

Multiple-Modal Constructions in Mandarin Chinese: A Cartographic Approach and an MP Perspective*

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This paper aims to give a thorough account of the ordering restrictions on multiple-modal constructions in Mandarin Chinese. First, we give a brief introduction of modals. Then we examine a “modals as verbs” approach (Lin and Tang 1995, Lin 2006), which proposes that modals are clause-taking verbs and handles the sequencing constraints through the finiteness property of the causal complement that modals takes. Next, we address several arguments to advocate a cartographic approach (Rizzi 1997, Cinque 1999), which assumes that modals are directly merged in functional projections and there exists a rigid hierarchy of modals. Finally, we compare relative distributions among modals and establish a fine-grained modal hierarchy, thereby elucidating the ordering restrictions on multiple-modal constructions.

1. Introduction

Mandarin Chinese (henceforth MC) allows two or more modals to co-occur; however, some ordering restrictions seem to be at work. As exemplified in (1), if we reverse the relative order of the two modals, the sentence will turn ungrammatical:

- (1) a. ta keneng hui chuxi.
he likely will present
'It is likely that he will be present.'
b. *ta hui keneng chuxi.
he will likely present

The papers then endeavors to find out the mechanism for arranging modals.

Since so far linguists have not reached a consensus on the classification of modality and on the exact membership of modals in MC, in this paper we will focus only on ten typical modals and classify them as bellow:

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Epistemic	Future	Root
Necessity: <i>yinggai</i>	<i>hui</i>	Obligation: <i>yinggai, bixu, dei, yao</i>
Possibility: <i>keneng</i>		Permission: <i>keyi, neng/nenggou</i>
		Volition: <i>ken, gan</i>
		Ability: <i>neng/nenggou, hui, keyi</i>

Furthermore, we will distinguish modal auxiliaries from modal adverbs. Tsai (2009) proposes that VP-fronting and VP-ellipsis can be licensed only by the former but not by the latter. Based on the criteria, we tentatively treat *yinggai*, *keneng*, and *bixu* as adverbs and *hui*, *dei*, *yao*, *keyi*, *neng/nenggou*, *ken*, and *gan* as auxiliary heads.¹

The organization of the paper goes as follows. In Section 2 we review the “modals as verbs” (MAV) approach. In Section 3 we provide seven arguments to advocate the cartographic approach. In Section 4 we exploit the cartographic approach to establish a fine-grained modal hierarchy in MC. Section 5 concludes the paper.

2. The MAV Approach

2.1. Lin and Tang (1995)

Lin and Tang contend that modals in MC are verbs that take a CP complement. More specifically, epistemic modals, including *hui* in their system, obligation *yinggai*, and permission *keyi* are raising verbs; the rest of the root modals are control verbs. They also offer several arguments to support their analysis; in what follows, we will examine them carefully and raise some questions.

2.1.1. Sentence-final Modals

Lin and Tang observe that modals can appear sentence-finally:

¹ Take the VP-fronting test for example:

- (i) a. [chuguo]_i, Zhangsan gan/ken/keyi/neng/hui **ti**.
 go-abroad Zhangsan dare/willing/can/can
 ‘Zhangsan dare/is willing/permitted/able to go abroad.’
 b. *[chuguo]_i, Zhangsan yinggai/keneng/bixu/dei/yao **ti**.
 go-abroad Zhangsan should/likely/must/must/must

However, the above judgments are not accepted by every speaker. Besides, the test does not seem to apply to all modals. For instance, *dei* and *yao* fail to license VP-fronting, which implies that they are modal adverbs, though we will still regard them as modal auxiliaries.

- (2) a. ni zheyang zuo (bu) yinggai. (Lin and Tang 1995: 56)
 you this-way do not should
 ‘For you to do it this way is (un)acceptable.’
 b. ni zheyang fenxi keyi.
 you this-way analyze can
 ‘For you to analyze (it) this way is acceptable.’

I agree with them that in these configurations modals serve as a main predicate and the elements before them constitute a sentential subject, but I disagree with them that modals are verbs. In MC, various types of phrases can role-play as predicates in addition to VPs. For instance, PPs and APs can generally function as main predicates:

- (3) a. Zhangsan zai Taipei. (PP predicate)
 Zhangsan in Taipei
 ‘Zhangsan is in Taipei’
 b. Zhangsan hen gao. (AP predicate)
 Zhangsan very tall
 ‘Zhangsan is very tall.’

More importantly, we find that the occurrence of sentence-final modals is in fact highly restrictive. Epistemic and future modals can never occur sentence-finally. In (2a) only the obligation reading of *yinggai* is obtainable, while its epistemic reading is unavailable.² Furthermore, either in a simple or negative form, laying *keneng* or *hui* in a sentence-final position will cause marginality or ungrammaticality:

- (4) ??ta zheyang zuo (bu) keneng.
 he this-way do not likely/likely-not-likely
 Intended: ‘That he did it this way is (not) possibly the case.’
 (5) *ta qu Taipei (bu) hui.
 he go Taipei not will/will-not-will
 Intended: ‘He will (not) go to Taipei.’

Lin and Tang do not notice all the constraints. They mention that *hui* cannot appear sentence-finally, but they simply ascribe the prohibition to an idiosyncratic property of *hui*. That is, whether the whole complement clause can raise to serve as a sentential subject depends on the choice of the matrix predicate, which constitutes a stipulation.

² In fact, here we have a different judgment from Lin and Tang. If we omit *bu* ‘not’ in (2a), the acceptability will largely decrease. Even if we retain *bu*, the sentence still sounds odd.

Lin and Tang further contend that modals are verbs since modals can be negated by *bu* ‘not’ and form A-not-A questions. However, some of the PPs and APs can perform the same task as well. Take the AP *gao* ‘tall’ for example:

- (6) a. Zhangsan bu gao.
 Zhangsan not tall
 ‘Zhangsan is not tall.’
 b. Zhangsan gao-bu-gao?
 Zhangsan tall-not-tall
 ‘Is Zhangsan tall or not?’

All in all, no direct evidence shows that modals are verbs.

2.1.2. Sentence-initial Modals

Lin and Tang find that epistemic modals can occur sentence-initially:

- (7) yinggai/keneng Zhangsan yijing likai le.
 should/likely Zhangsan already leave Prf
 ‘It should be the case/It is likely that Zhangsan has already left.’

They propose that for raising modals either the whole clausal complement or simply the embedded subject can be moved to the matrix subject position. Moreover, they assume the existence of empty expletives in MC. Therefore, the embedded subject or the entire complement clause can either raise or stay in-situ, depending on the occurrence of an empty expletive. In the case of (7), the latter option is adopted.

Nonetheless, as indicated by Lin and Tang themselves, *hui* ‘will’ as an epistemic modal cannot appear in the sentence-initial position:

- (8) *hui Zhangsan mingtian qu Taipei.
 will Zhangsan tomorrow go Taipei
 Intended: ‘Zhangsan will go to Taipei tomorrow.’

It is then perplexing why an empty expletive cannot render (8) grammatical. Lin and Tang, however, have no explanation for why *hui* cannot occur sentence-initially. Additionally, obligation *yinggai* and permission *keyi* are also classified as raising verbs by Lin and Tang. If that were true, then why should they also resist sentence-initial occurrence, as in (9)?

- (9) *yinggai/keyi Zhangsan dai zai jiali.
 should Zhangsan stay at home
 Intended: ‘Zhangsan is required/permitted to stay at home.’

More concretely, if obligation *yinggai* and permission *keyi* were raising verbs, they should also be able to follow an empty expletive and appear sentence-initially. Nevertheless, Lin and Tang miss the restrictions that rule out (9).

Most importantly, if raising modals took a CP complement, we would expect subject raising from the embedded clause to the matrix clause to be impossible. That is, subject raising would cause Empty Category Principle (ECP) violation. Lin and Tang suggest that in this case the CP layer becomes transparent so that the trace can be properly governed, i.e. a CP-transparency approach. However, as they also admit, this approach is simply a stipulation triggered by individual lexical entry.

In terms of current MP assumptions, Lin and Tang’s proposal is also dubious. Chomsky (2000, 2001) argues that raising constructions lack a CP layer. Even if MC were particular in that raising verbs could take a CP complement, raising of the embedded subject would still violate the Phase Impenetrability Condition (PIC). More specifically, the case feature of the embedded subject must have already been valued by a Φ -complete T selected by C. Unless the subject bears some unvalued peripheral features, it must thereafter become inaccessible to the higher phases and no longer participate in subsequent syntactic computation.

2.1.3. Adjacent Modals

Lin and Tang argue that multiple-modal construals involve multi-clausal structures. This is evidenced by the fact that each of the adjacent modals may be negated by an independent negative *bu* ‘not’:

- (10) ta bu yinggai bu hui bu lai. (Lin and Tang 1995: 68; (27))
 he not should not will not come
 ‘It ought not to be the case that it is not possible that he will not come.’

They assume that *bu* is generated in Infl. Consequently, if modals are clause-taking verbs, it follows directly that each modal in (10) can be independently negated by *bu*.

However, it is now widely accepted that negative elements reside in a dedicated NegP projection rather than in Infl. Cinque (1999) further contends that

NegP can be based-generated in several distinct positions within a clause. If so, it is natural for *bu* to arise repeatedly and again we do not have to treat modals as clause-taking verbs.

2.2. Lin (2006)

Lin further polishes Lin and Tang's (1995) analysis. Lin proposes that epistemic and obligation modals take a finite TP complement and can only appear in finite context. By contrast, future and other types of root modals take a nonfinite TP complement and can occur in finite and nonfinite clauses. As a result, modals that take a finite TP must precede modals that take a nonfinite TP, and Lin thereby sets up the following hierarchy of modals in MC, cited from Lin (2006: 8):

- (11) Necessity > Possibility/Obligation > Future > Ability/Permission/Volition

Lin also offers evidence to support his proposal. He argues that epistemic modals always scope over *le2* since *le2* can be licensed within their finite TP complements. Conversely, root modals always scope under *le2* because *le2* cannot be licensed within their nonfinite TP complements. If *le2* is to appear, it must be generated in the matrix Asp⁰ and takes the modal verb as its complement. To illustrate, see (12) below, cited from Lin (2006: 14).

- (12) a. Zhangsan_i T_F [AspP [VP *keneng* [TP *t_i* T_F [AspP [VP *qu Taipei*] *le*]]] Ø]
 Zhangsan likely go Taipei Prf Stc
 'It is likely that Zhangsan has gone to Taipei.'
 b. Zhangsan_i T_F [AspP [VP *nenggou* [TP PRO T_{NF} [AspP [VP *qu Taipei*] Ø]]] *le*]
 Zhangsan able go Taipei Stc Prf
 'Zhangsan has (become) able to go to Taipei.'

Lin's analysis is elegant, but some minor problems exist. First, if *le2* must get licensed in finite context, then why *le2* cannot appear in the matrix clause of (12a), which is also finite, and hence scope over *keneng*?

In addition, Lin's analysis cannot predict the distribution of *yijing* 'already'. According to Tang (2001), *yijing* occurs only in finite clauses but not in nonfinite clauses. Nonetheless, *yijing* can occur in the matrix clause of *nenggou* but not that of *keneng*. This is unexpected by Lin since both matrix clauses are finite in his analysis:

- (13) a. ta (yijing) neng (*yijing) shuo yingwen. (Tang 2001: 232; (75c))
 he already can already speak English
 ‘He (already) can speak English.’
 b. ta (*yijing) keneng (yijing) lai le. (Tang 2001: 232; (75d))
 he already possible already come Prf
 ‘He probably has (already) come.’

Moreover, Chomsky (2000, 2001) argues that control and finite constructions are both headed by C. If Chomsky’s argument holds universally, the finite and the control structure in (12a-b) should also have a CP layer and the same PIC violation problem will arise again. Even if control and finite clauses in MC indeed lack a CP layer, we will still require a proper explanation for why MC is so particular.

Lin (2007) attempts to solve the above problem and contends that MC has no grammatical features that need to be checked; accordingly, the subject of a finite clause is free to raise. Specifically, he argues that there are no Φ -features and/or case feature in either T or the embedded subject, and the agreement requirement is vacuously satisfied. As a consequence, the embedded subject is never rendered inactive and is free to move to satisfy just the EPP-feature of matrix T.

Lin’s solution, nevertheless, involves some controversies. On the one hand, it remains debatable whether MC has grammatical features or not. On the other hand, the approach to some degree deviates from the current MP notions. According to Chomsky (2000, 2001), only an uninterpretable or unvalued feature will make a probe and a goal. If there were no grammatical features on T and NPs at all, no agreement relation could be established. Though movement is EPP-driven, without agreement, EPP alone could not locate a proper candidate for movement. In other words, movement applies on the basis of agreement; EPP cannot complete the task by itself. In view of this, subject raising constitutes a tough problem to the MAV approach.

3. The Cartographic Approach and its Explicative Advantages

Cinque (1999, 2006), Butler (2003), and Tsai (2009), among others, all claim that modal auxiliaries are not verbs, but they are in fact directly merged in distinct functional projections in syntactic structure. Furthermore, they argue that there exists a rigid hierarchy among modals in the syntax and/or at LF, thus accounting for the ordering restrictions on multiple-modal constructions. In what follows, we will address seven arguments to advocate the cartographic approach, showing that it achieves better explanatory adequacy than the MAV approach in both theoretical and

empirical respects.

3.1. Sentence-initial/final Modals and Normal Subject-modal Order

We have seen that there are restrictions on sentence-initial occurrence of modals. From the view of the cartographic approach, because epistemic modals like *yinggai* and *keneng* stand high in the CP periphery, it follows naturally that they can precede the subject. In this way, there is no need to resort to empty expletives, whose existence in MC remains controversial. Moreover, since the future modal *hui* has a bearing on tense, we may tentatively place it around I/T.³ Suppose further that Chomsky's (2000: 109) proposal is on the right track that "the EPP-feature might be universal for T", then subjects in MC must raise at least to Spec-I/TP. Accordingly, it follows directly that *hui* can never appear in the sentence-initial position. In addition, since root modals stand between vP and I/TP, it follows straightforwardly that obligation *yinggai* and permission *keyi* resist sentence-initial occurrence.

On the other hand, we have seen that there are also constraints on sentence-final occurrence of modals. We have indicated that only root modals can behave as a main predicate, whereas epistemic and future modals can never do so. Tsai (p.c.) proposes that most modal auxiliaries are grammaticalized from verbs. Therefore, root modals interspersed between vP and I/TP could still retain their verbal characteristic to serve as a main predicate. In contrast, epistemic and future modals interspersed in the I/TP and the CP layer are too deeply grammaticalized; consequently, they may have lost the ability to function as a main predicate.⁴

In view of the above argumentation, the cartographic approach explains the sentence-initial/final occurrence of modals in a more precise and principled way than the MAV approach. Furthermore, only the former captures the distinction between modal adverbs and modal auxiliary heads and the fact that the so-called "modal verbs" have undergone grammaticalization and are no longer pure lexical verbs.

Concerning the normal subject-modal sequence, I attribute it to a common subject topicalization phenomenon in MC. Note what I am contending here is that subjects in MC often, but not generally or always, move to a topic position. According

³ It must be emphasized that we deny that *hui* is a syntactic realization of tense.

⁴ Notice that adverbs cannot serve as main predicates. If *yinggai* and *keneng* are indeed modal adverbs, it is natural that they cannot behave as a main predicate. Then, the marginality or oddness induced by sentence-final *yinggai*, as we indicated in n.2, is accounted for.

to Rizzi (1997, 2004), TopP is recursive in the left periphery, as shown below:

- (14) Force Top* Int Top* Focus Mod* Top* Fin IP (Rizz 2004: 241)

As a result, for cases where the subject follows an epistemic modal, the subject probably stays in Spec-I/TP or moves to a lower topic position. On the contrary, for cases where the subject precedes an epistemic modal as in (15), the subject probably moves to a higher topic position:

- (15) Zhangsan yinggai/keneng yijing likai le.
 Zhangsan should/likely already leave Prf
 ‘Zhangsan should/is likely to have left already.’

3.2. Resistance to Passivization and Transparency Effects

We observe that modals never undergo passivization. In MC, some of the state verbs taking a clausal complement, such as *renwei* ‘consider’, can be passivized, as in (16). However, none of the modals is found to be able to get passivized, as in (17):

- (16) Zhangsan_i bei renwei t_i hen xihuan yanxi.
 Zhangsan BEI consider very like acting
 ‘Zhangsan is considered to like acting a lot.’
- (17) *Zhangsan_i bei keneng/hui/yao/keyi/neng/ken t_i hen xihuan yanxi.
 Zhangsan BEI likely/will/must/can/can/willing very like acting

If modals belonged to the class of clause-taking state verbs, we would expect that at least some of the modals could undergo passivization. The MAV approach then has to stipulate that no modals can be passivized, which is an unwelcome result.

The contrast is reminiscent of Cinque’s (2006) analysis of “restructuring” verbs. He assumes that universally the “restructuring” verbs, including modal, aspectual, and motion verbs, are in fact directly merged in distinct functional heads corresponding to their semantic content. Besides, a monoclausal structure is involved instead, rather than a biclausal structure. Consequently, the transparency effect often induced by “restructuring” verbs is only apparent. To be more specific, the subject simply raises from Spec-vP to Spec-I/TP or to a topic position within the same clause; therefore, there will never be ECP or PIC violations.

Regarding the contrast between (16) and (17), Cinque (2006) indicates that the

phenomenon that “restructuring” verbs resist passivization is universal. It follows directly from the fact that a passive form must raise to Voice to check the relevant feature and that no lowering is admitted. This implies that only a true lexical verb generated in VP will be able to get passivized. This also suggests that modals occupy functional heads higher than Voice rather than occupy the lexical verbal head.

3.3. Restriction against Modal-aspect Adjacency

We notice that there is a restriction preventing modals from adjoining aspect markers. In MC, some of the state verbs that take a clausal complement like *xiang* ‘think’, for example, can immediately precede aspect makers like perfective *le*₁, experiential *guo*, and durative *zhe*, as demonstrated in (18-20), respectively:

- (18) ta xiang le₁ xujiu ruhe jieju zhe wenti.
 he think Prf long how solve the problem
 ‘He has thought how to solve the problem for long.’
- (19) ta xiang guo shifou yao jieshou zhe liwu.
 he think Exp whether going-to accept the gift
 ‘He thought whether to accept the gift before.’
- (20) ta zheng xiang zhe shifou yao jieshou zhe liwu.
 he right think Dur whether going-to accept the gift
 ‘He is right thinking whether to accept the gift.’

If modals were also state verbs taking clausal complements, we would expect that at least some of them could immediately precede aspect markers, contrary to the fact:

- (21) *ta yinggai/keneng/hui/dei/keyi/ken le₁/guo/zhe kai saiche.
 he should/likely/will/must/can/willing Prf/Exp/Dur drive race-car

The MAV approach then has to resort to semantic accounts or simply add another stipulation that no modals can be immediately adjacent to an aspect maker.

Alternatively, the cartographic approach alone can offer a plain and purely syntactic exposition. According to Liao (2004) and Tsai (2008), *le*₁, *zhe*, and *guo* are middle aspects situated between vP and VP. Besides, it is a common assumption that main verbs in MC normally move to v. Accordingly, (21) crashes simply because the genuine verb *kai* ‘drive’ fails to raise to v and precede the middle aspect. If we execute the V-to-v movement, the sentence will turn acceptable (the MAV approach would instead make an opposite prediction within the same framework):

- (22) ta keneng kai guo saiche.
 he likely drive Exp race-car
 ‘Possibly, he has driven a race car before.’

3.4. Scope Interaction between *le2* and Modals

We have shown in 2.2 that epistemic modals always scope over *le2* as in (23), while root modal always scope under *le2* as in (24):

- (23) ta keneng qu Taipei le.
 he likely go Taipei Inc
 a. ‘It is likely that he has gone to Taipei.’ (*keneng* > *le2*)
 b. *‘It has become the case that possibly he will go to Taipei.’ (*le2* > *keneng*)
- (24) ta bixu qu Taipei le.
 he must go Taipei Inc
 a. *‘He is required to have gone to Taipei.’ (*bixu* > *le2*)
 b. ‘It has become the case that he is required to go to Taipei.’ (*le2* > *bixu*)

However, the MAV approach cannot fully anticipate the scope interaction between *le2* and modals and has to resort to semantic factors.

On the contrary, the cartographic approach alone could provide a simple and straightforward account. Tsai (2008) treats *le2* as an inchoative marker in the left periphery. This being so, it follows naturally that epistemic modals like *yinggai* and *keneng*, which also stand in the CP layer, may scope over *le2*. Conversely, root modals sit below I/TP; therefore, it follows directly that they always scope under *le2*.

3.5. Scope Interaction between TP-layer Adverbs and Modals

Tang (2001) notices that the TP-layer adverb *yijing* can only appear in tensed (finite) clauses, but not in tenseless (nonfinite) clauses. Moreover, she observes that *yijing* precedes dynamic modals, but follows epistemic modals:

- (25) a. ta (yijing) neng (*yijing) shuo yingwen. (Tang 2001: 232; (75c))
 he already can already speak English
 ‘He (already) can speak English.’
 b. ta (*yijing) keneng (yijing) lai le. (Tang 2001: 232; (75d))
 he already possible already come Prf
 ‘He probably has (already) come.’

The pattern is unexpected by the MAV approach since the matrix clauses of both sentences in (25) are finite. It then needs to appeal to semantics for solutions.

By contrast, the cartographic approach alone could correctly predict the pattern in an easy and direct way. Tang assumes that TP-layer adverbs are licensed by T. As a result, epistemic modals, which reside in the CP domain, must precede *yijing*. Conversely, dynamic modals, which reside in the vP domain, must follow *yijing*.

3.6. Scope Interaction between *yinggai* and Different Layers of Adverbs

We have shown in Section 1 that *yinggai* has two interpretations: epistemic necessity and obligation. Nevertheless, when *yinggai* precedes the adverb *zongshi* ‘always’, only the epistemic reading is available, as in (26). In contrast, when *yinggai* follows *zongshi*, only the obligation reading is obtainable, as in (27).

- (26) ta yinggai zongshi beiheiguo, (zhenshi daomei).
 he should always take-blame really unlucky
 a. ‘It should be the case that he always takes the blame for others, (what a bad luck).’ (epistemic)
 b. *‘He is required to always take the blame for others, (what a bad luck)’ (obligation)
- (27) ?ta zongshi yinggai beiheiguo, (zhenshi daomei).
 he always should take-blame really unlucky
 a. *‘It always should be the case that he takes the blame for others, (what a bad luck).’ (epistemic)
 b. ‘He is always required to take the blame for others, (what a bad luck).’ (obligation)

In terms of the MAV approach, epistemic *yinggai* and obligation *yinggai* share the same structure (they are both raising verbs taking a finite clausal complement). It cannot explain why different placement of *zongshi* could function to rule out either of the construals of *yinggai*.

On the contrary, the cartographic approach can easily explicate the above phenomena. In the light of Cinque (1999), adverbs like *zongshi* might be hosted by Asp_{perfect}. If *zongshi* stands higher than the obligation *yinggai* in the I/TP layer, it then follows straightforwardly that only the epistemic *yinggai* in the CP layer can precede *zongshi* and only the obligation *yinggai* can follow *zongshi*.

3.7. Scope Interaction between Symmetric Predicates and Modals

Brennan (1993) points out that if clauses with symmetric predicates also contain modals, the symmetric relations remain valid only under epistemic readings but not under root readings. According to her, epistemic modals are propositional operators, hence not affecting the way a predicate and its subject combine. By contrast, root modals are VP operators, thus changing the nature of a predicate (the subject will no longer combine with the original predicate). The same observation also applies to MC:

- (28) a. Zhangsan kanqilai xiang Hushi.
 Zhangsan look like Hushi
 ‘Zhangsan looks like Hushi.’ → ‘Hushi looks like Zhangsan.’
- b. Zhangsan yinggai/keneng kanqilai xiang Hushi.
 Zhangsan should/be-likely look like Hushi
 ‘It should be the case/is likely that Zhangsan looks like Hushi.’ → ‘It should be the case/is likely that Hushi looks like Zhangsan.’
- c. Zhangsan bixu/keyi kanqilai xiang Hushi.
 Zhangsan must/can look like Hushi
 ‘Zhangsan is required/able to look like Hushi.’ -/→ ‘Hushi is required/able to look like Zhangsan.’

In (28c), we cannot infer that Hushi is required or able to look like Zhangsan. Nonetheless, the MAV approach cannot explicate why the symmetric relation is canceled by root modals.

On the other hand, the cartographic approach precisely captures these facts. Epistemic modals sit in CP, whereas the future modal and root modals lie in I/TP and between I/TP and vP, respectively. As a consequence, the former will not affect the relation between the subject and its predicate but the latter will.

4. Modal Hierarchy in MC--Topography of Modals

In this section, we exploit the cartographic approach to establish a rich and articulated modal hierarchy in MC. We will compare the relative distributions among modals and thereby set their positions in syntactic structure.

To begin with, we find that the epistemic necessity modal *yinggai* occurs before the epistemic possibility modal *keneng*, but not the other way round, as in (29)⁵:

⁵ In fact, whether *yinggai* and *keneng* are classified as adverbs or auxiliary heads does not hinder our cartographic task. Cinque (1999) argues that each adverb class enters into a special spec-head relation with one particular functional head, and vice versa. Furthermore, each

- (29) a. ta yinggai keneng zai jia.
 he should likely at home
 ‘It should be the case that he is likely to be at home.’
 b. *ta keneng yinggai zai jia.
 he be-likely should at home
 Intended: ‘It is likely that it should be the case that he is at home.’

Next, since epistemic modals stand in the CP periphery, they should be followed by the future modal and all root modals, which lie in the I/TP domain. As shown in (30), this is indeed the case:

- (30) a. ta keneng hui/bixu/yao/dei/neng/keyi/ken chuxi.
 he likely will/must/must/must/can/can/willing present
 ‘It is likely that he will/ is required/permitted/able/willing to be present.’
 b. *ta hui/bixu/yao/dei/neng/keyi/ken keneng chuxi.
 he will/must/must/must/can/can/willing likely present

In addition, we notice that the future modal and the obligation modals both precede other types of root modals as in (31), but they are mutually exclusive in either order as in (32):

- (31) a. ta hui/bixu keyi/neng/ken chuxi.
 he will/must can/can/willing present.
 ‘He will/must be permitted/able/willing to be present.’
 b. *ta keyi/neng/ken hui/bixu chuxi.
 he can/can/willing will/must present
- (32) a. ??ta hui bixu/dei/yao/yinggai chuxi.
 he will must present
 b. ??ta bixu/dei/yao/yinggai hui chuxi.
 he must will present

In Rizzi’s (1997, 2004) spirit, this indicates that the future modal *hui* and the obligation modals must compete for the same position, namely around I/T.

Furthermore, we observe that permission modals can to some extent precede

functional head hosts only one adverb of the same class in its Spec. Consequently, if an adverb precedes a functional head of a different class, the covert head hosting the adverb also precedes the overt functional head. In other words, both modal adverbs and modal auxiliary heads can reflect their position in the functional hierarchy.

ability and volition modals, as demonstrated in (33-34):

- (33) a. ?ta keyi neng(gou) qu Taipei. (permission > ability)
 he permitted able go Taipei
 ‘He is permitted to be able to go to Taipei.’
 b. *ta keyi neng(gou) qu Taipei. (ability > permission)
 he able permitted go Taipei
- (34) a. ?ta keyi ken wei ni zuoshi. (permission > volition)
 he permitted willing for you work
 ‘He is permitted to be willing to work for you.’
 b. *ta ken keyi/neng(gou) wei ni zuoshi. (volition > permission)
 he willing permitted for you work

Moreover, we note that the ability modal and the volition modal mutually exclude each other in either order as in (15):

- (35) a. *ta keyi/neng(gou) ken/gan wei ni maoxian.
 he able willing/dare for you risk
 b. *ta ken/gan keyi/neng(gou) wei ni maoxian.
 he willing/dare able for you risk

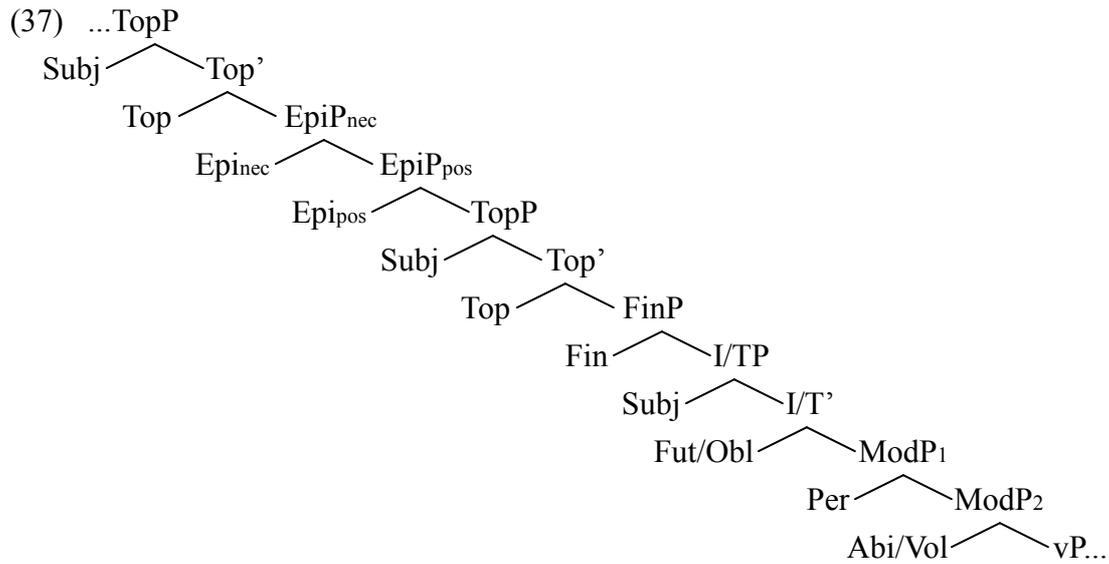
Again, this signifies that ability modals and volitions modals compete for the same position, in the light of Rizzi (1997, 2004).

Finally, we reach a comprehensive modal hierarchy in MC as presented below⁶:

- (36) necessity > possibility > future/obligation > permission > ability/volition

We could then map the hierarchy onto a finer tree diagram, where the possible distributions of subjects are also included:

⁶ Ignoring different classification of modality, we notice that there is a significant difference between Cinque (2006)’s hierarchy and the one we derive. We have no clear expositions at present. Perhaps UG allows languages to have different functional hierarchies to some degree. Or perhaps modals in MC undergo some kinds of movement, thus disrupting their surface order, and the functional hierarchy still holds cross-linguistically as Cinque assumes.



5. Conclusion

We have demonstrated that the cartographic approach achieves better explanatory adequacy than the MAV approach in both theoretical and empirical aspects. More concretely, if we assume that modals are directly merged in distinct functional projections and establish a rigid modal hierarchy, rather than treat modals as verbs, we could elucidate the ordering restrictions on multiple-modal constructions and the relevant phenomena in a simpler, more precise, and more principled way.

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