrases or adjectival phrases, can be found in argument positions; these are the nominalized properties, and as such should be treated as being of type *e*, rather than type <*e,t*>. In the domain of discourse, individuals therefore occur in various sorts, such as:

- singular individuals (standard assumption)
- plural individuals (Chierchia, 1998a, b; Landman, 1988; Link, 1983)
- kind individuals (Chierchia, 1998b)
- ''states,'' ''acts,'' etc., as the individual images of predicates (Chierchia, 1984, 1985, 1998a)

Let us now turn to see how Property Theory can help explain the distributional properties of Chinese adjectival forms. The main differences between SAs and CAs presented earlier can be summarized as follows:

(6)a. SAs can occur alone in adnominal, modifier position
b. CAs cannot; in modifier position, they need *de*
c. SAs cannot occur alone in predicate position; they need some sort of predication marker (such as *hen*)
d. CAs can occur alone in predicate position.

If it is assumed that SAs are of type *e* while CAs are of type <*e,t*>, the patterns in (6c) and (6d) can be straightforwardly accounted for. SAs being argumental cannot occur in predicate position, whereas CAs being predicates can:

(7)a. *Zhangsan gao 'Zhangsan is tall'
where *gao*(*Zhangsan*) is undefined, because *gao* is of type *e*
b. Zhangsan hen gao
where *hen*(*gao*)(*Zhangsan*) is defined, because *hen*(*gao*) is of type $< e,t >$

Here it can be suggested that the element *hen* is a type-lifter mapping things of type *e* into things of type <*e,t*> (and *hen* is, therefore, defined in terms of pred).

What needs to be explained is why SAs, as type *e*, can occur in adnominal position. Here, I adopt the view that modification is in fact a case of conjunction/intersection, which requires sameness of types.[10] Under such a view, it is expected that if the head noun (the modifiee) is of type *e*, the modifier must also be of type *e*. In a property theoretic framework, conjunction (and any other Boolean operator) can be generalized to apply to nominalized properties in a straightforward way. For example, given two properties *x* and *y*, *x y* is a new property defined as follows:

(8) Definition of Nominal Modification (first version)
a. $x \wedge y = \text{nom}(\lambda z[\text{pred}(x)(z) \wedge \text{pred}(y)(z)])$
b. xin shu $\rightarrow$ xin $\wedge$ shu 'new book'

[10] See Heim and Kratzer (1998, p. 65) for how the conjunction/intersection analysis of noun modification works in English.

With such an assumption in place, it can be seen that if nouns are of type *e*, SAs can be combined directly with nouns. SAs are nominalized properties; Ns in Chinese are also nominalized properties. Property Theory leads one to expect that both types of element can be coordinated/intersected. Thus, what is proposed as a type matching constraint in Huang (1997), where it is claimed that the bare noun and its modifier must be of the same semantic type, in fact follows directly from the conjunction/intersection analysis of modification within NP.[11]

Section 2.2 now presents empirical evidence showing that bare nouns and SAs are indeed type *e* entities in Chinese in contexts beyond those of modification.

2.2 Establishing the Semantic Types of Chinese Adjectives

Having adopted Property Theory, which states that all elements appearing in argument positions are of type *e* ([+arg]), we can see that bare nouns and SAs in Chinese both pass such a test for consideration as elements of type *e*.

Bare nouns in Chinese are of type *e* (Chierchia, 1998a)[12]

(9)a. Nuhai kanjian le nanhai.
girl see Asp boy
'The girl saw the boy.'

b. Songshu ai chi yumi.
squirrel love eat corn
'Squirrels love to eat corn.'

In (9a, b), both the subject and object positions are occupied by bare nouns, showing that bare nouns in Chinese are of type *e*.

Simple Adjectives in Chinese are of type *e* (Huang, 1997)

There is clear evidence that SAs are also argumental, that is, of type *e*, as they can appear in argument positions:

SAs in subject position:

(10)a. Ta hen qinfen.
she very diligent
'She is very diligent.'

b. Qinfen shi yige meide
diligent is one-Cl beautiful virtue
'Diligence is a beautiful virtue.'

[11] One can see that this definition works in English as well, since in English both bare nouns and adjectives are of type *<e,t>*.

[12] Chierchia (1998b) lists four typological characteristics of Chinese, which represent the *NP [+arg] and [-pred] languages* (p. 354):

(i) a. Generalized bare arguments
b. The extension of all nouns is mass
c. No plural marking
d. Generalized classifier system

SAs in object position

(11)a. Tamen neige diqu hen pinqiong.
they that region very poor
'Their region is very poor.'

b. Women yao zhansheng pinqiong.
we want overcome poverty
'We want to wipe out poverty.'

In ''non-finite'' positions where SAs are arguments of verbs (i.e., the so-called small-clause position, or other infinitival positions, based on Property Theory (Chierchia, 1984).

(12) Laoshi kua wo congming.[13]
Teacher praise me smart
'The teacher praised me for being smart.'

(13) Ta xian wo zang.
She disfavor me dirty
'She disfavors me for being dirty.'

(14) Wo xiwang ni xingfu.
I hope you happy
'I wish you happiness.'

The conjunction word *he* in Chinese lends further support to the view that bare nouns, SAs, and even bare verbs (verb phrases) can all be nominal, that is, of type *e*. Sentences (15)–(20) show that *he* can only conjoin two phrases that are nominal; it cannot conjoin two predicates or two sentences (Huang, 1996, p. 70, 2005).

(15) Wo xihuan Zhangsan he Lisi.
I like Zhangsan and Lisi
'I like Zhangsan and Lisi.'

(16) Women chi le fan, ye xi le zao.
we eat-Asp food, also wash-Asp bath
'We had a meal and took a bath.'

(17) *Women chi le fan he xi le zao.
we eat-Asp food and wash-Asp bath

(18) Zhangsan da paiqiu, danshi Lisi youyong.
Zhangsan play volleyball, but Lisi swim
'Zhangsan plays volleyball, but Lisi swims.'

(19) *Zhangsan da paiqiu, he Lisi youyong.
Zhangsan play volleyball, and Lisi swim

[13] I thank a reviewer for bringing (12) and (13) to my attention. There is in fact a whole class of ''factive'' verbs that can take an SA as an argument, such as *yuanliang* 'forgive,' *gongxi* 'congratulate,' *piping* 'criticize,' among others.

(20)a. Da paiqiu he youyong dui shenti you haochu.
play volleyball and swim to health have advantage
'Playing volleyball and swimming are good for (one's) health.'

b. Wo jintian xiawu xiang dadaqiu **he** youyouyong.
I today afternoon want play-play ball and swim-a-swim
'I want to play some ball and swim a little this afternoon.'

In (15), the two conjuncts of *he* are NP arguments and the sentence is fine. When the two conjuncts of *he* are predicate verb phrases, as in (17), or sentences, as in (19), the sentence is ruled out. However, when the verb phrases serve as arguments either in the subject position or as infinitival complements of the verb, as in (20a, b), conjunction by *he* is again perfectly fine. Sentences in (21) show that adjectives exhibit the same pattern of behavior in this regard.

(21)a. Zhang San hen qianxu, **ye** hen qinfen.
Zhang San very modest, also very diligent
Zhang San is very modest and diligent.'

b. *Zhang San hen qianxu **he** (hen) qinfen.
Zhang San very modest and very diligent

c. Qianxu **he** qinfen shi zhide tichang de meide.
diligent and modest is worth advocating DE virtue
Diligence and modesty are virtues that are worth advocating.'

2.3 Adjectives in the Predicate Position

SAs, being of type *e*, are disqualified from the predicate position, as the literature has shown abundantly and is illustrated in example (4). Another position barring SAs is the 'augment position'—the so-called 'buyu' in traditional Chinese grammar.[14] In the following examples, Huang (1987, p. 243, 1988) describes the coda of the sentences (the traditional 'buyu' position) as a secondary predicate position. The present analysis of SAs would predict that SAs are disqualified from such a position, as an element of type *<e,t>* should be required here. As shown in the examples below, such an expectation is indeed met, and in each augment/buyu case, a degree modifier is obligatorily present, converting an SA into a CA, or the sentence is unacceptable:

(22)a. Lai-le yige ren *(hen) yonggong.
come-Asp one-Cl person (very) hard-working
'There came a person who is (very) hard-working.'

b. Ta jiao-guo yige xuesheng *(hen) congming.
he teach-asp one-Cl student (very) smart
'He once taught a student who was very smart.'

[14] The term 'buyu' is often translated as ''complement.'' However, to differentiate such a syntactic position from the X'-theoretic phrase-structural term ''complement,'' the term ''augment'' is used here.

(23) Tamen tiao de *(hen) lei.
they dance DE very tired
'They got (very) tired from dancing.'

Note how use of the degree adverb *hen* manages to salvage the otherwise ungrammatical sentences. This is expected under the theory put forward here as *hen* is suggested to turn an SA from type *e* into type <*e,t*>, resolving the conflict between the type required in the predicate position, i.e., type <*e,t*> and the type initially available, i.e., type *e*. This special function of *hen* warrants a closer examination, which is the main focus of Sect. 2.4.

2.4 On *Hen*

Although previous considerations of the element *hen* have not directly addressed the issue of its semantic function in examples such as those given above, there are useful and suggestive characterizations of the use of *hen* in many works.

In Li and Thompson (1981, p. 143), for example, it is observed that: ''If *hen* is not heavily stressed, its meaning 'very' may be bleached.'' Sybesma (1992, pp. 75–77, 1997, p. 228) describes it as the most neutral positive degree marker. Xing (1962, 1997) presents evidence that *hen* can turn a noun like *shunü* ''gentlewoman; lady'' into an adjective meaning ''lady-like'', and Li (1996, p. 7) observes that there has been an increasing propensity to form an adjective by using *hen* + noun. Both Xing and Li furthermore suggest that *hen* + noun is now serving as a template producing large numbers of new adjectives.

To illustrate such processes, consider the expression *xiandaihua* ''modernization.'' This behaves like a typical noun in that it can take a classifier:

(24) sige xiandaihua
four-Cl modernization
'four modernizations'

However, when *hen* co-occurs with it, it has the meaning ''(very) modernized'' and can be used in the predicate position, as shown in (25):

(25) Tamen guojia zai jiaotong fangmian *(hen) xiandaihua.
their country in transportation aspect very modernized
'Their country's transportation system is very modernized.'

Chao (1968, p. 695) takes such adjectival conversions of nouns to arise from backformation. For example, *kexue* ''science'' is a noun, and the adjectival use of the word in (26b) is taken to be derived from (26a):

(26)a. Ni zhe fazi hen bukexue.
you this method very not science
'This method of yours is not very scientific.'

b. Wo juede hen kexue me!
I think very science emphatic particle
'I think it is very scientific!'

Chao does not seem to take into consideration the presence of *hen* and treats the adjectival meaning of *kexue* as solely arising through a process of backformation from the string *bukexue*. Note that Chao's transliteration of this sequence of elements goes against the standard practice of separating the negation word *bu* from what is being negated. This is apparently a deliberate choice on the part of Chao to suggest that *bu* and *kexue* form a derived word with an adjectival meaning. Although such treatment of *bukexue* may have its merits, it fails to acknowledge the contribution of *hen* in the structure and that (21b) would be unacceptable if *hen* were not to be present. Once the crucial role *hen* plays in converting a noun to an adjectival usage is recognized, there is no reason to resort to a backformation account as Chao proposed.

In property-theoretic terms, the bleached meaning use of *hen* suggests the function of a type-lifter, a lexical realization of the operator pred, and hereafter, I concentrate on this aspect of *hen*, not its lexical meaning used purely in the adverbial sense. When viewed as such a potential type-lifter, *hen* can be characterized as denoting a function of type <*e*,<*e*,*t*>>, following the type shifting principles of Partee (1987).[15,16]

2.5 On *De*[17]

The examples given in (3) in Sect. 1 have shown that if predicative-CAs are combined with the element *de* they become able to occur as modifiers to bare nouns. In the present approach this suggests that *de* is able to convert CAs preceding it into elements of type *e*, thus avoiding the type clash that would otherwise occur if such CAs were to be directly combined with bare nouns as modifiers. In property-theoretic terms, *de*'s nominalizing effect can be recast as inducing a type-lowering operation that maps an expression of type <*e*,*t*> to an expression of type *e*. In other words, *de* is nom, a function of type <<*e*,*t*>,e>.[18]

The hypothesis of such a semantic function for *de* is supported both by the traditional description of *de* as a ''nominalizer'' (Li & Thompson, 1981; Zhu, 1961, 1993), and by the following two key distributional patterns relating to the use of *de*.

[15] I have translated *hen* in all the examples given as 'very' and will continue to do so. However, it should be understood that such translations are a convenient way of indicating the presence of such a word. Its lexical meaning in these examples is indeed bleached.

[16] Note that although this article does not discuss the [*shi*…X…*de*] construction, it can be easily brought under the rubric of the current semantic model where *de* is a nominalizer, and *shi* is a type-lifter that raises the following type *e* construction to type <*e*,*t*>, following Partee (1987) in her treatment of *be* in English.

[17] Our discussion here is exclusively on the nominalizing effect of *de*; hence it corresponds to de3, which we will discuss in Sect. 4.

[18] The strong form of the hypothesis put forward here would predict that no nominal modifier would co-occur with *de* in the modifier position, since the type matching constraint would be automatically met. This is indeed the claim. Apparent counterexamples to this claim, such as the NP *hongmu de jiaju* ''rosewood DE furniture'' could be explained as in Yuan (1995) which treats the modifier in this case as consisting of an implicit verb, hence the hidden structure is *hongmu* ***zuo*** *de jiaju*, meaning ''furniture made of rosewood,'' where the modifier is a VP, and as such *de* is necessary for nominalizing the VP.

Pattern 1: Relative clauses, which are predicative and therefore are of type <*e,t*> and which appear prenominally in Chinese, require *de*. This follows if a type-matching constraint requires the conversion of <*e,t*> elements by the use of *de* into elements of type *e* prior to combination with nouns.

(27)a. Wo xiu *(de) che
*I fix *(DE) car*
'the car I fixed'

b. Kan shu *(de) xiao nanhai
*read book *(DE) little boy*
'the little boy who is reading'

c. Zuo zai ta zuobian *(de) gongren
sit at he left side DE worker
'the worker who is sitting on his left'

Pattern 2: $X[_{+\text{pred}}]$...*de* phrases can appear in argument positions, again supporting the assumption that *de* converts predicative <*e,t*> forms into elements of type *e*:

(28)a. Zhei-ge yue, chidao de he zaotui de bu
this-Cl month, late-arrive DE and early-depart DE not
hui you jiangjin.
will have bonus
'This month, those who arrived late and those who left early won't get any bonus.'

b. Wo zhi zhao you jingyan de, mei you jingyan
I only recruit have-experience DE, not have-experience
de qing bu yao shenqing.
DE Please not should apply
'We only hire those who have experience. Those who do not have experience please do not apply.'

c. Tamen shi xin lai de.
they be newly arrive DE
'They are new comers.'

In Sect. 4, we will see some dialectal studies of *de* that suggest further differentiation of the functions of *de* in Beijing Mandarin. What we have seen so far is the manifestation of the nominalizing effect of *de* in the adnominal position, which Zhu called ''de3.'' There is another function of *de*, namely, marking predicates, which Zhu refers to as ''de2.'' The dialectal data to be presented in Sect. 4 validate this differential treatment of *de* by Zhu. In Sect. 4 we will see that de2 and de3 are different lexical items in various dialects.

To recap here, we have seen that the property-theoretic conjunction/intersection analysis of nominal modification helps capture a range of central empirical facts relating to nominal modification in Chinese, summarized in (29):

(29) Nominal Modification Structure in Chinese

		Modifier	Modifiee	
a.	syntax	SA	bare noun	e.g., *piaoliang yifu*
	semantics	*e*	*e*	'pretty clothes'
b.	syntax	*hen* adj	bare noun	e.g., **hen piaoliang yifu*
	semantics	$<e,t>$	*e*	'very pretty clothes'
c.	syntax	*hen* adj *DE*	bare noun	e.g., *hen piaoliang de yifu*
	semantics	*e*	*e*	'very pretty clothes'

2.6 Restriction on Quantification

In addition to serving as arguments in a sentence, nouns also function as restrictors of quantification, a function which requires them to be of type $<e,t>$. If nouns are interpreted as type *e*, then the question is how they are able to restrict quantification. I believe that the answer to this question lies in the classifier system. Recall that two characteristics of Chinese type languages go hand in hand (Chierchia, 1998b): argumental bare nouns and a classifier system. With bare nouns being of type *e*, what classifiers (or measure phrases) can do in Chinese is to type lift NPs from type *e* to type $<e,t>$ (Krifka, 1995; Chierchia, 1998b), as the following example illustrates:

(30) Mei ge daxue dou you yige tiyuguan.
every Cl college DOU has one Cl gymnasium.
'Every college has a gymnasium.'

What the classifiers or measure phrases do is to turn kind-denoting bare nouns into individuated instances of kinds, ready for quantification (or enumeration, which is another context in which classifiers or measure phrases are required on bare nouns). Thus, even though bare nouns in Chinese cannot function as restrictors because they are of the wrong type, a unit composed of [classifier/measure phrase + bare noun] can be hypothesized to be predicative and thus able to serve as the restrictor of the quantifier.[19]

A further interesting question arises now relating specifically to CAs. Recall that SAs can be argumental (as in Chinese) or predicative (as in English), but CAs are commonly predicative in both Chinese and English. What needs to be considered now is whether CAs can in fact ever be argumental. This is a fair question, particularly in view of the fact that in the property-theoretic framework adopted here *pred* and *nom* should be able to type shift back and forth, so an argumental CA might be expected to be possible. This issue is taken up in Sect. 3.[20]

[19] One reviewer pointed out that there are other quantifiers for which no classifier is needed. They are expressions such as *suoyou **de** xuesheng* 'all students', *dabufen **de** xuesheng* 'most students', *henshao **de** xuesheng* 'very few students', *henduo (**de**)xuesheng* 'many students', *san fen zhi er yishang **de** xuesheng* 'more than two thirds of the students.' It is true that none of the expressions uses a classifier. However, I think it more appropriate to turn the issue around: what is unclear and should be studied further is the semantics of the determiners themselves, since they behave very much like modifiers, particularly with the use of *de*. However, such an investigation is beyond the scope of the current paper.

[20] I thank a reviewer for raising this question.

3 Argumental CAs and the Sortal Matching Constraint on Nominal Modification

In this section, evidence is presented indicating that in both Chinese and English CAs can be argumental. As a consequence of there being argumental CAs, it becomes necessary to assume that there is further ''sortal matching'' between modifiers and modifiees in nominal modification structures. However, it is shown that no additional stipulation has to be made for this matching constraint. Instead, it follows directly from the Property Theory assumed here, which is a multi-sorted first order logic, and from the conjunction/intersection analysis of nominal modification in Chinese, which is based on this Property Theory.

Let us turn to consider the relevant facts. Significantly, there is evidence that CAs in English as well as in Chinese can appear in argument positions, indicating that they can be argumental/of type *e*, as shown in the following examples:

(31)a. Fast is good; faster is better; very fast is very good.
b. Really tall is what we want.
c. The parking lot went from completely empty to completely full in an hour.

(32)a. Tai pang bu heshi.
Too fat not suitable
'Too fat is not suitable.'
b. Jinshen bi bu jinshen geng youliyu gongzuo.
Cautious compared not cautious further beneficial work
'Being cautious is more beneficial to work than not being cautious.'
c. Tamen xiao wo tai sha.
They laugh I too foolish
'They laugh at me for being too foolish.'
d. Laoshi kua wo hen yonggong.
Teacher praise *we very hard-working*
'The teacher praised us for being very hard-working.'

(31) and (32) show that both SAs and CAs can be argumental in both Chinese and English. This establishes that the two operators, *pred* and *nom*, are considerably active in both languages.[21] Now the question is: why it is not possible for CAs to appear in the adnominal position in (3), and why is *de* always required on CAs in such examples? The picture that emerges is that CAs in Chinese can in

[21] The actual full extent of the use of *pred* and *nom* in both languages does appear to be subject to language-specific restrictions, which clearly warrants further study. However, this cannot be undertaken here.

fact appear in the modifier position without *de*, but this is feasible only if the head noun is of the right sort of *e*-type element.[22]

In the ontology of Property Theory assumed here, the domain of discourse is simplified by the number of types which occur and also enriched by the number of sorts under each type. For instance, as noted earlier in Sect. 2.1, there are four sorts of individuals (all of which are of type *e*, of course): singular/atomic individuals, plural individuals, kind individuals, and images of properties. Individual images such as ''states'' and ''acts,'' developed in Chierchia (1984, 1985), are Fregean notions Chierchia uses to account for higher order predication, as shown in (33).

(33)a. Wisdom is hard to find.
b. The property of being wise is hard to find among politicians.
c. Being wise/ To be wise is crazy.

The subjects in these three examples are second order, third order, and fourth order, respectively, and the predicate for each would be one order up in traditional logic. Chierchia argues that expressions appearing in argument positions should always be treated as type *e* ([+arg]) (1984), namely first order; those expressions that appear in argument positions but are not NPs are nominal nonetheless—they are the nominal ''individual images'' of the predicates that can be viewed as ''abstract individuals'' (1984, p. 55). This way the predicate does not have to spiral up to the *n*th+1 order when its argument is *n*th order.

As shown above, that nom(CA) yields an output that is of type *e*, one would expect to find such elements occurring as modifiers of nouns. Such an expectation is indeed borne out by data such as the following:

(34)a. hen da guwu
very *big* *encouragement/stimulation*
'great encouragement/stimulation'
b. ji da biance
extremely *great* *push/urging*
'great push'

There are two important characteristics of these expressions. First, these modifiers are CAs and can be used in the predicate as well as argument positions. Second, as Xiao (1956) points out, the modifiees in these examples are, critically, abstract nouns. As CAs have been shown to be able to occur in argument positions and hence be of type *e*, this combination of CAs with nouns of type *e* is further instantiation of type matching of modifier and modifiee.

What is puzzling, of course, is why these same CAs cannot always occur in adnominal positions, as exemplified in (3), which is repeated below, where the element *de* becomes necessary to render the structures grammatical:

CAs in the adnominal position modifying an abstract noun:

(3) hen zang *(**de**) shui 'very dirty *(DE) water'
hen hong *(**de**) fangzi 'very red *(DE) house'
hen gaodang *(**de**) che 'very high-end *(DE) car'
en piaoliang *(**de**) yifu 'very pretty *(DE) clothes'

[22] In Sect. 4, it will be shown that CAs are divided into two subgroups and the adnominal CAs all come from the same subgroup. More on this point will be covered in Sect. 5.

I would like to suggest that the answer here relates to the sortal differences in the nouns involved. Although all the head nouns are of type *e*, *chengjiu* 'achievement' and *guwu* 'encouragement' are abstract nouns (ANs) which do not denote kinds. In contrast to this, the head nouns present in (3) such as *shui* 'water' and *fangzi* 'house' are common nouns (CNs) which do denote kinds. There is consequently an apparently significant combinatorial difference relating to the sort of individual present in the modification structure. Let us put such an observation into a descriptive generalization.

(35) Descriptive Generalization on Nominal Modification:
The modifier and modifiee have to be matched not only in terms of type but also in terms of sort.

Naturally, the next step to take is to make sure that the Semantic Definition of Nominal Modification as given in Sect. 2 reflects this constraint. We can do so by adding a subscript representing different sorts of type *e*. Let the subscript *s* stand for any sorts of type *e*. Furthermore, let the indexical *i* mark identical sorts. Standard conjunction/intersection operation appears to require that the conjuncts be identical right down to the sort:

(36) Revised Definition of Nominal Modification
$x \wedge y = \text{nom}(\lambda z[\text{pred}(x_{si})(z) \wedge \text{pred}(y_{si})(z)])$

With conjunction it can be assumed that the head noun determines what expressions can appear in the adnominal position—they have to be of identical type (and sort) to that of the head noun.

In the examples of CA in the adnominal position modifying an abstract noun (CAAN) presented in (34), the CA and AN are not just type *e*, they both denote images of properties, hence they are included under the revised definition. In addition to such cases, there is also a special kind of CA that deserves some attention: the class of superlatives. First, superlatives seem to fall under CAAN—as CAs they can occur directly combined with abstract nouns in modification structures:

(37)a. zui xin chengjiu
most *recent* *achievement*
'the latest achievement'

b. zui gao jingjie
most *high* *state*
'the highest state (of mind or behavior)

Second, just as with the non-superlative CAs, there are noticeable prosodic effects: CAANs typically consist of four syllables, two representing the CA and two the AN.[23] However, such CAANs cannot be explained only through their associated prosodic properties; a sortal matching constraint is also very important, as when there is a sortal mismatch, even if the string consists in four syllables, the result is ungrammatical, as illustrated below:

[23] See Feng (2003).

(38) *hen man huoche
very slow train
*hen hao xuexiao
very good school

With regard to CACN (Complex Adjective combined with Common Noun), we have seen that typical CAs and CNs do not mix and match, as illustrated in (3). This is because typical CAs denote images of properties only, while common nouns denote kinds. Consequently typical CACNs are not defined due to a sortal clash.

Superlatives, however, turn out to behave differently in CACN combination. One major difference between superlative CAs and non-superlative CAs is that superlative CAs are good candidates for denoting specific/definite entities.[24]

(39)a. Shijie zhi zui
world Poss most
'the most (attributes) of the world (the superlative qualities of the world)'
b. Wo de zui ai
I Poss most love
'my favorite'

One may therefore expect that superlative CAs can denote kind individuals, and when they do, they can be expected to modify CNs, unlike other CAs. The following sentences support this conjecture:

(40)a. Zui jia daoyan
most good director
'the best director'
b. zui jia Fangan[25]
most suitable proposal
'the most suitable proposal'
c. Zui jia changxiaoshu[26]
most good popular book
'the best popular book'

Contrast this with attempted modification with non-superlative CAs. CACNs with non-superlative CAs are not acceptable because non-superlative CAs do not receive kind readings. Examples such as (41a, b) are therefore unacceptable:

[24] I thank Wynn Chao for discussing this point with me (personal communication, 2001). Shi (1991, p. 170) treats superlative adjectival phrases as denoting specific and singular entities. I agree with the first point. As to the second point, Xing (2000) points out that superlatives may denote multiple entities. Regardless whether superlatives denote one entity or multiple entities, the reference is definite or specific.

[25] This example comes from Xing (2000). I thank Waltraud Paul for bringing it to my attention.

[26] This example is from the Internet, as is the following example, which is from Microsoft China headquarters' web site. Here the expression is used as an honorary title:

(i) Zui you jiazhi zhuanjia
most have value expert
'the most valuable expert'

As titles, such expressions may be akin to proper names (or category names) or definite expressions.

(41)a.	*Shijie	zhi	hen	
	world	*Poss*	*very*	
b.	*Wo	de	hen	ai[27]
	I	*Poss*	*very*	*love*

We see now that the property-theoretic conjunction/intersection hypothesis seems to be operating fairly consistently in nominal modification structures in Chinese and has helped explain some puzzling facts that have resisted previous analyses. The data in this section critically reveal that the so-called complementary distribution between SAs and CAs is in fact a manifestation of sortal matching constraints directly derivable from the conjunction/intersection hypothesis of modification within NPs.

One cautionary note here is that prosodic effects notwithstanding, the argumental CAs permitted in CAAN are either superlatives or [*hen* SA], and not just any CAs. Hence with regard to the conceptual question that led us to the investigation of argumental CAs, what we have seen is short of a complete conceptual paradigm of *nom* and *pred* operating freely. Apparently the lexical semantics of the superlative morpheme *zui* and the type shifter *hen* have a great deal to do with their special status in CAs. The contribution of lexical semantics in the operation of type shifting has analogues in English. For instance, *the*, the definite article, is a type shifter that takes a type <*e,t*> and yields a type *e*. However, the output of applying *the* to a noun is more than just a type *e*. The lexical semantic contribution *the* makes is to ascertain that the type *e* entity is a unique individual. The roles of lexicalized type shifters as opposed to the more abstract *pred* and *nom* need more research, but what we have seen here is that both kinds of type shifters are quite active in natural languages, albeit bringing with them different constraints.

In the next section, I would like to revisit *de* to examine its puzzling multiple functions in Beijing Mandarin. It is important to bear in mind that the type matching constraint is partially based on the empirical observation that in Chinese the modifier in a nominal phrase must itself be nominal. This generalization was earlier proposed and defended by the Chinese linguist Zhu Dexi in over three decades of work devoted to studying Chinese adjectives, particularly in his articles published in 1961, 1980, and 1993. The central piece in the latter study is his observation of parallels between the multiple functions of *de* (the so-called de2 and de3) in Beijing Mandarin with multiple lexical items in various dialects. As Zhu (1993) is also a synthesis of dialectal studies which offer light on how to properly treat *de* in Beijing

[27] One other word that is very much like *zui* is *ji* 'extreme'. The North Pole and South Pole are called *beiji* and *nanji*, respectively. Another expression is:

(i)	*liang*	*ji*	*fenhua*
	two	extreme	divide

'division into two opposing extremes' or 'polarization'

So it is not too far-fetched to treat *ji* as having the potential for a kind reading, especially when we see it modifying a CN, as in this example found on a web site on cars:

(ii)	ji	su	qiche
	extreme	*speed*	*car*

'top speed car'

Mandarin, especially with regard to the CAs in Group B(a) and (b), and which lends strong empirical support to the conclusions of the present paper, the next section will be devoted to presenting Zhu's treatment of *de* in some detail.[28]

4 More on CAs and *de* from Dialectal Studies in Zhu (1993)

Zhu (1993) presents fascinating data from a number of dialects in Chinese which suggest that there might have been two sources for the *de* in modern Beijing Mandarin. Zhu (1961), based on his work carried out exclusively on Beijing Mandarin, suggests a three-way classification of *de*: de1 for adverbial marking, de2 for adjectival marking, and de3 for nominalizing. Since adverbial usage is not part of the study here, we will concentrate on de2 and de3. From the dialectal studies, he finds validation for distinguishing the functions exhibited by *de* in Beijing Mandarin into two types: de2 and de3. The dialects examined exhibit two separate lexical items with functions corresponding to those of de2 and de3, respectively.[29] Hence it might seem that while the two lexical items have maintained their separate identities in certain dialects, they have merged into an identical form in Beijing Mandarin, pronounced as *de* and written in the same character form. Although Zhu did not say so in so many words—he passed away before he could finish the relevant section outlined in his manuscript on the etymology of *de* in Beijing Mandarin—this is a reasonable conclusion from the data and synthesis presented in his work.[30]

Zhu (1980) represented a first effort in turning to dialects for supporting evidence for his classification of the varied behavior of *de* in Beijing Mandarin. However, the scope of the data was limited to only three dialects in that study. Zhu (1993) expanded that project to include data from ten dialects from six major dialect groups. The extensive groups of data are either collected and published by other scholars or collected or commissioned by Zhu himself in collaboration with others. Below is the list of the relevant dialects (Zhu, 1993, p. 85).

Dialect Group	Representative Dialects
Mandarin	Wenshui dialect in Shanxi Province
Yue	Cantonese; Pingnan Baihua in Guangxi Province
Min	Fuzhou dialect in Fujian Province
Gan	Daye (Jinhu) dialect in Hubei Province
Wu	Wenzhou dialect in Zhejiang Province;
	Pucheng dialect and Huzhou dialect in Fujian Province

[28] Conversely, one may consider the current study as offering semantic support to Zhu's largely syntactic analysis of *de* and adjectives, which was based on modern and classical Chinese as well as Chinese dialects.

[29] De2 and de3 may each have more than one lexical correspondence in some of the dialects. Daye (Jinhu) dialect is one such example (Wang, 1991). Yu (1995) provides data on multiple correspondences of de3 in Guangdong Kaiping dialect.

[30] Another possibility is that instead of a merger in Beijing Mandarin, it has gone in the other direction: namely Beijing Mandarin has maintained the original form of *de* with multiple functions, whereas in the various dialects, there was a split or multiple splits. This speculation is far less tenable than the first one given what we know about how the various dialects have retained more of the older features of Chinese than has Mandarin. At any rate, the full answer has to come from thorough diachronic and dialectal studies that the current study cannot undertake. Whichever way it turns out, though, the findings will not affect the property-theoretic account of adjectives adopted here.

Hakka Liancheng (Xinquan) dialect and Yongding (Xiayang) dialect in Fujian Province

The dialects in each dialect group were selected because they all have separate lexical items for de2 and de3 (Zhu continued to use *de* as the generic form for the differently pronounced lexical items in different dialects for convenience). Other members of the different dialect groups do not show such separation, with de2 and de3 in these dialects having identical lexical forms, just as in Beijing Mandarin.

Below is a summary of Zhu's observations based on his extensive data and analyses. Examples of (a range of) the dialectal data which led Zhu to his conclusions are presented following this summary. To spell out in brief what the observations indicate, Zhu's de2 seems to mark a type <*e,t*> expression while de3 is the nominalizer. Note that the letter symbol R corresponds to CA as used elsewhere in the present paper, and S is used to represent SAs, bare nouns and pronouns.

(42) Summary of Zhu's Observations

a. The distribution of [R + de2] is as follows: It can appear in both the predicate position and the verb augment position. But it cannot appear in subject and object positions or the modifier position.

b. For [R + de2] to appear in the modifier position, one of two things has to happen. Either de3 is added to form [R + de2 + de3 + N], which Zhu calls 'jiahe guanxi', or syntagmatic relation, or

c. de2 is replaced by de3 as [R + de3 + N], which Zhu calls 'zhihuan guanxi', or paradigmatic relation (Zhu, 1993, p. 85).

d. The distribution of [S + de3] is as follows: It can appear in the subject and object positions, as well as modifier positions. But it cannot appear in the predicate position.[31]

Let us now look at a few examples from Wenshui dialect, Daye (Jinhu) dialect, and Guangzhou dialect.[32,33] Following Zhu's practice, we will list the information below with data presented from each dialect:

[31] Zhu also discusses a phenomenon called ''zhuanzhi'', which Yuan (1995) translates as ''transferred designation.'' For instance, *mutou* means 'wood', *mutou de* means 'that which is made of wood'. Zhu (1983) offers the following English examples to illustrate what 'zhuanzhi' means: when the suffix –er is added to the verb *write*, not only does the derived word change category, its reference changes too from a writing action to a person who writes. This contrasts with the derivation between *kind* and *kindness*, where even though the derivation results in category change, the basic meaning remains the same. 'Zhuanzhu' phenomenon is similar to the former derivation. Yuan (1995) treats this [NP de] as having an implicit verb, thus bringing it in line with the traditional role of de3 as a nominalizer.

[32] To maintain uniformity in presentation and also for practical purposes, the examples from Zhu, which are all written in character form except for the relevant modifier markers, will be transliterated according to Beijing Mandarin pronunciation except for the relevant modifier markers, which appear in IPA form, as transcribed in Zhu's original article without tone markers.

[33] All the examples are from Zhu (1993, pp. 86–87).

A. The pronunciation of de2 and de3.
B. The typical distribution of [R + de2]: only in predicate position and [S + d3]: in nominal position
C. Nominalization of [R (+ de2)] with de3: [R (+ de2) + de3] in adnominal position.

Wenshui Dialect (Shanxi Province)

A. de2: di de3: diə
B. The typical distribution of [R + de2] and [S + de3]:

R+de2 (in predicate position)

(43) Dijiaoli liangyinyin di.
celler cool de2
'The cellar is quite cool.'

S+de3 (in nominal position)

(44) Wo mai le yi ge liutiao bian diə.
I buy Asp one Cl willow branch weave de3
'I bought one that was woven with willow branches.'

C. Nominalization of [R (+ de2)] with de3:

R+de2+de3 (in adnominal position)

(45) lüyouyou di diə yezi
green-glossy de2 de3 leave
'glossy green leaves'

R+de3+N (in adnominal position)

(46) xuebai diə bu
snow-white de3 cloth
'snow-white cloth'

Daye (Jinhu) Dialect (a member of the Gan dialect in Hubei Province)

A. de2: da de3: go
B. The typical distribution of [R + de2] and [S + d3]:

R+de2 (in predicate position)

(47) Zhei ding maozi dada-er da.
this Cl hat big-big de2
'This hat is a little too big.'

S+de3 (in nominal position)

(48) taomi go e bu sha.
beg-rice de3 hungry not die
'A beggar (the one who begs for food) won't die of hunger.'

C. Nominalization of [R (+ de2)] with de3:

R+de2+de3 (in adnominal position)

(49) honghong da go lian
red-red de2 de3 face
'reddish face'

R+de3+N (in adnominal position)

(50) bijianzhi go malu
pen-straight de3 street
'straight street'

Guangzhou Dialect (Cantonese)

A. de2: dei de3: gɛ

B. The typical distribution of [R + de2] and [S + d3]:

R+de2 (in predicate position)

(51) Li ge ren gaogao dei, feifei dei.
this Cl person tall-tall de2, fat-fat de2
'This person is tallish, fattish.'

S+de3 (in nominal position)

(52) Xinxian gɛ dou you.
fresh de3 also have
'There are also fresh ones.'

C. Nominalization of [R + de2] with de3:

R+de2+de3 (in adnominal position)

(53) Wo yao zhao ge feifei dei gɛ yanyuan.
I want find Cl fat-fat de2 de3 actor
'I want to find a fattish actor.'

R+de3+N (in adnominal position) (examples lacking)

The evidence from the dialectal data demonstrates two patterns. Recall that we listed Zhu's classification of CAs as Group B in (1). The first pattern is that Zhu's Group B (a) and (b) are marked with de2. This is not true of Zhu's Group B (c) and (d). For this reason, CAs have to be further divided into subgroups depending on whether they are marked with de2.[34] Second, all modifiers in the NP structure must be nominal or nominalized.[35] In particular, the dialectal data suggest that the modification structure we commonly see in Beijing Mandarin, namely [X de N], is underlyingly either [X de2 de3 N] or [X de3 N].[36] If the former, we can speculate that due to haplology or some sound change, the two de's are reduced to one. This is a logical conclusion from all the data—Beijing Mandarin as well as the ten other dialects–-analyzed by Zhu. Though Zhu did not live long enough to explicitly make this conclusion, everything in his work points to it.

The dialectal data validate another claim Zhu (1961) made, namely, the claim that in Beijing Mandarin if an [Adjective+de] phrase is used in the predicate position, then *de* is de2, not de3. Sentences in (54) represent Beijing Mandarin. As the Daye (Jinhu) examples demonstrate, de2 cannot be replaced by de3, as shown in (55). And in the case of a CA with *hen*, neither one can be used, as shown in (56):[37]

(54)a. Zheipian caodi lüyouyou de.
this Cl lawn green-glossy de2
'This lawn is so lush.'

b. Neijian yifu zang-bu-la-ji de.
that Cl shirt dirty de2
'That shirt is disgustingly dirty.'

(55) Zhei ding maozi dada-er da/*go.[38]
this Cl hat big-big de2
'This hat is very big.'

[34] CA(c) can be used with de2, but it is not always so. And even though two out of four of Zhu's CA classes require de2 as a reviewer points out, and, another class can be used with de2, this is not a problem for the analysis presented here. First of all, de2 is not de3, as the dialects unambiguously show. So we are not dealing with a nominalizer marker used on a predicate as the Beijing Mandarin data would lead one into thinking; we are seeing a special marker, namely de2, that appears with CA in the predicate position. Second, *hen*, which belongs to Zhu's CA(d), is the most productive device in terms of turning SA into CA. It is fairly clear that for any newly coined adjective, *hen* would be the most unmarked way of turning it into CA, or more specifically, into type $\langle e,t\rangle$. So even though Zhu's CA(d) is outnumbered by the other classes of CAs, its main member, *hen* is the most powerful and productive device as a type lifter.

[35] I have extended this claim to SAs, which were left out of Zhu's discussion on nominal modifiers, by treating them also as nominal (i.e., type *e*), thus presenting a complete uniformity in the application of the type matching constraint on the nominal modification construction.

[36] The fact that these two forms still co-exist in some of the dialects shows that this process of converging de2 and de3 is still very active.

[37] Wang Guosheng, personal communication.

[38] Wang (1991), which is a main source of Daye data for Zhu (1993), duly points out that in these examples the copula *shi* cannot be inserted. The same is true of the Beijing Mandarin examples, suggesting that the [Adjective+de] expression in the predicate position is type $\langle e,t\rangle$ and therefore predicative in its own right. This comes in direct contrast with a nominal expression, such as *laoshi* 'teacher' in Chinese, which, being type *e*, cannot be used in the predicate position unless the copula *shi* is there to uplift it to type $\langle e,t\rangle$.

(56) Zhei ding maozi hen da (*da/*go).
*this Cl hat very big (*de2/*de3)*
'This hat is very big.'

As we have seen earlier in the dialect sentences, these CAs, which appear in the predicate position with de2, would require de3 when used in the modifier position. But of course in the Beijing Mandarin dialect, one can no longer perceive such a difference since de2 and de3 have merged into one lexical item.

In sum, the dialectal facts support Zhu's generalization that *de* in Beijing Mandarin Chinese is ambiguous between the two functions designated as de2 and de3. And they show, unambiguously, that the modifier of a noun must be nominal or nominalized. These syntactic patterns fit in perfectly with the semantic account proposed here.

5 Discussion

Building upon earlier work and following Chierchia's property theory, I have made two major claims in this article. First, I claim that CAs in Mandarin Chinese should be divided into two subgroups, with one group marked with de2 in predicate position and the other group not marked with de2 in predicate position. The first subgroup, which can be referred to as CA+de2, is in total complementary distribution with SAs. The second subgroup, which can be called CA-de2, is in partial complementary distribution with SAs. We have shown that CA-de2s can be argumental and some argumental CAs can be used in the adnominal position due to their sortal properties. Superlatives and [*hen* SA] are typical members of this subgroup. The sortal matching constraint leads to the second claim: that the total or partial complementary distribution between SAs and CAs can be explained by a property-theoretic conjunction/intersection analysis of modification structures which ensures not only type matching but also sortal matching between the modifier and modifiee. Evidence from dialectal studies (Zhu, 1993) provides strong support for both claims.

The full range of facts concerning adjectival modification is of course more complex than has been discussed here. For instance, we have not considered ordering of multiple adjectives within an NP (see Chao, Mui, & Scott, 2001; Sproat & Shih, 1988, 1991). However, the current hypothesis seems quite compatible with the patterns observed and may help solve some of the controversies with such constructions. I will have to leave this for future research.

The question of non-intersective adjectives is not addressed either. This does not just pertain to Chinese; it remains an issue in studies of adjectives in general. In the literature, there is no shortage of hypotheses that take adjectives, including dimensional/gradable ones, as type $\langle e,t\rangle$, rather than attributive, as type $\langle\langle e,t\rangle, \langle e,t\rangle\rangle$, plainly or primarily (Bach, 1968; Bierwisch, 1989; Bolinger, 1967; Lakoff, 1970; Larson, 1998; Reichenbach, 1947). Relatedly, Siegel (1976, particularly Chapter IV) and Heim and Kratzer (1998) show the viability of an intersective analysis of the so-called ''non-intersective'' adjectives such as *small* in *small elephant*, and *Jumbo is small*. They show that if we allow the ''contextually salient standard'' (Heim & Kratzer, p. 71) in the definition of such adjectives, then an intersective analysis is indeed possible. A further important work, Larson (1998) is particularly interesting in terms of the treatment of words like *beautiful* and *former*. Larson

allows an event variable within a nominal phrase such as *beautiful dancer* to account for the ambiguity between the two readings that either the dancer is beautiful or the dance is beautiful. For the former reading, *beautiful* is intersective and predicates of the person who happens to be a dancer, and in the second reading, *beautiful* is also intersective but it predicates of the dance event. This extensional analysis is then applied to *former*, which is also treated as intersective. It is quite possible that a similar treatment can be applied to the so-called non-intersective adjectives in Chinese, thus allowing them to be folded into the proposed analysis of adjectival modification. Concerning English, if one does adopt an intersective interpretation of adjectives, it can then be claimed that all adjectives in English within the scope of discussion fall under the rubric of the property-theoretic conjunction/intersection hypothesis on modification.[39] Hence although an exhaustive account of all possible modification structures may not be within reach at this stage of research, the property-theoretic conjunction/intersection hypothesis can be said to enjoy good empirical support from Chinese and English, and perhaps can be extended to other languages.

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[39] One may even make a similar observation about Russian. In Russian, bare nouns can appear in argument positions, just like Chinese. So bare nouns in this language can be of type *e*. By our type matching hypothesis, it is expected that modifiers of such nouns should or can be of type *e*, and the facts in Russian seem to bear this prediction out. Russian adjectives come in two forms: the short form and the long form. Their general distribution pattern is that the short form appears almost exclusively in the predicate position while the long form generally appears in the adnominal position but can be used predicatively if the quality is an intrinsic or permanent one (for a dissertation-length treatment of Russian adjectives, see Siegel, 1976). Since only the long form can appear in the modifier position, and the modifiee can be of type *e*, we expect that the long form adjectives can be of type *e* as well, and that is exactly what happens in Russian: only the long form, not the short form, can be used as adjectival nouns (Lunt, 1958; Wade, 1992).

One final note: Over the last few decades, the short forms are disappearing from the speech of the younger generations of Russian speakers who use long forms in both predicate and adnominal positions. However, middle-aged Russian speakers still differentiate the two forms and observe the fairly complementary distribution of the two forms. I thank Muffy Siegel for conducting an informal survey among Russian speakers at Temple University.

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