Prosodically constrained postverbal PPs in Mandarin Chinese*

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Abstract

This article discusses postverbal PPs in Mandarin Chinese and proposes that the constraints on postverbal PPs are not syntactic per se, but prosodic in character. It is shown that the NSR (Nuclear Stress Rule), formulated in terms of government, is responsible for the grammaticality of postverbal PPs in Mandarin Chinese.

Introduction

Postverbal PPs in Mandarin have been investigated by Chao (1968), Li and Thompson (1981), J. Huang (1982), A. Li (1990), Mulder and Sybesma (1992), and many others. Some important facts have been discovered in previous studies, and among them, two are directly relevant to the present study. First, the postverbal PPs are actually predicative complements that have a resultative meaning (Mulder and Sybesma 1992; see examples [2] and [3] below). Second, when such a PP is adjacent to a preceding V, the P and V automatically form a complex verb (through reanalysis [A. Li 1990], P-incorporation [Feng 2000], or morphological Merger [Z. Li 2001] see example [4]). While significant results on the syntactic behaviors of the postverbal PPs have been brought into light in previous investigations, there are still important facts that have not been recognized in the literature. First, as observed in this paper, there exists a metrical asymmetry (heaviness vs. lightness) between each of the following two pairs:

[V P+NP_{light} NP] (5a)
[V *P+NP_{heavy} NP] (5c),

and

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[V NP_{heavy} P+NP_{light}] (3a) and (3b)
[V *NP_{light} P+NP_{heavy}] (6a) and (6b)

Second, as shown in section 4.4, there is also a semantic asymmetry between the [V NP PP] structure (where the locative PP is semantically ambiguous [42a and 42b]) and the [V PP (NP)] structure (where the PP denotes no semantic ambiguity [42c and 42d]). Finally, even though the P can generally form a complex verb with a VR (disyllabic verb+resultative compound), it cannot do so if the verb is a VRR (a trisyllabic verb+resultative compound). All these new facts raise further questions as to where the metrical asymmetry comes from, why the P must form a verb complex with a preceding V (or VR) but cannot do so with a VRR, and finally what the syntactic structures of the postverbal PPs are.

In this article, I propose that the constraints on postverbal PPs are not syntactic or morphologic per se, but prosodic in character. It is shown that the NSR (Nuclear Stress Rule) formulated in terms of government is responsible for the grammaticality of postverbal PPs in Mandarin Chinese. This article is organized as follows. Section 1 provides facts about the distributions of postverbal PPs in Chinese; section 2 raises questions and problems involved in postverbal PPs; section 3 offers a prosodic analysis based on the NSR (Nuclear Stress Rule) formulated in terms of government; section 4 provides analyses on the [V PP], [VRR PP], [V PP NP] and [V NP PP] structures and section 5 is a summary of this study.

1. Facts

A well-known fact in Mandarin Chinese is that the PPs (sometimes called "co-verb phrases") cannot be freely used to form grammatical sentences. First, adjunct PPs are strictly banned in postverbal positions (Mulder and Sybesma 1992). For example (1):

(1) *Ta nian shu [zai jia/xuexiao].
he read books [at home/school]
'He studies at home/school.'

Second, contrary to (1), complement PPs are perfectly allowed to appear postverbally. For example (2):

(2) a. Ta xiang shui [zai xiao chuang shang].
he want sleep [at small bed top]
'He wants to sleep on the small bed.'
b. *Ta xiang shui [zai jia].
he want sleep [at home]
'He wants to sleep at home.'

The contrast between (2a) and (2b) is very clear: only complement PPs are allowed in postverbal positions while adjunct PPs are forbidden to appear after the main verb.

Third, a PP can also appear after the object if it is a complement. For example (3):

(3) a. Ta fang le yi zhang zhi [zai nei ge beizi shang].
he put Asp. one CL paper [at that CL cup top]
'He put a piece of paper on the cup.'
b. Ta xie le yi ge zi [zai zhuozi shang].
he write Asp. one CL character [on table top]
'He wrote a character on the table.'

In section 4.4, we will examine closely the structure of the [V NP PP] type sentences.

Fifth, when the theme-object is not present (topicalized or in *ba* construction), that is, when the complement PP is adjacent to the verb, the P cannot be separated from the verb. For example (4):

(4) a. *Ta fang le [zai yizi shang].
he put Asp. [on chair top]
'He put on a chair.'
b. Ta fang zai le yizi shang.
he put on Asp. chair top
'He put on a chair.'

The aspectual *le* cannot occur between the verb and the following P. Instead, the P must be attached to the verb to form a complex verb (A. Li 1990) in order to make the sentence acceptable.

Sixth, the postverbal PP can also appear before the theme-object. However, when it does, the object of the P must be a pronoun (or a definite NP), otherwise the sentence is unacceptable or at least very odd. Consider the examples (5a)–(5d):

(5) a. Ta fang [zai nar] hen duo shu.
he put [at there] very many book
'He put many books there.'

b. Ta gua [zai nar] hen duo shangyi].
he hung [at there] very many jacket
'He hung up there many jackets.'

c. *Ta fang [zai liang zhang zhuozi shang] henduo shu.
he put [at two CL table top] many book
'He put many books on two tables.'

d. *Ta gua [zai hao jige difang] hen duo shangyi.
he hung [at good many places] very many jacket
'He hung up many jackets in various places.'

The grammatical contrast between (5a) and (5b), and (5c) and (5d) is very clear (in a default context), though my informants perceive differing degrees of ungrammaticality of (5c) and (5d) (the same is true for sentences given in [6]).

Seventh, when the theme-object is a pronoun (or a definite NP), the [V pron PP] is generally unacceptable. Compare (6):

(6) a. *Zhang San fang le ta zai zhuozi shang.
Zhang San put Asp. it at table top
'Zhang San put it on the table.'

a'. Zhang San ba ta fang-zai le zhuozi shang.
Zhang San ba it put-on Asp. table top
'Zhang San put it on the table.'

b. *Zhang San fang le neixie shu zai zhuozi shang.
Zhang San put Asp. those book on table top
'Zhang San put those books on the table.'

b'. Zhang San ba neixie shu fang zai zhuozi shang.
Zhang San ba those book put on table top
'Zhang San put those books on the table.'

Considering the examples given in (1)–(6), the distribution of PPs in Chinese can be summarized in (7) as follows:

(7) *Descriptive generalization of postverbal PPs in Chinese:*
i Only complement PPs are allowed to appear postverbally;
ii. When there is no object, the P must be attached to the V;
iii. Both the [V NP PP] and [V PP NP] orders are allowed, but the object of V cannot be a pronoun (or a definite NP) in [V NP PP], while the object of P must be a pronoun (or a definite NP) in [V PP NP].

2. Questions and problems

Given the descriptive generalization in (7), the first question is why only complement PPs are allowed to appear postverbally. There have been proposals suggesting that all adjunct locative PPs are located preverbally and all postverbal locative PPs are predicative complements (Mulder and Sybesma 1992; Travis 1984; A. Li 1990; J. Huang 1982; Sybesma 1999; and many others). However, given that a syntactic analysis could account for this restriction, a question still remains: Why does Chinese not behave like English in that adjunct PPs can occur on both sides of the verb?

Second, why must the postverbal P be attached to the V when it is adjacent to the V? Note that the same P does not need to be attached to a verb if it appears before the main verb as in (8):

(8) a. Wo xiang jintian [zai jia] nian shu.
I want today [at home] read book
'I want to study at home today.'

b. Ta ming nian jiang zai Zhongguo nian shu.
He next year will at China read book
'He will study in China next year.'

The sentences given in (8) are perfectly grammatical, even if, in (8a), the time adverbial phrase *jintian* intervenes between the verb *xiang* and the P *zai*. In (8b), the P is adjacent to the auxiliary verb *jiang* and located within the same IP, however, the P is not attached to the Aux.[1] Example (3) also shows that the PP does not need to be attached to a verb either when it occurs after the object. Why, then, must the P be combined with the verb only in the [...V PP] environment?

The third question comes from the following contrast explained in (7iii):

(9) a. [V+*Definite-NP+PP] (see [6])
b. [V+[P+*(pronoun)]$_{PP}$+NP] (see [5a]–[5b])

As seen before, both orders (i.e. [V NP PP] and [V PP NP]) are allowed, but what seems strange is the fact that in (9a), the internal argument cannot be a pronoun or a definite NP while in (9b), the locative NP must be a pronoun. Why must this be so? This question has not been recognized in the literature, but is extremely important for the syntactic behaviors of the postverbal PPs. That is, if syntax allows the [V NP PP] structure to exist, as seen in (3), why cannot a pronoun (or a definite NP) appear in the argument position of that structure? There is no syntactic constraint of natural languages that permits only indefinite, but not definite NPs in the argument position of ordinary VPs. The prohibition of a pronoun or definite NP from occurring in the argument position raises the serious question of what the syntactic structure of the [V NP PP] sentences really is and how it is organized. Whatever it is, one thing

is clear, the [V NP PP] sentences must have a structure that allows (3) but not (6).

With regard to the questions raised above, I propose in this paper that the behaviors of postverbal PPs in Chinese cannot be properly accounted for by syntax. Instead, they are prosodically constrained syntactic phenomena. The reason they are prosodically constrained will be given in the next section. For now, we will concentrate first on why they are difficult to be accounted for in purely syntactic terms.

First, as seen in (3), the PP in [V NP PP] is independent of the verb. However, in (4), the P of [V PP] must be attached to the V. A syntactic analysis cannot explain why the P must act this way. The attachment of P to V in (4b) ([[V-P]$_V$ NP]) is, of course, a syntactically or morphologically allowable operation. For example, preposition incorporation and morphological merger can both give the correct output in (4b). However, the [V [PP]] structure can also be a perfect structure without incorporation or merger in many other languages. Given the fact that the PP in Chinese can be used independently in [V NP PP], and especially in the [$_{IP}$ Aux PP V] structures (8b), the problem is why the PP must be syntactically incorporated into, or morphologically merged with the V in [...V PP] but not in other environments. There must be a reason, but it is hardly a syntactic, or even a morphological one proposed in Z. Li (2001) and adopted here.[2] As syntax allows PPs to be independent but the PP cannot do so only in [...V *PP], the reason must be something else other than syntax.

This, of course, does not mean that one could not propose any syntactic reason for the different behaviors of PPs in Chinese, but it will be very difficult for such a syntactic account to give a natural explanation without an ad hoc stipulation. It is especially so when syntax faces the question of why in the [V NP PP] structure, the NP cannot be a pronoun or a definite NP. The ban on pronoun and definite NPs in the argument position of ordinary VPs casts serious doubt on a syntactic account for their different grammaticality.

As is well-known, pronouns and definite NPs (c-construable information in the sense of Rochemont 1986) are anaphoric constituents (both have a semantic antecedent in a discourse). In prosodic analysis, anaphoric constituents are prosodically invisible (see Zubizarreta 1998 for detailed discussions on this matter). They are prosodically invisible because they do not generally attract stress, thus they can be characterized as prosodically light-forms. Given the metrical property of stress attraction between anaphoric elements (marked with "L(ight)") and non-anaphoric constituents (marked with "H(eavy)"), the different grammaticality between *[V pronoun/definite-NP PP] and [V indefinite-NP PP] in (9) can be summarized as follows:

[V NP_H P+NP_L] (3a) and (3b)
[V *NP_L P+NP_H] (6a) and (6b)

Following the same analysis and notations, the contrast between [V+*pron+PP] and [V+[P+*(pron)]$_{PP}$+NP] in (9b) can also be shown as follows:

[V [P NP_L]$_{PP}$ NP] (5a)
[V [P *NP_H]$_{PP}$ NP] (5b)

These asymmetries show that the grammatical constraints between Light and Heavy forms in those environments are not due to syntax, for it is difficult (if not impossible) for syntax (or even morphology) to reject a pronoun in the argument position of the [V NP PP], but request a pronoun for a PP in the [V PP NP] structure. Note that, in both cases, it is the same postverbal position (i.e. the object of V and the object of [V-P] complex verb) where a pronoun is rejected and demanded. How could syntax reject and also demand the same lexical category occurring in the same postverbal position?

On the other hand, the contrasts of the grammaticality between stressable nouns and unstressed pronoun/definite-NPs in the above two structures indicate that we are dealing with a prosodic phenomenon (for relevant discussions on this matter, see Selkirk 1984; Nespor and Vogel 1986; Guasti and Nespor 1999; Kager and Zonneveld 1999; and references cited there). Since pronouns and definite expressions are anaphoric constituents, they are metrically invisible to prosodic operations (see Zubizarreta 1998). The prosodic analysis proposed here, as seen in section 3, offers a unified explanation that accounts for all the facts given here.

3. A new proposal

In this section, I will first introduce the basic prosodic constraint (NSR) formulated in (10).

(10) *G-NSR (in Chinese):*
Given two sister nodes C1 and C2, if C1 and C2 are selectionally ordered (see note 5), the one lower in selectional ordering and containing an element governed by the selector is more prominent.

The NSR in Chinese is government-based (hence G-NSR) and the notion of Government is defined in the following manner:[3]

(11) *Government:*
α governs β if and only if
i. α is an X^0, and
ii. α c-commands β, and
iii. every branching node dominating α dominates β.

The NSR in Chinese is no more than a specification of the S-NSR defined for German in Zubizarreta's system. Compare:

(12) *S-NSR:*
Given two sister nodes C1 and C2, if C1 and C2 are selectionally ordered, the one lower in the selectional ordering is more prominent.

The S-NSR in German and the G-NSR in Chinese indicate that Chinese is typologically similar to Germanic languages (see Y. Li 2001 for other similarities between the two types of languages). Compare (13) and (14) (the capital letters represent stress):

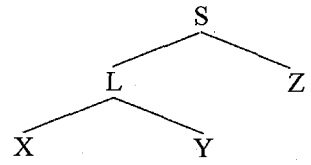
(13) a. Peter hat an einem PAPIER gearbeitet.
Peter has on a paper worked
'Peter worked on a paper.'
b. Peter hat an einem kleinen Tisch GEARBEITET.
Peter has on a small table worked
'Peter worked on a small table.'

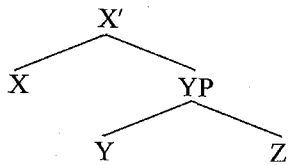
(14) a. Ta bu xiang gen wo kan DIANYING.
he not want with me watch movie
'He does not want to watch the movie with me.'
b. Ta zong zai jia chi WANFAN.
He always at home eat dinner
'He always has his dinner at home.'
c. Ta yao gen laoshi jie SHU.
he want from teacher borrow book
'He wants to borrow books from teachers.'

As pointed out by Truckenbrodt (1993), in German, adjuncts do not attract NS even when they have a complex structure (see also Zubizarreta 1998). This is also true in Chinese as seen in (14). Of course, German is a head-final language, whereas Chinese is a head-initial language, and therefore the directions of NS are different in the surface structures of the two languages. However, based on Kayne's (1994) theory of asymmetric c-command, the underlying structure of the two languages is the same, which means that the operation of NSR is the same if the NSR is typologically accessible to the same type of structure in the computation

system of the grammar. Given this, it is theoretically reasonable to hypothesize that in both German and Chinese, the NSR is operated only on complements. Empirically, since complements in Chinese are located to the right of the verb (at surface structure),[4] if NSR in Chinese only accesses to complement, only postverbal elements could be assigned an NS. This is borne out as seen above.

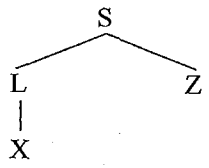
As defined in (10), the unique characteristic of NSR in Chinese is the local domain to which the NSR applies. That is, in Chinese the NSR is only accessible to the government (or sisterhood) relation between a selector and a selected constituent, not a selectional chain as in German.[5] As a result, NSR in Chinese is more local in the sense that only the internal structure of material dominated directly by a governor is accessible to the computation of metrical structure.[6] To see this, let us begin with the definition of government in the structure in (15):

(15) a.


b.


By the government definition given in (11), X in (15a) governs only Y but not Z, because Z is not a sister of X. The government relation requires every branching node dominating α dominates β. Thus if the terminal X is a selector for NSR, then NSR will only compute Y as its governee. Hence, NSR will assign NS only to Y. It follows that Z is not computable by NSR for it is not a complement of X. In (15b), on the other hand, X also cannot govern Z if YP is a barrier for government, hence no NS is assigned to Z. If Z in both (15a) and (15b) is excluded by NSR, it must be excluded as a constituent outside of the NSR-domain, giving rise to what is called a prosodic *affect* in the sense of Zubizarreta (1998) — a situation where "must do something" is called for; otherwise Z must be ruled out.[7]

The notion of "every branching node dominating α dominates β" is crucial for the government relation used here, because if we remove the terminal Y from the tree structure (15a), the government relation changes:

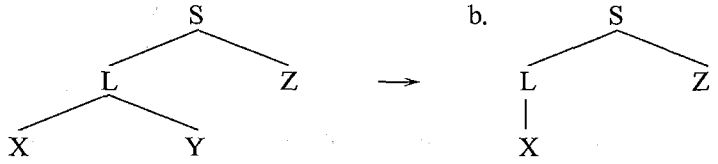
(16)


In (16), X governs Z, because the only branching node is S which dominates both the X and the Z. As we will see, there are situations where a structure like (16) is automatically derived in a prosodic analysis when the terminal Y of (15a) is not computed by the NSR, even if Y still exists in syntax. This situation occurs as a terminal category being prosodically invisible. In other words, if Y is prosodically invisible, the branch connected to Y from its mother-node is recessed from NSR. This situation is defined in terms of the invisibility condition given in (17) (see Zubizarreta 1998 for detailed discussions about a cluster of elements such as pronouns, definite expressions, empty categories, traces, etc., that are metrically invisible to NSR):[8]

(17) *Invisibility condition*
In Chinese, anaphoric elements are prosodically invisible constituents that have no bearing on prosodic analysis.

Given the invisible condition, the two structures, that is (15) and (16), can be more directly interpreted as follows:

(18) a. b.



Given the above analysis, we see that if terminal Y is a prosodically invisible constituent, the only accessible structure to NSR in (18a) is (18b), because (18a) is metrically non-distinct from (18b), thus when NSR applies, only (18b) is visible to NSR. Given the invisibility condition (17), the change of structure from (18a) to (18b) can be formulated in terms of a structural removing condition (SRC), as (19).

(19) *Structural removing condition (SRC)*
Remove all the prosodically invisible elements (with their syntactic branches) from the tree structure, when NSR applies.

In short, the NSR under government plus the invisibility condition is all we need to account for the syntactic behaviors of PPs in Chinese, as we will see in section 4.

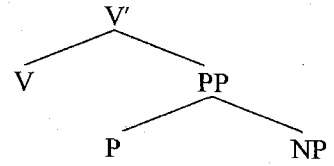
4. Analysis

4.1. **[V PP]*

First, consider the *[V PP] structure. Given the theoretical assumption above, if the government requirement of the NSR is responsible for the

postverbal complement PPs in Chinese, the *[V PP] structure must therefore be ruled out by the NSR assignment hypothesis. Let us first look at the [V PP] structure in (20).

(20)



By government relation, the governor (selector) in (20) is the V. By NSR, only a sister note that contains an element governed by the governor can receive the NS. Apparently, although V governs PP and PP contains an NP, V does not govern the NP. As a result, V cannot assign NS to the NP. This structure must therefore be ruled out for the simple reason of noncomputable configuration by NSR. This explains why sentences like (4a) are not acceptable. As mentioned above, the syntax of UG can generate this structure perfectly, but obviously what syntax has produced is not interpretable by prosody and a syntactically well-formed sentence is ineffable without prosody. As a result, this structure must be ruled out prosodically, though not syntactically. Put differently, since the PP is ill-formed prosodically, either this structure cannot exist or the last-resort *affect* will force the computational system to "do something" to the PP.

Apparently, there are two ways in the language to carry out the *affect* on the prosodically ill-formed structure. First, the ill-formed PP can be dislocated at the right periphery of VP (or IP), a common process also called right-dislocation or emargination in other languages (Calabrese 1990; Zubizarreta 1998: 121). Thus, by right-dislocation or emargination (P-movement), we have a sentence like (24) (# refers to an intonation break and all the constituents after the break are destressed and pronounced in a low pitch):

(21) a. *Wo ba shu fang-zhengqi le zai zhuozi shang.
I ba book put-neat Asp. on table top
'I put the books neatly on the table.'

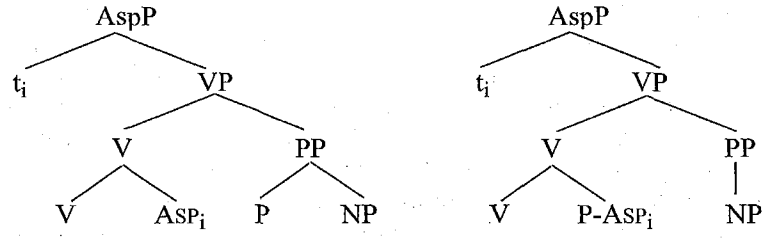
b. Wo ba shu fang-zhengqi le # zai zhuozi shang.
I BA book put-neat Asp. # on table top
'I put the books neatly on the table.'

If the PP *zai zhuozi shang* is uttered in a null stress on each constituent of the intonation phrase with a characteristic of "after thought," the sentence becomes acceptable (21b).

Second, the prosodically ill-formed *[V PP] can also be affected by 'do something' to the P. In this case, the prosodic analysis not only rules

out the undesirable result (4a), but also explains why, if the complement PP occurs inside the VP (i.e. not to be right-dislocated), the P must be incorporated into V. This is so because if the PP occurs inside of the VP, it will be directly governed by the V and then the NSR will count it as the target of the NS (the only way for the PP to break the government relation with V is to occur outside of the government domain as defined in [11]). If PP is the target of the NS, P must be merged with V, for otherwise the NS cannot be assigned to it. As seen before, although V governs PP, V cannot assign NS to the locative NP, for the V does not govern the NP (P does). In other words, the PP is a barrier for V to govern anything inside the PP. As a result, either the VP-internal PP must be ruled out (NSR is inoperable, resulting in [4a]), or the P is merged with V, giving rise to the morphological merger through (a) lowering of Asp and (b) local dislocation of P, as proposed by Z. Li (2001) and shown in (22).[9]

(22)



After merger (see note 21 for cases without the Asp), the verb complex $[V\text{-}P\text{-}ASP]_V$ is the governor and the locative NP is the governee. Since the PP is no longer branching (the P is gone and the branch from PP to P cannot be seen by NSR), the $[V\text{-}P]_V$ and the NP become two metrical sisters, one governed by the other. As expected, the NS can therefore be assigned to the complement NP, giving rise to grammatical sentences like (4b).

Under the analyses given above, we can now answer the questions of why the *[V [P NP]] is ungrammatical and why the P must be merged with V-Asp, because both are caused by the application of NSR, in the sense that the NS must be assigned under government (V governs PP). However, without P merging with V-Asp, there is no government relation obtained between the V and the NP. As a result, in the structure of *[V PP], either the PP must be emarginated or the P must undergo a merging process (i.e. P-Affect), otherwise, the [V *PP] is unacceptable (i.e. the P-blocking effect).

4.2. **[VRR PP]*

The above analysis can naturally be extended to, and therefore confirmed by, the ill-formed *[VRR PP] structures. For example:

(23) a *Wo ba shu fang-zhengqi-zai le zhuozi shang.
I ba book put-neat-on Asp. table top
'I put the books neatly on the table.'
b. Wo ba shu fang-zhengqi le # zai zhuozi shang.
I ba book put-neatly Asp. on table top
'I put the books neatly on the table.'

The verb + resultative forms are compounds as commonly assumed in Chinese syntax (whether they are generated in syntax or morphology). Given the compound states of the verb + resultative forms and the merger process of P with V, it is unexpected that (23a) is unacceptable, because if the verb + resultative forms are compounds, they should not be different from the Vs in taking a complement PP in a syntactic analysis. Thus, a syntactic (or morphological) analysis for the [V PP] will be equally applicable for the [VR PP]. However, it is not true as seen in (23a). The fact is, only disyllabic VR forms can take a complement PP freely, trisyllabic VRR forms cannot generally do so. On the other hand, not only are [VRR *PP] forms ill-formed, [VRR *NP] forms are also unacceptable. For example:

(24) a. Ni yinggai dian-tou daoli.
you should point-thorough reasons
'You should point out the reasons thoroughly.'
a'. *Ni yinggai dian-touche daoli.
you should point-thorough reason
'You should point out the reasons thoroughly.'
b. Ni yinggai ba daoli dian-tou dao renren dou
you should ba reason point-thorough to everyone all
dong de chengdu.
understand de extent
'You should point out the reasons thoroughly to the extent that everyone understands.'
b'. *Ni yinggai ba daoli dian-touche dao renren dou
you should ba reason point-thorough to everyone all
dong de chengdu.
understand de extent
'You should point out the reasons thoroughly to the extent that everyone understands.'

c. Ni yinggai ba shuangfang de yaoqiu bai-ping dao
you should ba two-party de request arrange-even to
bici manyi de chengdu.
each satisfy de extent
'You should treat evenly the requests of the two parties to the extent that each of them is satisfying.'

c′. *Ni yinggai ba shuangfang de yaoqiu bai-gongping dao
you should ba two-party de request arrange-fair to
bici manyi de chengdu.
each satisfy de extent
'You should treat the two parties' requests fairly to the extent that each of them is satisfying.'

What is wrong with the VRR taking a complement PP (or NP)? The answer is also prosody, because even though all complement PPs can attach to VRs (disyllabic), no complement PPs can attach to VRRs (trisyllabic), as seen in (24b′)–(24c′). This poses a challenge to a purely syntactic (as well as a purely morphologic) account, by which there is no reason why (24a) and (24c) are grammatical while (24a′) and (24c′) are not. The question raised by the fact is why only disyllabic VRs can take a PP or a NP complement while trisyllabic ones cannot. Given the oddity of (24a′)–(24c′), it is clear that the postverbal PPs in [VRR *PP] are constrained in terms of prosody, simply because it is a syllabic constraint that trisyllabic VRR verbs cannot take postverbal PPs by exactly the same reason as it cannot generally take an object in [VRR *NP] (see Feng 2000). More specifically, while the PP after disyllabic VR forms is governed by the VR, the PP after trisyllabic VRRs is not. In other words, the PP after VRR (*fang-zhengqi*) is not computable by NSR (23) and the object NP after *dian-touche* 'point-through to' is also not computable by NSR (24a′), for exactly the same reason.

Apparently, the number of syllables has affected the government relation in the present analysis: if the V+R is disyllabic, the VR can function as an X^0 (a lexical category) and hence govern the complement NP (or PP); if the V+R is trisyllabic, the VRR will function as an X′ (a phrasal category) where the V governs only the RR, not the object (or the PP).

How could that be? First, there have been intensive studies on the prosodically determined distinctions between words and phrases in Chinese (Feng 2000, 2001). Although I am not able to review all details of the arguments here, examples of the following should clearly show the fact that only disyllabic phrases can become compounds, while trisyllabic ones all fail to do so. For example:

(25) a. Fu -ze bingfang.
take -responsibility patient-room
'Responsible for hospital room.'

a′. *Fu zeren bingfang.
take responsibility patient-room
'Responsible for hospital room.'

b. Dui bingfang fu -ze.
to patient-room take -responsibility
'Responsible for hospital room.'

b′. Dui bingfang fu zeren.
to patient-room take responsibility
'Responsible for hospital room.'

c. You-hai shenti.
have harm body
'Harm (one's) health.'

c′. *You shanghai shenti.
have harm body
'Harm (one's) health.'

d. Dui shenti you -hai.
to body have harm
'It is harmful to (one's) health.'

d′. Dui shenti you shanghai.
to body have harm
'It is harmful to (one's) health.'

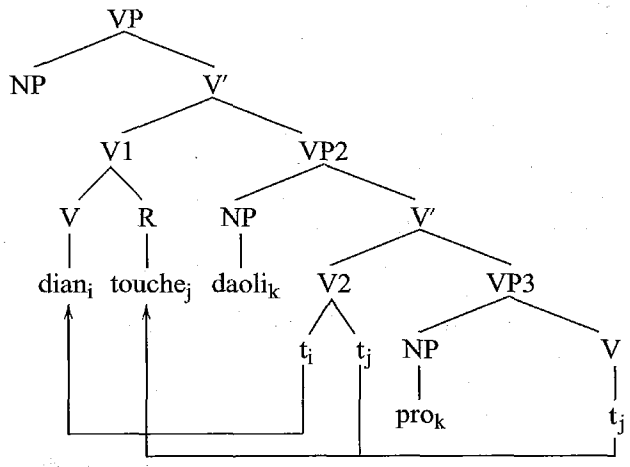
In Chinese, only disyllabic [V+Obj] forms can take an outer object while no trisyllabic [V+OO] forms can do so. This contrast shows clearly that all [V+OO] forms cannot function as a compound (an X^0 category). There are also other types of syntactic organizations, such as [[V+R] NP] (24) and [V PP] NP] (30a), as seen in this article, and $[V+O]_{Adv}$ $[Aux+V]_{Adj}$, $[A+N]_{N}$, $[Subj+Predicate]_{Adj}$,[10] etc., as shown in Feng (2001). All of them follow the same prosodic constraint, that is, the minimal-word condition as illustrated in (26).[11]

(26) *Minimal-word condition*
a. A minimal word is a foot formed by two syllables, i.e., MinWd = foot([σσ]).
b. Any syntactic organization of the form [X+Y] cannot be an X^0 category unless it is a MinWd, i.e., $[X+Y] \rightarrow [X+Y]_{x^0}/[\_]_{MinWd}$.

Now, under the MinWd condition, the [V+RR] forms can no longer be counted as an X^0 category by the prosodic constraint. Instead, they must

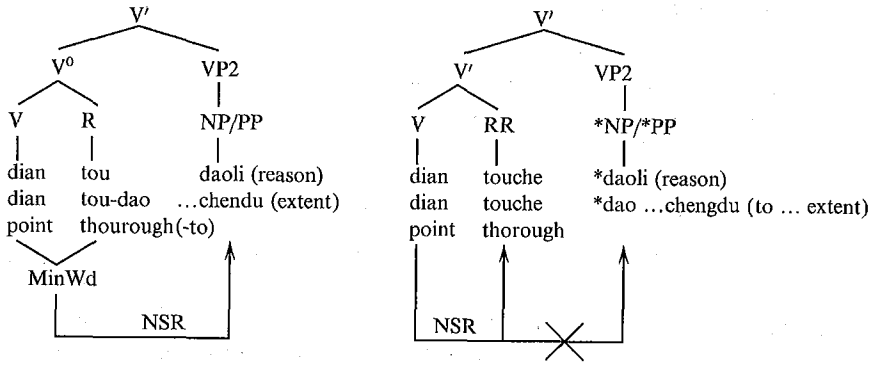
be (re-)analyzed as a phrasal category (or two prosodic sisters) when NSR applies. This analysis implies that prosody must have a function to trigger a reorganization of syntax, so that an X^0 can be decomposed into an X′ during the operation of NSR. This is so because the VRR is too big to be permitted as a MinWd and if it is not a MinWd, it cannot be taken as an X^0 category according to (26). If VRR is not allowed to be an X^0, it must be decomposed (or reanalyzed) as a phrase. In this case, the NS must be assigned within the [V+RR] where the V is the selector and the RR is the selected predicate governed by the V, in the following structure proposed in Feng (2002) (see also Sybesma 1999):

(27)



Apparently, the operation of NSR must respect the MinWd condition. This is actually what we expected because in this environment, what the MinWd condition determines is just the prosodically legitimate syntactic head on which the NSR applies. In other words, the NSR would not work without a head but it cannot operate on a prosodically illegitimate head. Given this, it is not surprising that the number of syllables is so crucial for the government relation in relevant syntactic environments. As a result, both [VRR *PP] and [VRR *NP] strongly indicate that it is the NSR under government that controls the grammaticality of the postverbal constituents.[12] The two syllabically affected government relations are shown in (28) (only relevant parts of the tree structure in [27] are repeated here).

(28) a. $[\sigma + \sigma] = X^0$ b. $[\sigma + \sigma\sigma] = X'$



Given the above analysis, the [V(R)-P] combination (24) is essentially a prosodically motivated operation, even though this is carried out through a morphological process (Z. Li 2001). This can also be seen as a case of prosodically constrained syntax in the sense that without the force of prosody, the PPs would have occurred freely (i.e. without the morphological merger) in the postverbal positions. Note further that the process of morphological merger is entirely dependent upon whether or not there is a prosodic requirement, thus, the merger operation in the present theory is merely a prosodically forced morphological process activated in the syntactic environments where the NSR applies.

Furthermore, the merger process occurs only if the NS is assigned under government, because otherwise there would be no need for the merger to take place and more importantly, there would be no way to block the merger of P in the [VRR *PP] environment. To put it differently, there would be no merger operation without motivation from prosody, and there would be no prosodic motivation for the merger without the application of NSR under government (the NS could fall naturally on the object of P without the merger of P as in other languages). Thus, the [[V-P] NP] and the [VRR *PP] structures in Chinese provide strong evidence for the assignment of NS under government, and in turn, constitute clear cases of both a prosodically motivated morphological merger (i.e. $[[V(R)\text{-}P)_V$ NP]), and a prosodically invalidated syntactic operation (i.e. [V *PP] and [VRR *PP/NP]) in the sense that the structures produced by syntax are ruled out by prosody.

4.3. *[V PP NP]*

The [V PP NP] structure also confirms our analysis given in section 4.2. First, the [V PP NP] sentences, as seen before, can be formed alternatively

as a [V NP PP] structure without affecting its grammaticality. More examples are given in (29).

(29) Ni rang ta gan shenme la?
'What did you make him to do?'
a. Wo rang ta fang (zai) nar le hao ji ben shu.
'I let him put there many books.'
b. Wo rang ta fang le hao ji ben shu zai nar.
'I let him put many books there.'

In both cases, the NS falls on the object *hao ji ben shu* with the locative PP unstressed. Since the PP is invisible to NSR (being anaphoric), it is located either before or after the object NP. As seen below, (29) provides strong evidence for our analysis of the MinWd condition and of the NSR under government.

While an emarginated PP in (29b) is expected according to (21b) (more analysis is given in section 4.4), the intervening PP raises questions as to how a PP can possibly appear before the object NP. Though this is a purely syntactic question, it cannot be answered properly without concerning its prosodic property. That is, the locative NP must be a pronoun (or at least a definite NP) in order to be located between the V and its object. Otherwise the sentence is unacceptable, as seen more clearly in (30).

(30) a. Ta fang (zai) nar le hao ji ben shu.
he put on there Asp. good many CL book
'He put there many books.'
b. *Ta fang zai hao ji zhang zhuozi shang le hen duo ben shu.
he put at good many CL table top Asp. very many CL book
'He put many books on many tables.'

Here, the aspect marker *le* can be an important indicator: when the PP appears before the object 'books,' *le* can occur after PP if the locative NP is a pronoun, but if the object of P is not a pronoun (an indefinite NP, as in [30b]), *le* cannot appear after it. Why must this be so? It cannot be properly explained in purely syntactic terms.

As we can see below, these two questions (i.e. the position of PP and the requirement of a pronominal object within the PP) are actually related in our analysis, in the sense that the latter provides conditions for the former.

First, recall that in order for the NSR to be operative in the [V [P NP1] NP2] structure (at the end of all syntactic operations where the NSR applies, see Zubizarreta 1998), the P must first be merged with V (22), for otherwise the P will block the government relation between V and NP1. Given this, we will have a structure like $[[V\text{-}P]_V$ NP1 NP2]. Now the $[V\text{-}P]_V$ complex governs the NP1 — the locative object of the preposition. In this case, the NSR can be satisfied within the [V-P NP1] in examples of the following.

(31) Ni rang ta gan shenme la?
you let him do what Prt.
'What did you make him do?'
Wo rang ta ba shu fang-zai nar.[13]
I let him ba book put-at there
'I let him put books there.'

When the locative NP is an indefinite NP (nondestressable), the NSR will apply automatically within [V-P NP1], because NP1 is a sister of V and also a prosodically visible entity. In this case, the NP2, on the other hand, will either be ruled out as in (30b), or emarginated as in (32).

(32) [V-P NP1 # NP2]
Ta fang zai hao ji zhang zhuozi shang le # nei xie shu.
he put at good many CL table top Asp. those CL book
'He put those books on many tables.'

However, as seen in (29), the object NP in both [V PP NP] and [V NP PP] sentences can be an indefinite NP, while the locative NP must be weak (a pronoun, for example), suggesting that the object NP must be prosodically heavier than the locative NP. Given this, it follows that the object NP must be located within the VP (not a dislocated NP), hence is assigned NS by the NSR. With this in mind, consider the following contrast in the [V PP NP] structure:

(33) In the [V P+NP1 NP2] structure,
a. if NP1 is heavier, the object-NP2 must be lighter and emarginated. (32)
b. if NP2 is heavier, the locative-NP1 must be a pronoun. (30)

The ungrammatical sentences given below show, once again, the contrast between these two stress patterns:

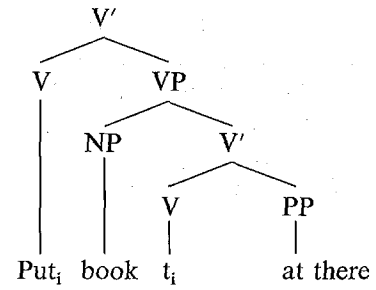
(34) a. *Ta fang-zai le liang zhang zhuozi shang nei xie shu le.
he put-at Asp. two CL table top those CL book Asp.
'He put those books on two tables.'

b. ??Ta fang zai hao ji zhang zhuozi shang le # hao
he put at good many CL table top Asp. good
ji ben shu.
many CL book
'He put many books on many tables.'

Example (34a) shows that the same sentence (32) is unacceptable without emargination (violating [33a]), while (34b) shows that a stressed NP strongly disfavors the emarginated position. The question, then, is why there exists a light-heavy alternation between the locative NP1 and the object NP2 in just a matter of complementary distribution, and especially why, if the NP2 is not emarginated, the locative NP1 strongly favors a light form (a pronoun). According to the present theory, the reason is very clear: only when the locative NP1 is prosodically invisible (being a light form) to NSR, then the NS can be assigned to the object NP2. In other words, if the locative NP1 is not prosodically weak (i.e. prosodically visible to NSR), it will block the NS to be assigned to NP2. In that case, NP2 must be either ruled out (34) or emarginated (32).

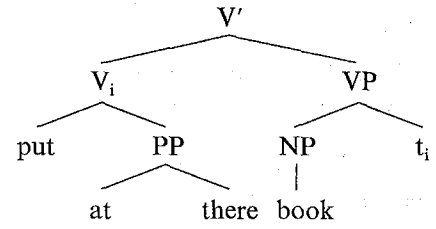
How does the NSR work syntactically when the locative NP1 is prosodically invisible? According to Larson's (1988) double object structure which J. Huang (1988, 1994) and Y. Li (2001) have adopted for Chinese, the [V PP NP] may have the structure in (35):

(35)



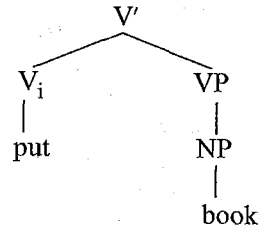
Structure (35) will give the correct order of (29b).[14] Furthermore, following Larson's (1988) reanalysis of the lower V′ as V when it moves into the empty V, the [V PP NP] sentences (29a) are derived as in (36):

(36)



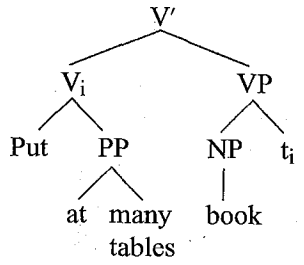
The V′ category *put at there* moves together to the V (see [30a] for evidence of this process), giving rise to the [V PP NP] sentences. Note that this process can yield a desirable result if, and only if, the PP is prosodically invisible to NSR, because only then what the NSR actually sees in structure (36) can be a sister relation between the verb (governor) and the object (governee), shown in (37):

(37)

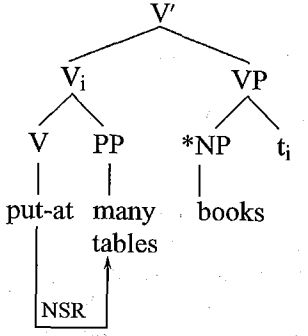


By removing all the invisible constituents (or branches) from the tree, according to the SRC given in (19), the NSR-visible structure is the one given in (37). It is not difficult to see that if the PP is not invisible to NSR (30b), we cannot have a structure like (37) and the object *book* will not be a legitimate target of NS, and a sentence so generated will be ungrammatical as shown in (38b = 30b).

(38) a.



b.



Since *many tables* is a visible NP, the verb complex [V-P] can actually see it and hence assigns NS to it. This will leave the object NP *books* uninterpretable. This is why even if any PP can be moved together with the V in syntax, only the prosodic invisible ones give the right result.

Obviously, given the present analysis, the locative pronoun requirement in the [V PP NP] structure is no longer a mystery, because, being an invisible element, the locative pronoun is expected not to block the NS-assignment from the $[\text{V-P}]_V$ to the object NP2. What is unexpected, at least on the surface of this analysis, is the NSR-operation in (38b). That is, the NSR would have taken the $[\text{V-P-NP}_{\text{indefinite}}]$ as a head because

it is an X^0 category generated in syntax. Yet, the NSR must have not taken the [V-P-$NP_{indefinite}$] as a head, for otherwise the NS would be assigned to the NP2, making the sentence acceptable, contrary to the fact. Instead, the [V-P-$NP_{indefinite}$] must have been reanalyzed as an X′, so that the [V-P] was taken as a head and the NS was assigned to the locative NP as seen in (38b). This must be so, for otherwise the ill-formed sentences cannot be ruled out by NSR. Given this, it follows that the prosody must have triggered a decomposition of an X^0 (formed in syntax) into an X′ (required by prosody), exactly what we have seen in [VRR *NP] and [VRR *PP] environments. Note that the [V-P-$NP_{indefinite}$] must be a V^0 (through head movement), if so, what triggers the V^0 ([V-P-$NP_{indefinite}$]) to be a V′ then? Given the argument in the last section, I propose that it is the same constraint, namely, the MinWd condition, that is functioning here. This is so because the minimal word condition says essentially that an [X+Y] form resulted from any syntactic organization can be an X^0 category only if it is a minimal word. Given this, the [V-P-$NP_{indefinite}$] cannot be computed as an X^0 by the prosodic restriction, simply because the [V-P-NP] sequence (*fang zai hen duo zhuozi shang*) in (38b) is way beyond the size of a minimal word (equal or greater than two but less than three syllables). As a result, the [V-P-$NP_{indefinite}$] must be taken as an X′ by prosody and this is why the NSR does not count it as a single (prosodic as well as syntactic) unit.[15]

To sum up, we have argued that the [V-PP] movement in [V PP NP] (36) is a prosodically licensed syntactic movement. This must be so because syntax cannot distinguish prosodically invisible PPs from prosodically visible PPs, and if the former can be moved together with the verb, there is no reason why the latter cannot, according to the same syntactic operation. The fact is, only the former is acceptable (22), suggesting that the grammaticality of (22) and (34) have nothing to do with syntax. In short, the process of prosodic syntax seems to proceed in the following ways: syntax provides legitimate structural operations and prosody determines when and where they are operational (in cases of [V *PP] for example).

Furthermore, the process of V′-reanalysis constitutes an important case of syntax having access to prosody. By syntax, the V′ reanalysis in $[\ldots[_V\text{V-PP}]_i[_{VP}\text{NP } t_i]]$ structure (36) will always result in a complex head (V^0) directly governing the object NP. Given this, the reanalyzed V^0 would make all sentences acceptable, not only syntactically but also prosodically (at least in theory) because NSR must find a selector in syntax and the $[\text{V-PP}]_V$, though complex, is the syntactic head. However, sentences so generated are ungrammatical if the locative NP is not a pronoun. It follows that the syntactically reanalyzed V^0 must have access to prosody in order to prevent the NSR from taking place in the illegitimate prosodic context. In other words, the complex V^0 (from V′) must be structurally decomposed into a V′ again, so that the NSR will not take the whole complex V^0 as the governor (in violating the MinWd condition) and assign the NS to the object NP in cases where the locative NP is indefinite (and where the resultative complement is disyllabic as in [V+RR *NP/*PP] [24]). Obviously, without the decomposition of V^0 to V′, there is no way for NSR to rule out (38b)[16] and without syntax there is no way to decompose a V^0 into a V′. Prosody cannot create or even change a syntactic structure by itself alone. As a result, the process of V^0 to V′ must be considered a syntactic operation activated during the interface between prosody and syntax.[17] If it is so, syntax must respond to prosodic requirement by simultaneously activating an appropriate operation for prosody. Otherwise there is no reason why a V^0 category created by movement can (and indeed must) be decomposed as an X′ in syntax.

4.4. *[V NP PP]*

Given the analysis of prosodic syntax, we can now examine the structure of [V NP PP] closely. Along the same lines of reasoning given above, the [V NP PP] sentences are analyzed as a [V NP] prominence structure with the PP emarginated.[18] In other words, the PP in [V NP PP] is not located inside, but outside of the VP. Three pieces of evidence argue for this analysis. First, consider the sentences given in (6), repeated and compared with their counterpart *ba* sentences in (39):

(39) a. *Zhang San fang le neixie shu zai zhuozi shang.
Zhang San put Asp. those book on table top
'Zhang San put those books on the table.'

a′. Zhang San ba neixie shu fang zai le zhuozi shang.
Zhang San ba those book put on Asp. table top
'Zhang San put those books on the table.'

b. *Wo fang ta zai zhuozi shang le.
I put it on table top Asp.
'I put it on the table.'

b′. Wo ba ta fang zai zhuozi shang le.
I ba it put on table top Asp.
'I put it on the table.'

c. *Zhang San fang neixie shu zai nar le.
Zhang San put those book at there Asp.
'Zhang San put those books there.'

c′. Zhang San ba neixie shu fang zai nar le.
Zhang San ba those book put at there Asp.
'Zhang San put those books there.'

d. Wo fang le hao ji ben shu zai nar.
I put Asp. good many CL book at there
'I put many books there.'

As seen before in the [V NP PP] structure, the object NP rejects pronouns and definite expressions, while the locative NP favors a pronoun or a definite NP. The former implies that the object NP cannot be metrically lighter than the locative NP, whereas the latter indicates that the locative NP cannot be metrically heavier than the object NP, that is:

(40) [V *pronoun PP]
[V NP P+pronoun]

Example (40) suggests that the PP is indeed located in an unstressed position, while the object NP must occur in a stressed position where an indefinite NP is allowed but a pronoun (or a definite NP) is banned. It follows that the position the object NP occupies must be a main stress position, whereas the PP is located outside the NSR-domain. Given this, the question is how we can explain the syntactic structure with a stressed NP and an unstressed PP or with a nondestressable (indefinite) NP and a destressed PP in the [V NP PP] sentences. Before we conclude anything, compare the two sentences in (41) in which the grammaticality changes when the definite and indefinite NPs exchange their syntactic positions:

(41) a. *Wo fang le [neixie zhi] zai [hao ji ge beizi
I put Asp. [those paper] at [good many CL cup
shang].
top]
'I put those papers on many cups.'

b. Wo fang le [hao ji zhang zhi] zai [neixie beizi
I put Asp. [good many CL paper] on [those cup
shang]
top]
'I put many papers on those cups.'

Since indefinite NPs are nondestressable and definite ones are non-stressable (in default contexts), the object of V in (41) must be stressable and the object of P is not. On the other hand, in the [V PP NP] structure, as seen before, the NP (the object of V) is also stressable. As argued before, the NP in [V PP NP] must be located within the VP, based on the fact that the NP carries the main stress and is always prosodically

strengthenable (indefinite and complex) without being emarginated (30). Following the same line of reasoning, the PP in [V NP PP] must not be located within the VP or at least not within the NSR-domain; otherwise there is no reason why it cannot be strengthened prosodically (41a). The nonstrengthenable property of the PP in the [V NP PP] (in a default context) shows that the PP does not occur in a position where the sentential main stress is assigned to. Instead, it is located in a position where a nonstressable or an emarginated element usually appears.

In addition to the stress pattern given above, a semantic analysis also supports the argument that the [V NP PP] structure is better analyzed as an emarginated structure. For example:

(42) a. [...V NP PP]
Ta xie le yi ge zi zai yizi shang.
he write Asp. one CL character at chair top
i. 'He wrote a character *in* a chair.' (adjunct PP)
ii. 'He wrote a character *on* a chair.' (complement PP)

b. Ta gua le liang jian yifu zai nar.
he hung Asp. two CL shirts at there
i. 'He hung two shirts *in* there.' (adjunct PP)
ii. 'He hung two shirts *on* there.' (complement PP)

c. [...V PP]
Ta ba zi xie zai yizi shang le.
he ba character wrote at chair top Asp.
i. 'He wrote the character *on* the chair.' (complement PP)
ii. *'He wrote the character *in* the chair.' (adjunct PP)

d. Ta gua (zai) nar liang jian yifu.
he hung at there two CL shirts.
i. 'He hung two shirts *on* there.' (complement PP)
ii. *'He hung two shirts *in* there.' (adjunct PP)

As seen in (42), when the PP is unambiguously located in a complement position as in (42c) and (42d), there is no semantic ambiguity on the locative PPs, as shown in the translations of (42c) and (42d). Given this, the semantic ambiguity of the PPs in (42a) and (42b) indicates that the PP in (42ai) and (42bi) must not occupy the complement position, for otherwise there is no reason why (42a) and (42b) and (42c) and (42d) are semantically different. On the other hand, given the emarginated position as shown in note 14, the semantically ambiguous behavior of the PPs in (42a) and (42b) follows naturally, because both adjuncts (note 4(ii-a″) and complements (21b) and (32) are allowed to be dislocated in that position. As a result, the semantic difference between [V NP PP]

and [V PP (NP)] confirms our analysis that the PP in [V NP PP] is located in a dislocated position.

The final evidence for the [[...V NP]]$_{VP}$ # PP] emarginated structure comes from the NSR assignment. It is clear that whatever syntactic analysis is adopted, the NP in the surface structure of [V NP PP] must be directly governed by the V, thus the government relation will permit the NSR to access only to the [V NP]. As a result, only the [V NP] sisters are computable by the NSR. The PP, on the other hand, must be excluded from the NS domain. If the PP is not computable by NSR, it must either be ruled out or dislocated at the periphery of the VP.[19] This is borne out as expected.

In short, we have argued that the [[...V NP]]$_{VP}$ # PP] structure is best analyzed as an emarginated structure demanded by the NS assignment, and the correctness of the NSR analysis is confirmed by both the stress patterns and the semantic ambiguity of the postverbal PPs in the [V NP PP] sentences.

Based on the above analysis, it seems, however, that if the object NP in the [V NP PP] is prosodically invisible — a situation where the mechanism of government is inapplicable on the object NP — then the locative NP will be accessible to the NSR and assigned NS accordingly. In theory, this must be the case because the NS must be assigned to another prosodically visible complement under government (if there is one), which is exactly what happened in the [V PP NP] structure (29a). In other words, in (6a) and (6b) the NS would have been assigned to the second complement PP, because the PP is the only one that is prosodically visible to NSR. Why, then, are sentences (6a) and (6b) ungrammatical? Under our analysis, the reason is very simple. First, the NS cannot be assigned to the PP because the P blocks the government relation between the V and locative NP. However, the P cannot be merged with the preceding [V-ASP], because the local dislocation operates under string-adjacency conditions (see note 9), dislocation of P cannot cross either an adjunct or a DP. In other words, neither syntactic (P-Incorporation, for example) nor morphological operations are available for the application of the NSR assignment. As a result, the NSR is inoperable, so a sentence generated this way is not acceptable, as shown in (43):

(43) *Wo fang-zai yi pen hua [_e__zhouzi shang] le.
I put-at one potted flower [_e__table top] Asp.
'I put one potted flower on the table.'

Example (43) violates the adjacency condition for merger and it is also unacceptable by the preposition incorporation because the object of the P lacks case (traces do not assign case, see Baker 1988: 287, footnote 56), hence the result is ungrammatical.[20] That is to say, the locative PP in the post-VO position either must be emarginated or the O must be moved into a preverbal position.[21]

5. Summary

In this article, I have argued that the postverbal PP complements are essentially constrained by prosody. Given the NSR under government, a PP can only occur inside the VP in the [V PP (NP)] structure, where the object NP is either present or absent. In case the object is absent (or in a preverbal position), the P in [V PP] is forced to undergo a merger process, so that the verbal complex [V-P-ASP] can directly govern the locative NP and the NSR will assign an NS to the NP, otherwise the PP must be emarginated (21b). In case the object is present in [V P+NP NP], the locative NP must be prosodically invisible to the NSR, so that the NSR can take the object NP as a metrical sister of the V. Under this situation, the object NP can be assigned an NS and therefore located inside the VP. If, on the other hand, the locative NP is prosodically visible to NSR, the P must be merged with a preceding verbal element as in [V PP], otherwise the NSR is inapplicable and sentences formed this way will be unacceptable. However, after the merger process and the locative NP (visible to NSR) is assigned an NS, the object NP must be emarginated and formed with a prosodically light form, otherwise the sentence is also unacceptable.

When the object NP appears after the verb in the [V NP PP] structure, however, the PP cannot be located inside the VP, whether the object is prosodically invisible or not. If the object is prosodically visible, the NSR will compute the object NP as the NS target, the PP is then excluded from the NSR domain. When the object is prosodically invisible, the PP also cannot be the target of the NS, because the V cannot govern the locative NP without the merger of P. However, the P cannot undergo the process of merger due to a violation of the adjacency condition, because the object is invisible only prosodically, not morphologically.

Given all the prosodic analyses above, the postverbal PPs can only appear in a restricted position with required prosodic shapes. Obviously, the prosodically determined syntactic behaviors of the postverbal PPs are constrained by the application of NSR. This solution is strongly supported by the fact that no PP complements are allowed to appear after the VRR verbs, which is consistent with the fact that no object NPs are allowed to appear after the VRR verbs either. As disyllabic VR verbs

can take a PP complement (or object) but trisyllabic VRRs cannot, the reason for such a constraint can only be prosodic. Thus, the postverbal PPs are doubtlessly governed by the prosody of the language. Furthermore, the ungrammatical [VRR *PP] (as well as the [VRR *NP]) also confirms that the NSR in Chinese is operated under government. This is so because only by government can the V structurally govern the complement RR, and only when V governs the RR (by decomposing) X^0 into X′), can the NS be assigned to RR, making it possible to exclude additional materials from the NSR-governing domain in the VP. As a result, it is not surprising to see that in [VRR *NP/*PP] structures, even an object NP is ruled out by NSR, let alone the complement PP. Obviously, it would be difficult to allow [VR NP] and [VR PP], but not [VRR *NP] and [VRR *PP] without (1) the government relation required by the NSR and (2) the process of syntax having access to prosody.

If the above analysis is correct, the present theory may also explain why no adjunct locative PPs are allowed postverbally (i.e. inside the VP). Since the NSR is only sensitive to complements, only complements that are directly governed by the verb are assissable to the computational system of the NSR. Given this, there will be no room for adjunct PPs to appear inside the governing domain defined by NSR, hence there is no chance for adjunct PPs to be located within the VP where the NSR applies.

Finally, given the argument in this article, it is clear that prosody does constrain syntax and syntax could also have access to prosody. If this is so, the 'phonology-free syntax' hypothesis proposed by Zwicky and Pullum (1986) must be revised accordingly. Contrary to a 'phonology-free syntax', the present research calls for a theory of prosodic syntax (i.e. P ≫ S) that not only accommodates the facts given in this article, but also facts in all human languages, in future studies.

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Notes

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1. As is well known, the preverbal preposition is always pronounced in its underlying tone, that is, tone 4, and only the postverbal preposition loses its underlying tone when it attaches to the V, which has been considered as a neutralized element (Lin 1990). This contrast can be seen clearly in (8), that is, the preposition *zai* in the preverbal position is pronounced in the tone 4, indicating that it is not attached, though adjacent to the preceding element.
2. Although the morphological merger analysis on the [...V PP] structures is insightful, the merger process alone cannot explain the grammatical examples such as (8b) where the P is adjacent but not merged with the Auxiliary V. It is also difficult for the merger process to account for the ungrammatical ones in (24) where the P is adjacent to the VRR verb, but no merger operation is possible.
3. Note that the notions of "government" and "selectional ordering" are all syntactic notions that are crucial in the present theory. As seen below, prosody must have direct access to syntax, hence syntactic information is indispensable for prosodic operations (i.e. the NSR in the present case).
4. Here, I will adopt J. Huang's (1994) generalization for Chinese phrase structure, which is shown below:

   (i) *Phrase structure rules in Chinese* (J. Huang 1994)
   1. X′→YP X′ (head-final adjunct rule)
   2. X′→a. X^0 YP iff X=[+v] (head-initial complement rule)
      b. YP X^0 otherwise

   These two rules indicate a complementary distribution between preverbal adjuncts and postverbal complements in Chinese. Given this, adjuncts in preverbal positions will not be assigned an NS and adjuncts in postverbal positions are also excluded from the NSR-domain because they are not selected by the verb. This is borne out as shown in (ii).

   (ii) a. Ta zuotian yijing qu le.
   he yesterday already go Asp.
   'He has already left yesterday.'
   a′. *Ta yijing qu le zuotian.
   he already go Asp. yesterday
   *'He has already left yesterday.'
   a″. Ta yijing qu le # zuotian.
   'He has already left yesterday.'

   Adjuncts like adverbs in Chinese are base-generated preverbally and cannot be located postverbally as in (ii-a′). If, however, they appear postverbally, they must be located outside of the VP domain (being emarginated), as indicated by the intonation break # in (iia″). Although (i-1) and (i-2) give a full array of preverbal adjuncts and postverbal complements, verbs in Chinese can also be followed by a frequentative, durative, resultative, or manner expression (FDRM for short). The FDRM expressions must occur postverbally though they may be considered adjuncts. For example:

   (iii) a. Ta pao de hen kuai.
   he run-de very fast
   'He runs very fast; He is a very fast runner.'
   b. Ta pao le san ge zhongtou.
   he run Asp. three CL hours
   'He has run for three hours.'

   These examples would constitute an exception to (i-2a) as well as to NSR if the FDRM expressions are adjuncts. However, as argued by many linguists (J. Huang 1994; Mei

1978; S. Huang 1984; A. Li 1990; Sybesma 1999; and others), the FDRM expressions are not (true) adjuncts. For example, the frequency expression, as J. Huang has pointed out (1994), "does not express frequency per given time period, but indicates the number of incidences of a described event." And also, "the postverbal manner phrase is more appropriately a predicative stative expression." Hence each of the FDRMs is treated as a secondary predicate that combines with the main verb or primary predicate to form a complex predicate in J. Huang's analysis (1994). In Sybesma's analysis (1999: 208–209), the manner expression in (iiia) is directly analyzed as a complement of a small clause:

(iv) pao(-de) [? [ta hen kuai]]
run he very fast

As pointed out by Sybesma, *pao(-de)* 'run(-de)' can be analyzed as a copular verb, complemented by a small clause (after 'he' moves to the subject position of the matrix clause, we have 'he runs very fast'). Note that what the structure conveys is 'he is fast' and 'his way of being fast can be characterized as running' (Sybesma 1999). This is exactly what the sentence means: he is a very fast runner, as indicated in (iiia). The durative (as well as frequentative) expressions can also be analyzed as a predicate (i.e. [$_S$ Subj-NP [$_{VP}$ V (complement)]] [$_V$ durative]] in A. Li's analysis (1987), or an indirect object (i.e. [Suject V [e (you) durative]]) in Sybesma's analysis (1999: 109–129). Whatever analysis is adopted, if the FDRM expressions are all postverbal predicates (or complements), they are not (true) exceptions to the complement rule (i-2a) and to the NSR proposed here.

5. To review briefly, the selectional chain is defined in terms of 'selectional ordering' in the following form (Zubizarreta 1998: 52).

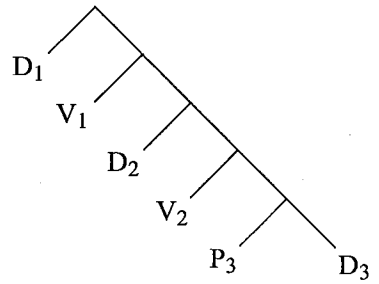
(i) (C, T, V_1..., V_i, P/V_m, D_m), with possibly $m = 1$
(C, T, ..., V_i, D_i), for $i = 1, 2, \ldots, m-1$ (for the cases where $m > 1$)
where D_i, $i = 1, 2, \ldots, m-1$ is the nominal argument of V_i (for the cases where $m > 1$) and D_m is the nominal argument of the lowest (possibly only) verb or prepositional predicate (P/V_m) in the selectional ordering.

The system in (i) is represented as a set of maximal selectional chains: the functional category C(omp) selects the T(ense), which in turn selects a verbal projection. D_m is the nominal argument of the last element P/V_m. A category C_r to the right of some other category C_q in the selectional ordering in (i) is said to be *lower than* C_q in the selectional ordering. An important aspect of the selectional ordering is that it is asymmetric in the sense that a selector is a head, though a selected constituent may be a head or some projection. To illustrate, consider the following German example (see Zubizarreta 1998: 50):

(ii) Karl *hat ein* Buch ins Regal gestellt.
Karl has a book on-the shelf put

The S-NSR works in the following way. First, following Kayne's (1994) hypotheses, the word order of natural languages reflects asymmetric c-command. Thus, the complement in German must be uniformly projected to the right of its selecting head, and it subsequently moves leftword for licensing reasons. Second, following Hale and Keyser (1993), Zubizarreta (1998) argues that the ditransitive directional predicates like *put* select the P, and the P in turn selects an argument D, as shown in (iiia). The sentence in (ii) is therefore analyzed as in (iiib):

(iii) a. Ditransitive directional predicates



b. [$_{CP}$ $Karl_1$ [*hat* [e_1 [v_1 [*ein* $Buch_2$ [e_2 [ins [Regal]$_3$]]]$_4$ [$_{V2}$ gestellt [e_4]]]]]]].
Karl has a book in-the-shelf put

Leaving all complexities aside, the selectionally ordered metrical sisters in (iiib) are [P D_3] (=*ins Regal*) and V_2 (=[*gestellt*[e_4]]). Obviously, they are selectionally ordered derivatively, hence PP_4 is lower than V_2 and therefore assigned prominence by the S-NSR. The algorithm must apply again to the metrical sisters P and D_3 in the selectional chain. Thus, D_3 is assigned prominence by the S-NSR because it is the argument of P in the selectional chain. Note that the algorithm based on the selectional chain will not work in Chinese because the NS must be assigned directly to a governed terminal element by the selector V. However, the PP is a barrier for V_2 to govern the D_3, as seen in (15b) and (20).

6. One may wonder why there should be such a different application of an important rule in the grammar. Though extremely important, it is a difficult question, especially for the initial investigation on Prosodic Syntax. What we can say, however, is basically as follows. If Zubizarreta (1998) is correct and if the hypothesis given in this article is accepted, there seems to be (at least) three different applications of NSR in different languages:
English: NS is assigned to a c-command element;
German: NS is assigned to a selected element;
Chinese: NS is assigned to a governed element.
However, it is still premature to give a complete account for why the application of NSR should be different in different languages. I will leave this question for future study and would like to thank one of the reviewers for pointing out this question.

7. The term "do something" in Zubizarreta's system is characterized as a P-movement motivated by the affect, formulated as in (i).

(i) "Affect the nodes α and β if these nodes have contradictory prosodic properties." (Zubizarreta 1998: 140).

Apparently, if the data given in this article is taken into account (see section 4), then not only P-movement (prosodically motivated syntactic movement), but also P-invalidation (prosodically invalidated syntactic structure), P-merger (prosodically motivated morphological merger) and P-decomposition (prosodically motivated decomposition of a syntactic category) should all be considered as P-affect. Given this, the prosodic affect may be formulized more generally as in (ii):

(ii) Affect the syntactic structure if there is a prosodic conflict.

The term P-conflict is understood in terms of (a) a conflict between two prosodic rules or (b) a conflict between two structures (prosodic vs. syntactic structures).

8. Invisible constituents such as pronouns and definite expressions do not attract stress in an out-of-the-blue context (NSR). That is, they are unstressed under wide focus contexts and if stressed, a contrastive reading results.
9. In distributed morphology, certain types of head movement have been treated as morphological merger operations (Marantz 1984; Noyer 1998; Embick and Noyer 2001; and references cited there). The two operations (lowering and local dislocation), as frequently assumed in the literature, are formally illustrated in (i) and (ii) (Noyer 1998):

   (i) *Lowering:*
   $X^0\,[_{YP}\,ZP\;Y^0\ldots]\rightarrow[_{YP}\,ZP\;Y^0+X^0]$
   A zero-level element trades its 'head-to-complement' relation with its complement for a relation of affixation to the structural head of its complement.

   (ii) *Local Dislocation:*
   $X^0\,[Y^0\ldots]\rightarrow[Y^0+X^0]$
   A zero-level element trades its relation of adjacency to a following constituent with a relation of affixation to the linear head (peripheral) zero element of that constituent.

10. For example:

		Disyllabic
(i)	$[V+O]_{Adv}$	bing -jian zhandou connect shoulder fight 'to fight shoulder by shoulder'
(ii)	$[Aux+V]_{Adj}$	feichang ke -yi extremely can-doubt (doubtable) 'extremely suspicious'
(iii)	$[A+N]_{N}$	hei da -yan black big-goose 'black (wild) goose'
(iv)	$[Subj+Pred]_{Adj}$	hen nian-qing very age-green 'very young'
		Trisyllabic
(i)	$[V+O]_{Adv}$	*bing jianbang zhandou connect shoulder fight 'to fight shoulder by shoulder'
(ii)	$[Aux+V]_{Adj}$	*feichang ke -huaiyi extremely can-doubt (doubtable) 'extremely suspicious'
(iii)	$[A+N]_{N}$	*hei xiao yusan black small umbrella 'small black umbrella'
(iv)	$[Subj+Pred]_{Adj}$	*hen nianji qing very age green 'very young'

Due to the length limit of this article, I will not go into the details of the analysis for each of these examples. The reader is referred to the discussions in Feng (2000, 2001).

11. Note that the [N + N] combinations are assumed to be non-phrasal (Feng 2001), hence they are not relevant here.
12. According to the present theory, why, as one of the reviewers pointed out, do the following sentences differ in their acceptability? For example:

   (i) a. Qing ni xian ji-qingchu suoyou de xijie, zai lai tan da shi.
   please you first remember-clear all de details, then come talk big thing
   'Please first clearly remember all details before you talk big.'

   b. *Qing ni xian ji-qingchu zai xinzhang, zai lai tan da shi.
   please you first remember-clear at heart, then come talk big thing
   'Please first clearly remember (it) before you talk big.'

The reasons are as follows. First, as seen before, the VRR is assumed to be generated in syntax by the structure given in (27). Second, the VR compounds are derived by head movement by which the R is adjoined to the sister node of V. Third, the MinWd condition plays an important role in the operation of NSR. That is, NSR can compute a VR as a (complex) verbal head if it is a minimal word (disyllabic), otherwise the VRR will be computed as a phrase, where the RR is the sister of V and assigned NS, leaving the complement NP/PP uninterpretable. This is why all [VRR + *NP] and [VRR + *PP] are unacceptable. However, why is (ia) acceptable even if it is formed with a [VRR] *ji-qingchu*? Note that the RR in (ia) is formed with a neutral tone (.R) on the second syllable which is different from that in (24a′). A neutral tone in Chinese contains only one mora while a full tone syllable has two moras (Duanmu 2000), as generally assumed in the literature. It has been argued (Feng 2000) that it is the neutral tone that makes the [[VR.R] + NP] acceptable (similar examples, such as V-*ming.bai* 'V-clear', V-*gan.jing* 'V-clean', can all take an object). The fact is, only [VR.R] can take an object freely while [VRR] cannot do so in general. This contrast confirms the analysis given here. If this is so, it is reasonable to relax the MinWd definition in a way slightly different from (26a):

(ii) MinWd $\in$ [2, 3) (where 2 and 3 stand for the number of full tone syllables)
A minimal word is equal or greater than two but less than three syllables.

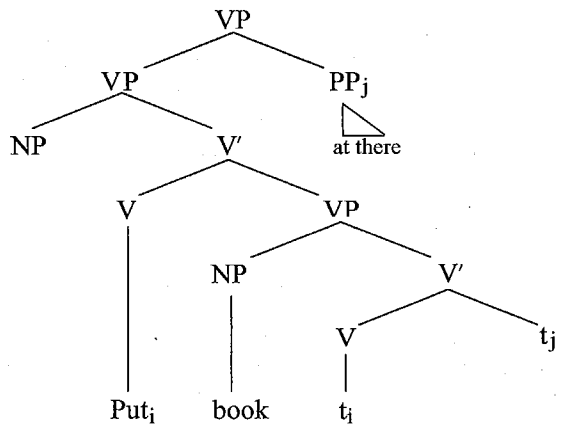
This explains why (ia) is acceptable while (24a′) is not, because in (ia), the [VR.R] form contains five moras (less than three syllables), making it a legitimate MinWd and hence can be a V^0 and take an object, as expected. This analysis is supported by the fact given in (24c) where the [V + R + P] *bai-ping-dao* 'arrange-even-to' is moraically counted exactly as the [V + R + R]. Compare (24c) and (ia):

(24c)	$[[\mu\mu]_V]_\sigma$ +	$[[\mu\mu]_R]_\sigma$ +	$[\mu]_P]]$ NP]		
	bai	ping	dao		
	arrange	even	to	extent	
(ia)	$[[\mu\mu]_V]_\sigma$ +	$[[\mu\mu]_R]_\sigma$ −	$[\mu]_R]]$ NP]		
	ji	qing	chu		
	remember	clear		details	

This is why *bai-ping-dao* in (24c) is also grammatical because it meets the MinWd in (ii). The last piece of evidence for this analysis actually comes from the one given in (ib). Example (ib) is expected to be ungrammatical because the derived verb-complex **ji qingchu zai* contains six moras in a row, making it exactly three syllables long: $[[[\mu\mu]_V]_\sigma + [[\mu\mu]_R]_\sigma[\mu]_R] + [\mu]_P]$. The MinWd is violated and hence the sentence so formed is not acceptable (P cannot be merged with [V-R.R] by MinWd condition, hence the NS cannot be assigned by [20]). I would like to thank the reviewer for pointing out this question for me.

13. Note that if there is no object, or the object of verb is invisible, NS falls naturally on the verb.
14. According to the present theory and the evidence given in section 4.4, the PP (37 = 29b) is emarginated after the application of NSR. That is, the PP is moved (dislocated) into the periphery position of the highest VP as in (i):

(i)



15. One of the reviewers questioned whether sentences like the one in (i) are also grammatical:

(i) Ta fang (zai) nei zhang zhuozi shang le yi ben shu.
he put (at) that CL table top Asp. one CL book
'He put a book on that table.'

My informants all consider (i) acceptable, though they also think that (30a) is better than (i). Given this judgment, the question is why (i) is acceptable even if *fang zai na zhang zhuozi shang* 'put on that table', like the ungrammatical (30b), is also beyond the size of being a minimal word. Secondly, if (i) is acceptable, why should a sentence be better with a locative pronoun (30a) than with a definite NP (i)? The reasons are given as follows. First, by MinWd condition, the definite NP in (i), like the indefinite one in (30b), must also be decomposed into a phrase (i.e. $[[\text{V-P}]_{\text{V}}\ \text{NP}]_{\text{V}'}$). However, unlike the indefinite ones, the definite NP is invisible to NSR, hence the NS can be assigned to the object NP2 and the sentence is therefore acceptable as shown in (i). Since the definite NP carries no stress at all between the head ([V-P]) and the stress target (the object NP), it is prosodically indistinguishable whether the definite NP occurs in a structure like $[[\text{V-P}]_{\text{V}}\ \text{NP}\ldots]$ or a structure like $[[\text{V-P-NP}]_{\text{V}}\ldots]$. The former is legitimate while the latter is disallowed by the MinWd condition. Since there is no prosodic distinction as to which structure is actually used, the sentence so produced will result in a marginal judgment, as predicated by the theory. Note also that the prosodic weight can be varying when definite NPs become more and more complex. Given the weight difference for definite NPs and the MinWd condition for NSR, it is expected that only locative pronouns are capable of making the [V PP NP] structure fully acceptable (30a), because the [V+P+Pronoun] *fang (zai) nar* 'put there' $(=[[\mu\mu]_{\text{V}}]_{\sigma}+[[\mu]_{\text{P}}+[\mu]_{\text{pronoun}}]_{\sigma}$, see note 12) can be perfectly accepted as having the same weight (or length) as a MinWd $(=[\sigma\sigma])$, assuming that the neutral-toned pronoun can be cliticized onto the merged [V-P] form. I would like to thank the reviewers for pointing out these questions to me.

16. This is because only after syntactic operations (i.e. the head movement here), can prosodic rules (i.e. the NSR in the present case) apply; hence when NSR applies to [38], the complex V^0 is the only head in the derived structure. Note that one may consider a different analysis by assuming that the NSR can actually see, and hence operate on the internal structure of the complex verb. If so, (38) can be ruled out without assuming the V^0 decomposition. However, it will not work because if it were the case, the NSR would also operate on the internal structure of [VR] and hence rule out the [VR NP] and [VR PP] sentences all together, contrary to the fact. Note further that the MinWd condition cannot be used any more for the disyllabic VR forms in this account, because the NSR must take a V^0 (head) structurally but the MinWd condition cannot create a V^0 (by combining V with R) in syntax, though it disallows illegitimate ones in general. As a result, the grammatical ones will all be ruled out wrongly.
17. I will not try to give a complete answer to all the questions involved in the initial hypothesis of syntax having access to prosody, at the first stage of investigations. However, some suggestions can tentatively be made for the current case. First, if syntax does see prosody and hence respond to it, there must be an interface level on which the interaction could take place. Following Zubizarreta (1998), I assume that the interface between prosody and syntax (i.e. P-S-Interface) is activated after all syntactic movements (in narrow syntax) and before spell-out where the P-affect (including the response of syntax to prosody) takes place. The process of decomposition of X^0 discussed here is therefore considered a case of the P-affect and is tentatively formulated as in (i).

(i) *Syntactic decomposition of X^0 (in P-S-Interface):*
$[\text{X}+\text{Y}]_{\text{X}^0} \rightarrow [\text{X}+\text{Y}]_{\text{X}'}$ if there are prosodic requirements such that an X^0 is disallowed and an X′ is demanded.

Future research is unquestionably needed in this area.

18. As one of the reviewers pointed out, if a pronoun and a definite expression can be invisible, why do they need to be emarginated? Theoretically, it is possible that the definite NPs could stay in their complement position without being emarginated because they are invisible to the NSR. This assumption can actually be incorporated into the present analysis. However, examples in (21b) and (32) show that the complement PPs and NPs, though invisible, must occur in an emarginated position. On the other hand, there is no clear evidence showing that a definite complement must not be emarginated in the post NSR position. Given this, I assume, in this paper, that the distressed ones after the NSR domain are emarginated. Although there are reasons for the present analysis (see also note 19), I would like to keep the other possibility open for future research and to thank the reviewer for pointing out this question to me.
19. A question arises as to why a constituent, though invisible to NSR, must be emarginated if it is located outside of the NSR domain. Although it appears to be a fact and is poorly understood in recent studies, it is still worthwhile to suggest the following reasons. First, it is well-known that there is only one NS per sentence in general. Second, given the argument that only the lower one in the asymmetrically c-command structure is assigned an NS, it is reasonable to assume that the NS has a function to mark the lower edge of the sentence. Languages may differ in different ways of marking the lower edge by NSR. In Chinese, since the NSR is operated under government, the lower edge of sentences is margined with a head and its complement. This may be the reason why no more constituents, but only a head with one complement, are allowed

to function as the lower edge of a sentence. This also explains why among invisible complements, only one of them is allowed after the verb (39c), because, based on the principle of relative prominence, only one is needed as a sister of the stress carried by the verb. More research is definitely needed in this area.

20. Note that when the object NP in (41a) is invisible and hence removed from the [V NP PP] structure, the NS would have been assigned to the locative NP and the sentence would be grammatical, contrary to the fact. Why can the invisibility not make the sentence grammatical? The reason is this: the invisibility condition applies only to prosodic rules like NSR, not to morphological rules like merger. Thus, when morphological operations take place, there is no prosodic invisibility available. As a result, the definite object NP, though invisible to NSR, functions the same as indefinite ones to block the merger process of P with V. If P cannot be merged with V, the NS cannot be assigned to the locative NP. This is why the object NP cannot be invisible in [V NP PP] structures, because if it does, the NS must be assigned to the locative NP, or kept on the verb itself otherwise. In the former case, the NS cannot be assigned to the locative NP due to the impossible process of merging the P with the V. In cases of the latter, if the NS is kept on the verb itself, the PP will have no stress, which is uninterpretable prosodically. Since this conflict cannot be resolved, sentences so generated are always ungrammatical.
21. We are fully aware that the morphological merger analysis proposed by Z. Li (2001) and adopted in this paper has a serious problem in dealing with sentences such as (i):

(i) Ta yao zuo-zai (*le) yizishang
he wants sit-on (Asp.) chair
'He wants to sit in a chair.'

That is, when the P is attached to the V, there can be no aspect marker (i.e. no perfective aspect is allowed as in [i]). The problem, then, is how the P could possibly be merged with an Asp when there is no such thing. Obviously, the morphological merger cannot account for the $[V\text{-}P]_V$ in (i). However, the facts are clear. First, in the [...[V PP]] environment the $[V\text{-}P]_V$ must be combined (or reanalyzed) as a complex verb whether there is an Asp or not, and second, it is the prosody that demands the $[V\text{-}P]_V$ combination. Given this, the $[V\text{-}P]_V$ can therefore be accounted for in terms of the optimality theory. In other words, the $[V\text{-}P]_V$ can be seen as a prosodically forced morphological operation in the sense that the prosodic requirement (NSR) must be met even if it may violate the local dislocation for merger, as shown in the following tableau in (ii):

(ii)

Posterval PP	NSR	Local Dislocation
[...V [PP]]	*!	
☞ [...[V-P] NP]]		*

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