On (a)symmetric epistemic interference*

Shi-yue Jeff Lin
National Tsing Hua University
shiyuejefflin@me.com

Abstract

A scope bearing element can never take scope over a subjective epistemic modal, e.g. epistemic adverbials, unlike other kinds such as deontic, root, or objective epistemic modals. This article provides supportive analytic data from Mandarin Chinese for this observation and offers a feature-centered cartographic account. In the explanation, first of all, a subjective epistemic modal would occupy the highest syntactic projection and take scope over other scope bearing elements, while an objective epistemic modal is located relatively lower, which is accessible to the scope interaction. Secondly, an epistemic adverbial, being *prima facie* subjective, would undergo feature movement to the highest position when it was introduced in the lower one initially. This feature movement, however, would be blocked by another feature of the same type of a scope bearing element, given the theory of revised relativized minimality. As a natural consequence, no scope bearing element can have scope above a subjective epistemic modal. Finally, various neglected epistemic interference effects on *wh*-construals would be brought out, and soon after the explication, we will realize that they are strong arguments in favor of the feature-centered cartographic analysis.

1 Introduction

Epistemic Containment Principle (von Fintel and Iatridou 2003) refers to the descriptive condition that a quantifier cannot have scope over an epistemic modal.

(1) Epistemic Containment Principle (ECP):
A quantifier cannot have scope over an epistemic modal
$\Rightarrow$ *[Quantifier$_i$ $\succ$ Epistemic Modal [...x_i...]]

Accordingly, an English sentence containing a quantifier and an epistemic modal is semantically unambiguous since the relative scope between the two scope bearing elements (SBEs) is rigidly frozen by ECP. Thus, the only interpretation allowed in (2) is (2b) that it may be the case that all the students have left, rather than (2a) that as for each student, it may be the case that he/she has left.

*Parts of this article were presented in 7th TEAL at Hiroshima University and IACL 20th at Hong Kong Polytechnic University. I am grateful to Chung-Yu Barry Yang, Jo-wang Lin, Kazunori Kikushima, Lavi Wolf, Pei-yi Katherine Hsiao, Ting-Chi Wei, Wei-tien Dylan Tsai, Wen-hsin Karen Tseng, Xin-xian Rex Yu, and Yi-Hsun Eason Chen for their invaluable comments and countless discussions. Besides, I owe too much thanks to Benjamin Lin and the English native speakers, who intended to be anonymous, in International Community Radio Taipei (ICRT) for the help of judgement on those complicated English sentences. Finally, the remaining errors are all mine.

(2) Every student may have left.
   a. $(\forall \succ \Diamond)/{}^{*}$ECP
   b. $(\Diamond \succ \forall)/{}^{\checkmark}$ECP

(von Fintel and Iatridou 2003: 175)

However, it has been noted in Tancredi (2007) and Huitink (2008) that the ECP effect is asymmetric (see also Anand and Hacquard 2009). Specifically, only subjective (doxastic) epistemic modal auxiliaries (EM^{s}_{aux}) and epistemic modal adverbials[1] (EM^{s}_{adv}) would induce the ECP effect,[2] as in (3). On the contrary, objective epistemic modal auxiliaries (EM^{o}_{aux}) could obviate the ECP effect so that the interpretation of its containing clause would be ambiguous, varied with the relative scope between the EM^{o}_{aux} and the quantifier, as illustrated in (4) (the examples are taken from Tancredi 2007: 4-5).

(3) # (As far as I know) Every student is perhaps$^{s}_{adv}$ Jones.[3]
   a. ^{ok} $(\forall \succ \Diamond)/{}^{*}$ECP
   b. # $(\Diamond \succ \forall)/{}^{\checkmark}$ECP

(4) (Objectively speaking,) Every student may$^{o}_{aux}$ be Jones.
   a. ^{ok} $(\forall \succ \Diamond)/$ ~~ECP~~
   b. # $(\Diamond \succ \forall)/$ ~~ECP~~

This article is devoted to understand the nature of this asymmetric generalization and the goal is threefold. First of all, this asymmetric generalization will be further verified through our target language in this article. In other words, this paper sides with Tancredi (2007) and Huitink (2008) by providing analytic Mandarin Chinese data to show two distinctive asymmetries, EM_{aux} (= *keneng* 'may')/EM_{adv} (= *yexu* 'perhaps') asymmetry and subjectivity/objectivity asymmetry, with respect to the ECP effect. Specifically, the interaction between epistemic modals and three types of SBEs in Mandarin Chinese will be taken into test, including (i) quantificational phrase with *dou* ([QP...*dou*] quantification),[4] (ii) focus construction, and (iii) negation. Secondly, it is argued in this article that an epistemic modal interferes with not only the quantifier-variable dependency but also *wh*-construals, originally observed in Drubig (2001). Nevertheless, I will show that the interplay can be even more puzzling than in the original proposal if the *wh*-construals in Mandarin Chinese were brought into attention and compared from English. As we shall see, in Mandarin Chinese various Epistemic Interference Effects will be observed for different types of *wh*-construals including unselective binding for *wh*-nominals and covert movement for *wh*-adverbials (Tsai 1999). These sophisticated interwoven effects, then, do call for an unified explanation. Finally, a feature-centered cartographic account will be provided in this article.

[1] An EM^{s}_{adv} always strongly prefers the subjective reading (Huitink 2008). That is, the subjectivity/objectivity distinction exists only in EM_{aux}. We will return to this issue in the discussion of section 2 and 5.

[2] Accordingly, example (2) would display the ECP effect only when *may* was under the subjective epistemic reading (cf. (4) below).

[3] ^{ok} represents the semantically acceptable interpretation, and # the semantically odd one.

[4] In this article I follow Lin's (1996) insightful study to assume that the quantificational force in [QP...*dou*] quantification resided in *dou*(P), rather than in QP like *mei*-CL-NP 'every-classifier-NP', which is more like a plural noun. See also Yang (2002) for the similar point, but an alternative proposal which analyzed the *mei*-CL phrase as a variable bound by *dou*.

The explanation involves three independent theoretical mechanisms to derive the epistemic puzzles. Firsly, I propose that [epistemic] feature, according to its quantificational nature (Kratzer 1991), should be classified also with the *quantificational* class within the theoretical framework of Revised Relativized Minimality (Starke 2001 and Rizzi 2004). Secondly, I adopt the modal topography in Tsai (2009b) but further propose that the highest position (i.e. ForceP) (Rizzi 1997), can also host epistemic modals, following the semantic insight in Lyons (1977). That is, ModalP^e is the locus for EM^o, while ForceP is for EM^s, and, as a consequence, EM^s must take scope over other operators, while EM^o is accessible for scope interaction with other SBEs. Furthermore, although both of MP^e and ForceP can host EM$^s_{adv}$ in their specifier, the [epistemic] feature of an EM$^s_{adv}$, would undergo feature movement to ForceP, through AGREE to MOVE (Miyagawa 2010), in the syntax of [uForce] valuation (Pesetsky and Torrego 2007) for the illocutionary force of its containing CP to be typed to express subjective conjecture in the subsequent semantic-pragmatic interface, but an EM$^o_{aux}$ is not obligatorily to undergo this feature movement because an EM$^o_{aux}$ is infused into a truth-conditionally propositional maximal projection only (Huitink 2008), namely, the locus of events, TP (Fox 2000 and Chomsky 2001). Finally, I pursue two conditions to constrain the process of the [epistemic] feature movement. On the one hand, the movement is sensitive to the featural intervention effect (Beck 1996, Pesetsky 2000, and Yang 2012). On the other hand, the competition for clause type (Cheng 1991) between the [epistemic] feature of EM^s and the [Int] feature of *wh*-expressions would induce a contradiction on feature interpretability at ForceP, resulted into various interference effects in different *wh*-construals.

The rest of this article is structured as follows. In section 2, I organize and present the issues related to the ECP effect in the previous studies. Besides, Mandarin Chinese data and some overlooked *wh*-puzzles will be brought out. Section 3 demonstrates the three theoretical frameworks in the feature-centered cartographic account and consequently offers the comprehensive picture of the explanation. In section 4 I will extend the account to the epistemic interference puzzles of *wh*-construals. At first sight, these puzzles seem to be mysterious since various epistemic interference effects would arise given distinct *wh*-construals. However, based on the insightful studies concerning with the clause type and speech act of questions (Hamblin 1973, Karttunen 1977, and Cheng 1991), these interwoven puzzling facts can be captured in the scope of our explanation, and will subsequently become the evidence for the our speculations. Section 5 discusses the consequences of our analysis and responds to the related issues. Finally, section 6 concludes this article.

2 The Stage

In this section, the relevant issues about the ECP effect in the literature are organized and Mandarin Chinese data are presented. We will see that the two asymmetries, EM$_{adv}$/EM$_{aux}$ and subjectivity/objectivity, interact with SBEs and subsequently constitute the puzzles.

2.1 Previous Studies

To begin with, I will review the previous researches concerning with the ECP effect to point out the relevant features.

2.1.1 The Syntax of Epistemic Modality (Drubig 2001)

Drubig (2001) analyzed epistemic modals as evidential markers, following Westmoreland (1998). According to this analysis, a proposition headed by an epistemic modal, $[\![may(p)]\!]$, does not mean that p is true iff p is compatible with the modal base. Rather, *may* was said to belong to the metalogical vocabulary, which indicates the inference of p from the speaker. In addition, according to this "extrapropositional" status, Drubig also argued for a correspondent syntactic structure which assumes a high position for epistemic modals within CP. As a consequence, an epistemic modal must take scope over all other propositional operators.

The interactions between epistemic modals and SBEs are taken to confirm the claim (the examples are taken from Drubig 2001). The first test concerned with the interaction between epistemic modals and negation. Specifically, the modal interpretation of *may* would shift with its relative position with *never*, for instance:

(5) a. John may^{e} never leave early.
b. Never may^{d} John leave early.
c. John never may^{d} leave early.

In (5) *may* must take scope over negation to be interpreted epistemically, as in (5a); otherwise, the deontic reading is forced when *never* takes scope over *may*, as in (5b) and (5c). Besides, it also has been pointed out in (Jackendoff 1972) that an EM_{adv} cannot stay in the scope of negation.

(6) a. * John never probably ran so fast.
b. John probably never ran so fast.

Another test came from polarity questions, seemingly incompatible with epistemic modals, for example:

(7) a. John must$^{e}_{d}$/may$^{e}_{d}$ leave early tonight.
b. Must$^{*e}_{d}$/May$^{*e}_{d}$ John leave early tonight?
c. Why must$^{*e}_{d}$/may$^{*e}_{d}$ John leave early tonight?

Although *may* and *must* are ambiguous in declarative sentence, as in (7a), the epistemic reading vanished once the clause type is turned into a question, as illustrated in (7b) and (7c). Moreover, this effect can be extended to EM_{adv}, such as *probably*, *possibly*, *perhaps*, etc., and was taken as an evidence to show that epistemic modals are evidential markers which are related to CP, because it interplayed with *wh*-operators. Finally, the last test comes from the interaction with focus. In (8) the interpretation of *may* would vary with its position with *only*:

(8) a. We only may^{*e} live once.
b. We may^{e} only live once.

In (8a) only non-epistemic reading for *may* is allowed when *only* scopes over it. In other words, the epistemic *may* must take scope beyond *only* as in (8b).

To sum up, according to Drubig (2001), epistemic modals must occupy the relatively higher position in the syntactic hierarchy and subsequently take scope over other SBEs. Furthermore, the position of epistemic modals must be somewhere around CP because of the interference with *wh*-construals. We will see that this argument is partially problematic in the next subsection, but we agree that in order to scrutinize the scope puzzle, it is important to investigate the syntactic structure of epistemic modality.

2.1.2 The ECP (von Fintel and Iatridou 2003)

As mentioned in section 1, von Fintel and Iatridou (2003) formulated a descriptive constraint, ECP, to capture the so-called Epistemic Containment phenomenon, which states that a quantifier cannot have scope over an epistemic modal. One of their observations in support of the ECP is that a sentence containing a quantifier and an epistemic modal is semantically unambiguous, unlike other sentences with non-epistemic modals, for instance:

(9) Quantifiers and Deontic Modals:
Most of our students must^d get outside funding −
a. for the department budget to work out/(must^d $\succ$ most)
b. the others have already been given university fellowship/ (most $\succ$ must^d).

(10) Quantifiers and Epistemic Modals:
Context: Imagine that we are standng in front of a student residence with the light on in some of the rooms and off in the other. Also, a student here would turn off the light if he/she has left. Consequently, we are sure that some students are home because the light is on. And then, I say:

Every student may have left.
a. ($\forall \succ \Diamond$)/*ECP
b. ($\Diamond \succ \forall$)/$^{\checkmark}$ECP

(von Fintel and Iatridou 2003: 175)

The continuation in (9a) and (9b) respectively brought out the divergent interpretations from the different relative scope between *most* and deontic *must*. On the contrary, since the ECP is operative and blocks the scope relation ($\forall \succ \Diamond$) which can be used to describe the given situation appropriately in (10a), only one scope interpretation, (10b), is allowed. This interpretation, however, is judged to be false under the context.

Later in their article, the ECP was redefined as a condition on Quantifier Raising (QR) (May 1985), against either the radical intervention or the clausal topological account.

(11) ECP as a Condition on QR:
At LF, a quantifier cannot bind its trace across an epistemic modal.
$\Rightarrow$ *[Quantifier$_i$ ... Epistemic modal [... t_i ...]]

The reason is that any radical intervention account may overlook the feasibility of pronominal binding and *wh*-dependencies, for example:

(12) Every student$_i$ thinks that Mary may/must like him$_i$ the most.

(13) Who$_i$ must she have hired t_i for that job?

(von Fintel and Iatridou 2003: 179&180)

Although an epistemic modal is placed in-between a quantifier and a bound pronoun in (12) and a *wh*-phrase and its trace in (13), none of these sentences were reported to be unacceptable. Besides, examples like (13) were taken as an argument

against the claim that epistemic modals would interfere with the polarity questions[5] (Drubig 2001). On the other hand, low epistemic modals would be neglected in a topological account. For instance, negation can have scope over verbal epistemic modals[6] like *need* or *have to*, as illustrated in (14).

(14) John does not have to be at home. ($\neg\Box$) He might be at work.

(von Fintel and Iatridou 2003: 184)

As a consequence, it was speculated that ECP is a LF intervention effect on QR.

Generally, we may assume a traditional terminology to say that epistemic modals show no intervention effect in the A-DEPENDENCY. As for A′-DEPENDENCY, the quantifier-trace chain is affected at LF exclusively. However something had sneaked away from our notice. For instance, the two asymmetries about head/phrase and subjectivity/objectivity distinctions were untouched. Besides, a debatable question was left open, about whether an epistemic modal would interfere with the *wh*-dependency.

2.1.3 Subjectivity/Objectivity Asymmetry (Tancredi 2007)

The notion of subjectivity/objectivity distinction in epistemic modality was evoked in Lyons (1977) and contributed to the discussions of ECP effect in Tancredi (2007). It was pointed out that the definition of ECP is insufficient since only the subjective (doxastic) epistemic modal would induce the ECP effect, as in (15), while an objective (metaphysical) epistemic modal would not, as in (16)

(15) a. # (As far as I know) Every student is perhaps^s John.
b. # (As far as I know) Most students are perhaps^s john.

(16) a. (Objectively speaking,) Every student may^o be John.
b. (Objectively speaking,) Most students may^o be John.

These sentences are felicitous only when the quantifier can take scope over the epistemic modal. In (15), the ECP blocks the sensible scope relation ($\forall \succ \Diamond$), and consequently only the awkard interpretation ($\Diamond \succ \forall$) is allowed, (i.e. it is may be the case that everyone is the identical individual *Jones*). On the contrary, no ECP effect is observed in (16) with *may* under its objective reading. Thus, the sensible scope relation ($\forall \succ \Diamond$) is allowed and the sentence is felicitous.

Tancredi (2007) explained this asymmetry by advocating a modification on the current single-model semantic theory. Generally, it was claimed in the explanation that a subjective epistemic modal would induce the ECP effect because it lacks

[5]According to von Fintel and Iatridou (2003), the problem in Drubig's (2001) examples is the choice of wrong predicate, eventive/nonstative, which is inherently incompatible with epistemic modals. Thus, an additional perfective expression *have* can save the sentences. This argument, however, does not seem to be extendable to EM$_{adv}$s, for instance:

(1) *Who$_i$ has John perhaps hired t_i for that job?

(2) *Where$_i$ has John probably said that Bill bought the book t_i?

(von Fintel and Iatridou 2003: 179&180)

A detailed discussion about *wh*-construals will be provided later in this article.

[6]I didn't devote this article too much to pursue the issue about low/verbal epistemic modals. For relevant discussion, see Lin and Tang (1995), Cinque (1999), and Lin (2011).

the world parameter which quantifiers are sensitive to in the procedure of semantic interpretation. Specifically, the world parameter is necessary for quantifiers to determine the quantificational domain, but beyond the scope of subjective epistemic modals no such world parameter can be provided. Subsequently, no quantifier is allowed to take scope over a subjective epistemic modal.

The multi-model semantic analysis is not absolutely unproblematic, however. On the one hand, it has been pointed by Huitink (2008) that the interpretational mechanism is somehow counter-intuitive. For example, in the context of *student residence* in (10), we actually knew which students we were talking about. This means that the quantificational domain had been settled. However, the ECP effect was still induced. On the other hand, other issues than the quantificational problems were not explicitly explored, such as the interference within the *wh*-dependency. Nevertheless, by adding the polished observations on subjectivity/objectivity distinction to the properties of epistemic modals, we can approach the comprehensive appearance of the ECP effect further.

2.1.4 Adverbial/Auxiliary Asymmetry

The EM_{adv}/EM_{aux} asymmetry was observed in Huitink (2008) by pointing out that a quantifier can have scope over an EM_{aux} easily in Dutch, unlike English, but still hard to scope over an EM_{adv}.

(17) Iedere student kan_{aux} vertrokken zijn.
every student may left be
'Every student may have left. ($\forall \succ \Diamond$ / $\Diamond \succ \forall$).'

(18) Iedereen heeft het misschien_{adv} gedaan.
everyone has it perhaps done
'Perhaps everyone has done it. ($^{*}\forall \succ \Diamond$ / $\Diamond \succ \forall$).'

(Huitink 2008: 79)

Huitink also correlated this asymmetry with the subjectivity/objectivity distinction. Specifically, it was proposed by using the tests in Lyons (1977) and Papafragou (2006) that an EM_{adv} always prefers the subjective reading, while EM_{aux} is ambiguous, for instance:

(19) a. ? If Max may^{s} be lonely, his wife will be worried.
b. If it may^{o} rain tomorrow, people should take their umbrellas.

(Papafragou 2006: 1690&1692)

(19a) shows that an EM_{aux} under the subjective reading cannot be embedded in an antecedent *if*-clause. On the contrary, an objective context like *weather report* in (19b) helps to bring out the objective interpretation of *may*, and embedding of *may* in the *if*-clause thus sounds fine. An EM_{adv}, as illustrated in (20), patterns with the subjective epistemic modal and cannot be embedded in *if*-clause even in the objective *weather report* context, which indicates that an EM_{adv} strongly prefers the subjective reading.

(20) * If it will perhaps rain, people should bring their umbrellas.

(Huitink 2008: 85)

To explain the ECP effect, it was argued that subjective epistemic modals are not contributed to the truth conditional content, unlike its objective counterpart. Rather, subjective epistemic modals act as speech-act modifiers which alter the illocutionary force of a sentence (Lyons 1977). Specifically, suppose that the default force of a given sentence is *declarative* (= *assertion*), the function of a given subjective epistemic modal, then, is to change the *declarative* force and turn the speech act into *conjecture*. On the contrary, an objective epistemic modal functions to relate the given proposition to the truth conditions and has nothing to do with the illocutionary force. As a consequence, quantifiers can never take scope over a subjective epistemic modal since quantifiers are operators sensitive to the propositional content, but not to the speech act/illocutionary force level.

Although the semantic analysis was sound, the puzzling ECP effect was fully understood yet, for example, the untouched problems of *wh*-dependency. The extended syntactic account in this article, I believe, can go farther for not only the ECP effect, but also other relevant features, as listed in (21). To sum up, a natural explanation to the ECP effect should at least respond the six issues fully.

(21) a. The subjectivity/objectivity asymmetry.
b. The EM_{adv}/EM_{aux} asymmetry.
c. The mapping for modal syntax and semantics.
d. ASYMMETRIC ECP EFFECT
e. Do epistemic modals interfere with the *wh*-dependency?
f. No interference in A-dependency

2.2 Mandarin Chinese Data

In this subsection, the issues in (21) will be elaborated further by bringing the Mandarin Chinese data into attention. First of all, the two asymmetries will be verified. Secondly, the asymmetric ECP effect will be confirmed. Finally, the question about epistemic (non-)interference effect in binding dependency and *wh*-construals will be responded, and some complicated *wh*-puzzles will be revealed.

2.2.1 Two Asymmetries

We begin with two tests to clarify the validity of the two asymmetries. The feasibility of *A-not-A* construction will show the EM_{aux}/EM_{adv} asymmetry on the one hand, and the embeddedness in *if*-clause will show the subjectivity/objectivity asymmetry on the other.

It has been pointed out in Lin and Tseng (2010) and Tseng (2010) that one particular feature of the *A-not-A* question is the preference of the X′-theoretic head. That is, a syntactic head can be applied to form *A-not-A* question quite freely, while it is hard for an adverbial to do so, for instance:

(22) Zhangsan xihuan-bu-xihuan Lisi?
Zhangsan like-not-like Lisi
'Does Zhangsan like Lisi or not?'

(23) * Zhangsan feichang-bu-feichang xihuan Lisi?
Zhangsan very-not-very like Lisi
'Does Zhangsan very like Lisi or not?'

In (22) the *A-not-A* operator formed with the verbal head *xihuan* 'like' and the sentence sounds fine, while in (23) the sentence was ungrammatical because the *A-not-A* construction can never be formed with an adverbial like *feichang* 'very'. This observation can be well extended to the distinction between *yexu* 'perhaps' and *keneng* 'may'. Specifically, *yexu* is strongly incompatible with the *A-not-A* construction, patterned with adverbials, while *keneng* is free to do so, as illustrated in (24) and (25), which can be taken as the evidence for the EM_{aux}/EM_{adv} asymmetry[7].

(24) Zhangsan ke-bu-keneng mai-guo zhe-ben shu?
Zhangsan may-not-may buy-ASP this-CL book
'May John have bought this book or not?'

(25) * Zhangsan ye-bu-yexu mai-guo zhe-ben shu?
Zhangsan perhaps-not-perhaps buy-ASP this-CL book
'Intended: Is it be possible or not that John has bought this book?'

On the other hand, the subjectivity/objectivity asymmetry can be identified by using the *if*-clause as a test. The prediction here is that EM_{adv} *yexu* can never be embedded in the *if*-clause since it is *prima facie* subjective, while EM_{aux} *keneng* can be under its objective reading, but not under the subjective reading (cf. Yu 2012). Just like the case in English, it is obviously ungrammatical to embed *yexu* in the *if*-clause, even in the objective context like *weather report*, for instance:

(26) * Genjü qixiang yübao, ruguo mingtian yexu hui xiayu
according-to weather report, if tomorrow perhaps will rain
de hua, nimen yao jide dai yusan.
SFP, you have to remember bring umbrella
'Intended: According to the weather report, if it may be the case that it perhaps will rain tomorrow, you must bring the umbrella.'

As for EM_{aux}, a question to be asked here is how to distinguish subjective *keneng* from objective *keneng*. A common consensus is to plug in different adjunct clauses, such as *according to my knowledge* or *based on the circumstantial evidence*, to respectively bring out the different readings. Here I would like to offer a new observation. The syntactic distribution of epistemic modals in Mandarin Chinese may have offered a sharper and clearer contrast *per se*. Specifically, a Mandarin Chinese epistemic modal can be placed sentence-initially or in-between a sentence, and the major difference between the two syntactic position is that the sentence-initial epistemic modal tends to be more subjective than the in-between one which is more objective, for example:

[7]One might suspect that the ungrammatical case of (25) could result from the incompatibility between the epistemic adverbial and the question reading. However, the sentence is still ungrammatical even when the question reading is removed from *A-not-A* construction, for instance:

(1) Mingtian de huiyi, Zhangsan ke-bu-keneng chuxi, wo dou bu zaihu.
Tomorrow DE meeting, Zhangsan may-not-may appear, I DOU not care
'As for tomorrow's meeting, I don't care whether it's possible for Zhangsan to appear or not.'

(2) * Mingtian de huiyi, Zhangsan ye-bu-yexu chuxi, wo dou bu zaihu.
Tomorrow DE meeting, Zhangsan perhaps-not-perhaps appear, I DOU not care
'As for tomorrow's meeting, I don't care whether it's possible for Zhangsan to appear or not.'

Thus, the distinction between (24) and (25) can not be simply attributed to the incompatibility between interrogative reading and epistemic adverbials.

(27) Ruguo mingtian keneng^{o} hui xiayü de hua, nimen yao jide
If tomorrow may will rain SFP, you have to remember
dai yusan.
bring umbrella
'If it may rain tomorrow, you must bring the umbrella.'

(28) * Ruguo keneng^{s} mingtian hui xiayü de hua, nimen yao jide
if may tomorrow will rain SFP, you have to remember
dai yusan.
bring umbrella
'Intended: suppose it's a raining day tomorrow, you must bring the umbrella.'

That is, the (27) and (28) show that an EM^{s}_{aux} tends to occupy the position higher than where the EM^{o}_{aux} does. Besides, this distributional difference may have also suggested that the subjectivity/objectivity asymmetry is not only a semantic phenomenon, but also correlated with syntactic structures, which we will turn to in section 3.

In a nutshell, the two asymmetries are verified with Mandarin Chinese data and confirmed by two tests: *A-not-A* construction and embeddedness of *if*-clause. The result was summarized as in (29).

(29) EM_{aux}/EM_{adv} Asymmetry and Subjectivity/Objectivity Asymmetry:

Table 1: Tests and Results for 2.2.1

	A-not-A construction	*If*-clause embedding
EM^{s}_{adv} *yexu*	×	×
EM^{s}_{aux} *keneng*	✓	×
EM^{o}_{aux} *keneng*	✓	✓

2.2.2 Scope Bearing Elements

The asymmetric interaction between SBEs and epistemic modals discussed in the previous section can be reformulated as in (30).

(30) Asymmetric ECP Effect Generalization:
SBEs can take scope over EM^{o}_{aux}, but not over EM^{s}_{aux} and EM^{s}_{adv}.
a. $[\text{QP}_i/\text{SBE} \succ \text{EM}^{o}_{aux}\ [\ldots\ x_i\ \ldots]]$
b. * $[\text{QP}_i/\text{SBE} \succ \text{EM}^{s}_{aux}/\text{EM}^{s}_{adv}\ [\ldots\ x_i\ \ldots]]$

Three types of SBEs in Mandarin Chinese, *dou*-quantification, focus construction, and negation, are included in this subsection to verify this generalization. Specifically, it will be demonstrated that a SBE can freely have either wide or narrow scope with respect to *keneng* 'may', but can only take narrow scope with respect to *yexu* 'perhaps'. Note that, according to the previous discussion, (30b) would become a natural consequence for EM^{s}_{aux} if it were presumably located sentence-initially, which entails a relatively higher scope position in the syntactic hierarchy. Nevertheless, $keneng^{o}_{aux}$ can still be used to compared from $yexu^{s}_{adv}$ to confirm the status of the asymmetric interaction, since both of them can be located in-between the sentence.

Consider the case of *dou*-quantification first. It has been generally agreed that in Mandarin Chinese *dou* marks the scope of a given QP (Aoun and Li 1993, Cheng 1995, Huang 1982, Lin 1996, Zhang 1997, and among many others). Contrary to English examples like (2), *dou* can scopally interact with an epistemic modal auxiliary, and two relative scope order can be obtained, for instance:

(31) a. Mei-ge xüesheng keneng dou likai-le.
every-CL student may DOU leave-SFP
'It may be the case that every student have left/ $\Diamond \succ \forall$.'

b. Mei-ge xüesheng dou keneng likai-le.
every-CL student DOU may leave-SFP
'For every student x, it may be the case that x has left/ $\forall \succ \Diamond$.'

In addition, the two scope relations correspond to different semantic interpretations, respectively. For instance, in (32a) the continuation is infelicitous when *dou* obtained the narrow scope, but it becomes felicitous once *dou* takes the wide scope as in (32b)

(32) *Context*: in the scene of the murder crime with three suspects, Holmes said:

a. Mei-ge ren keneng dou shi xiongshou, #dan jüefei
every-CL people may DOU is murderer but definitely-not
suoyou ren dou shi gongfan.
all people DOU is accomplice
'It may be the case that everyone are murderers, but it is not the case that all of them are accomplices of each other. '

b. Mei-ge ren dou keneng shi xiongshou, dan jüefei
every-CL people DOU may is murderer but definitely-not
suoyou ren dou shi gongfan.
all people DOU is accomplice
'As for everyone x, it may be the case that x is the murderer, but it is not the case that all of them are accomplices of each other. '

Besides, (33a) would sound awkward since every student were said to be the identical individual *Zhangsan*, while (33b) is fine because it simply said that there is a possibility for each student that he is actually *Zhangsan*.

(33) a. # Mei-ge xüesheng keneng dou shi Zhangsan
every-CL student may DOU is Zhangsan
'It may be the case that every student is Zhangsan.'

b. Mei-ge xüesheng dou keneng shi Zhangsan
every-CL student DOU may is Zhangsan
'As for every student x, it may be the case that x is Zhangsan.'

Moreover, in most cases, a superlative stative predicate like *tallest* is incompatible with *dou*-quantification, as in (34), because it is so hard to imagine such a coincidence that the heights of every student in a school are identical.

(34) # Mei-ge xüesheng dou shi xüexiao-li zui-gao de.
every-CL student DOU is school-in most-tall DE
'Every student is the tallest person in the school.'

Similarly, *dou* in narrow scope with respect to *keneng* is also incompatible with the superlative predicate, *zui-gao* 'tallest', as in (35a); while in wide scope position no such restriction is detected, as illustrated in (35b).

(35) a. # Mei-ge xüesheng keneng dou shi xüexiao-li zui-gao de.
every-CL student may DOU is school-in most-tall DE
'It may be the case that every student is the tallest person in the school.'

b. Mei-ge xüesheng dou keneng shi xüexiao-li zui-gao de
every-CL student DOU may is school-in most-tall DE
'As for every student x, it may be the case that x is the tallest person in the school.'

The above examples constitute strong arguments in support of the claim that the ECP is inert to EM^{o}_{aux}, since two relative scope orders and interpretations can be obtained. However, the situation changes immediately when an EM^{s}_{adv} was taken into consideration. Specifically, the scope position of *dou* is rigidly restricted to the narrow one with respect to *yexu*, as in (36a), and the wide scope position of *dou* is prohibited, as shown in (36b).

(36) a. Mei-ge xüesheng yexu dou likai-le.
every-CL student perhaps DOU leave-SFP
'It is perhaps that every student have left.'

b. * Mei-ge xüesheng dou yexu likai-le.
every-CL student DOU perhaps leave-SFP
'For every student x, it is perhaps that x has left.'

Now the Asymmetric ECP Effect Generalization becomes especially conspicuous in an analytic language like Mandarin Chinese. As for *dou* and *keneng*, two relative scopes are possible, while only narrow scope is allowed for *dou* with respect to *yexu*.

Another instance in support of the Asymmetric ECP Effect Generalization came from the focus construction. Specifically, the focus operator *zhi* 'only' can have scope over an EM^{o}_{aux}, but not an EM^{s}_{adv}, for example:

(37) a. Tamen keneng zhi zhidao Zhangsan xihuan jüfaxue.
they may only know Zhangsan like syntax
'It may be the case that they only know that Zhangsan likes syntax.'

b. Tamen zhi keneng zhidao Zhangsan xihuan jüfaxue.
they only may know Zhangsan like syntax
'It is only the case that they may know that Zhangsan likes syntax.'

(38) a. Tamen yexu zhi zhidao Lisi xihuan yüyixue.
they perhaps only know Lisi like semantics
'They perhaps only know that Lisi likes semantics.'

b. * Tamen zhi yexu zhidao Lisi xihuan yüyixue.
they only perhaps know Lisi like semantics
'It is only the case that they perhaps know that Lisi likes semantics.'

Still another evidence is the *shi*-'be' -focus construction. Again, we see that both EM^{o}_{aux} and EM^{s}_{adv} can take scope over *shi*-focus, but not *vice versa*. That is, *shi*-focus can take scope only above *keneng* to express the focus on the possibility, but can never take scope above *yexu*.

(39) a. Ta keneng shi shu mai-gei Zhangsan, bi mai-gei Lisi.
he may be book sell-give Zhangsan, pen sell-give Lisi
'It may be the case that he sold BOOK to Zhangsan, PEN to Lisi.'

b. Ta shi keneng shu mai-gei Zhangsan, bi mai-gei Lisi.
he be may book sell-give Zhangsan, pen sell-give Lisi
'It MAY be the case that he sold book to Zhangsan, pen to Lisi.'

(40) a. Ta yexu shi shu mai-gei Zhangsan, bi mai-gei Lisi.
he perhaps be book sell-give Zhangsan, pen sell-give Lisi
'He perhaps sold BOOK to Zhangsan, PEN to Lisi.'

b. * Ta shi yexu shu mai-gei Zhangsan, bi mai-gei Lisi.
he be perhaps book sell-give Zhangsan, pen sell-give Lisi
'It's PERHAPS the case that he sold book to Zhangsan, pen to Lisi.'

Finally, it has been pointed out in Tsai (2009b) that the irrealis negation *bu* 'not' can be located either beyond or below an epistemic modal, for instance:

(41) Zhangsan keneng bu xihuan zhe-jia canting.
Zhangsan may not like this-CL restaurant
'Zhangsan may not like this restaurant.'

(42) Zhangsan bu keneng xihuan zhe-jia canting.
John not may like this-CL restaurant
'It can't be the case that Zhangsan like this restaurant.'

Again, the relative order between *bu* and EM^{s}_{adv} is frozen and the scope of *bu* is limited to the narrow one. That is, *bu* cannot have scope over the EM^{s}_{adv}.

(43) a. Lisi yexu bu xihuan zhe-dao cai.
Lisi perhaps not like this-CL dish
'Perhaps, Lisi doesn't like this dish.'

b. * Lisi bu yexu xihuan zhe-dao cai.
Lisi not perhaps like this-CL dish
'It is not the case that Lisi perhaps like this dish.'

(44) a. Wangwu dagai bu xiaode zhe-ge mimi.
Wangwu probably not know this-CL secret
'Probably, Wangwu doesn't know this secret.'

b. * Wangwu bu dagai xiaode zhe-ge mimi.
Wangwu not probably know this-CL secret
'It is not the case that Wangwu probably know this secret.'

(45) a. Xiaomei jüedui bu hui jia-gei na-ge nanren.
Xiaomei definitely not will marry that-CL man
'Xiaomei definitely won't marry that man.'

b. * Xiaomei bu jüedui hui jia-gei na-ge nanren.
Xiaomei not definitely will marry that-CL man
'It's not be the case that Xiaomei definitely will marry that man.'

In sum, the observations in Tancredi (2007) and Huitnik (2008) that the ECP effect is asymmetric with respect to two asymmetries, EM_{adv}/EM_{aux} and subjectivity/objectivity, are well supported by the analytic Mandarin Chinese data. The Asymmetric ECP Effect Generalization is repeated below as (46), and Table 2 is provided to summarize the discussion in this subsection so far.

(46) Asymmetric ECP Effect Generalization:
SBEs can take scope over EM^o_{aux}, but not over EM^s_{aux} and EM^s_{adv}.

Table 2: Tests and Results for 2.2.2

	dou quantification	Focus construction	Negation irrelais *bu*
$\text{EM}^o_{aux} \succ$ SBE	✓	✓	✓
SBE $\succ \text{EM}^o_{aux}$	✓	✓	✓
$\text{EM}^s_{adv} \succ$ SBE	✓	✓	✓
SBE $\succ \text{EM}^s_{adv}$	×	×	×

2.2.3 *Wh*-construals

Another puzzle to be clarified is to what extend would epistemic modals interfere with the syntactic dependencies. I would like to offer Mandarin Chinese data to confirm the claim that epistemic modals show no interference in the A-dependencies, but reject the thought that equally no interference could be found within *wh*-dependencies. That is, we shall see that epistemic modals do intervene in *wh*-dependencies, and the facts are even more complicated and puzzling than the original proposal.

As for A-dependency, it is unproblematic to arrange a coreferential dependency across either an epistemic modal auxiliary or an adverbial, for instance:

(47) a. Zhangsan$_i$ keneng renwei Lisi hen taoyan ta$_i$
Zhangsan may think Lisk very hate he
'Zhangsan$_i$ may think that Lisi hates him$_i$.'

b. Zhangsan$_i$ yexu renwei Lisi hen taoyan ta$_i$
Zhangsan perhaps think Lisk very hate he
'Zhangsan$_i$ perhaps thinks that Lisi hates him$_i$.'

(48) a. Lisi$_i$ keneng renwei Zhangsan hen xihuan ziji$_i$
Lisk may think Zhangsan very like self
'Lisi$_i$ may think that Zhangsan likes him(self)$_i$.'

b. Lisi$_i$ yexu renwei Zhangsan hen xihuan ziji$_i$
Lisk perhaps think Zhangsan very like self
'Lisi$_i$ perhaps thinks that Zhangsan likes him(self)$_i$.'

In (47) nothing happened when *Zhangsan* binds *ta* across either EM^o_{aux} or EM^s_{adv}, and also in (48) it is fine to arrange the well-known long-distance anaphoric binding dependency between the matrix subject and the embedded bare reflexive *ziji* across epistemic modals. Thus, the claim that no intervention effect was observed in A-dependency should be on the right track. Nevertheless, this is unequal to admit

that no intervention could be observed for *wh*-dependencies. Although *may*, with the right choice of predicates, shows no intervention in English, this observation did not cover the syntactic distribution of EM^{s}_{adv} (see also McDowell 1987 for similar observations).

(49) a. Who$_i$ may^{e} John have hired t_i for that job?
b. * Who$_i$ has John perhaps hired t_i for that job?

(50) a. Where$_i$ may^{e} Mary have said that Sue bought the book t_i?
b. * Where$_i$ has Mary probably said that Sue bought the book t_i?

(51) a. How$_i$ may^{e} Bill have fixed the car for two hours t_i?
b. * How$_i$ has Bill possibly fixed the car for two hours t_i?

(49)-(51) show the interference of EM^{s}_{adv} in *wh*-construals, and lead us to speculate that the effect could also be asymmetric, as the case of SBEs. I will offer Mandarin Chinese data to show that this speculation is on the right track, but the general phenomena are more sophisticated.

It is generally agreed that there are two types of *wh*-dependency in Mandarin Chinese: unselective binding for *wh*-argument on the one hand and covert movement for *wh*-adverbial on the other (Tsai 1999 and Yang 2008). By considering the interaction between these different *wh*-construals and epistemic modals, various overlooked *wh*-puzzles would arise and provide us a broader view for the interplay. Consider example (52) first, where the EM^{o}_{aux} shows no interference in the unselective binding dependency.

(52) Speaker A: Zhangsan keneng$^{o}_{aux}$ mai-guo shenme?/.
Zhangsan may buy-ASP what
'What might Zhangsan have bought? (Interrogative)'
'Zhangsan might have bought something. (Existential)'

a. Speaker B: Shu, qianbi, han zidian.
book, pencil, and dictionar
'(He might have bought) books, pencils and a dictionary.'

b. Speaker A: ... Danshi ta bu gaosu wo.
but he not tell me
'...but he didn't tell me.'

On the one hand, speaker B's response in (52a) answered the interrogative reading of speaker A's utterance. On the other hand, the continuation of speaker A himself in (52b) brought out the existential reading. In other words, (52) is ambiguous because the *wh*-phrase can be unselectively bound by different operators, either by a Q-operator or an existential closure, without any interference from epistemic modals. However, *yexu* differs crucially from *keneng* in that the interrogative reading is strongly blocked, for example:

(53) Speaker A: Zhangsan yexu$^{s}_{adv}$ mai-guo shenme?/.
Zhangsan perhaps buy-ASP what
'What is the thing x such that Zhangsan perhaps has bought x? (*Interrogative)'
'Zhangsan perhaps has bought something. (Existential)'

a. Speaker B: Shu, qianbi, han zidian.
book, pencil, and dictionary
'(He might have bought) books, pencils and a dictionary.'

b. Speaker A: ... Danshi ta bu gaosu wo.
but he not tell me
'...but he didn't tell me.'

The response given by speaker *B* here sounds pretty awkward since the utterance given by speaker *A* in (53) can never express a question. The exclusive semantic interpretation allowed is the one like a deliberative conjecture (cf. Papafragou 1998) asked to and by speaker *A* himself, with existential quantification over the *wh*-phrase. That is to say, in (53) the interrogative reading is blocked by an EM^{s}_{adv}, which means that a Q-operator cannot bind the *wh*-variable across EM^{s}_{adv}. To make the judgement sharper and clearer, we can take instrumental *how*, *zenme*(*-yang*) 'with what mean', and purpose *why*, *wei-*(*le*)*-shenme* 'for what', which are also sensitive to unselective binding, as the test, because commonly instrumental-*how* and purpose *why* prefer the interrogative reading, and its existential reading might require a subsequent utterance said as the complement (see Stepanov and Tsai 2008 and Tsai 2008 for further discussion).

(54) a. Zhangsan keneng zenme(-yang) qu xuexiao?
Zhangsan may how-(mean) go school
'With what mean may Zhangsan go to school?'

b. * Zhangsan yexu zenme(-yang) qu xuexiao?
Zhangsan perhaps how-(mean) go school
'What's the mean such that Zhangsan perhaps went to school with?'

(55) a. Zhangsan keneng wei-(le)-shenme da Lisi?
Zhangsan may for-(ASP)-what beat Lisi
'For what reason may Zhangsan beat Lisi?'

b. * Zhangsan dagai wei-(le)-shenme da Lisi?
Zhangsan probably for-(ASP)-what beat Lisi
'What is the reason such that Zhangsan probably beats Lisi for? '

Without any subsequent complement in (54) and (55), the existential reading is hard to surface, and the exclusive interrogative reading for (54b) and (55b) is blocked by EM^{s}_{adv}. As a consequence, (54b) and (55b) are ungrammatical.

So far, it is evident that a parallelism can be detected between unselective binding in Mandarin Chinese and *wh*-movement in English. The descriptive generalization is that only EM^{s}_{adv} would interfere with the *wh*-dependencies, but EM^{o}_{aux} would not, as depicted in (56).

(56) Asymmetric Epistemic Intervention Generalization:
A Q-operator cannot bind its variable/trace across an EM^{s}_{adv}.

a. $[\text{Q-op}_i \ \ldots \ \mathrm{EM}^{o}_{aux} \ [\ldots \ wh(x_i)/t_i \ \ldots]]$

b. * $[\text{Q-op}_i \ \ldots \ \mathrm{EM}^{s}_{adv} \ [\ldots \ wh(x_i)/t_i \ \ldots]]$

At first sight, the Asymmetric Epistemic Intervention Generalization seems to imitate the Asymmetric ECP Effect Generalization, with nothing special about the *wh*-construals. However, the situation changes immediately once we turn to

the covert *wh*-adverbial movement in Mandarin Chinese. Specifically, According to Tsai (1999), both reason *why*, *weishenme*, and manner *how*, *zenme*, are *bona fide* operators which would undergo covert movement to obtain the sentential scope. Interestingly, unlike their English counterparts like (51), the covert *wh*-movement in Mandarin Chinese is blocked by an intervening epistemic modal, regardless of its syntactic status.

(57) a. * Zhangsan keneng$^{o}_{aux}$ zenme$^{manner}_{adv}$ zebei Lisi?
Zhangsan may how blame Lisi
'How may Zhangsan blame Lisi?'

b. * Zhangsan yexu$^{s}_{adv}$ zenme$^{manner}_{adv}$ zebei Lisi?
Zhangsan perhaps how blame Lisi
'What is the manner such that Zhangsan perhaps blame Lisi in?'

(58) a. * Ta keneng$^{o}_{aux}$ renwei tiankong weishenme$^{reason}_{adv}$ shi lan de?
he may think sky why be blue DE
'Why may he think that the sky is blue?'

b. * Ta yexu$^{s}_{adv}$ renwei tiankong weishenme$^{reason}_{adv}$ shi lan de?
he perhaps think sky why be blue DE
'What's the reason such that he perhaps thinks that the sky is blue?'

None of the *wh*-operators can covertly move across the epistemic modals, as illustrated in (57) and (58). In other words, covert movement of *wh*-adverbials seems to violate the generalization in (56) since the *wh*-dependency is blocked by not only EM$^{s}_{adv}$ but also EM$^{o}_{aux}$. This seeming vagary is depicted as a descriptive generalization for *wh*-adverbials in Mandarin Chinese, as in (59).

(59) Symmetric Epistemic Intervention Generalization:
A *wh*-adverbial cannot move covertly across an epistemic modal.
*[Q$_i$-$^{adv}_{op}$ ... EM [... t_i ...]]

Finally I would like to introduce another puzzle about the interference of epistemic modals in *wh*-construals, which differs largely from the interaction with other SBEs. Recall the previous discussions that in Mandarin Chinese (subjective) epistemic modals can appear sentence-initially. The observation is that the two types of interrogative *wh*-construals are both blocked when the epistemic modals were brought to the sentence initial-position, for instance:

(60) Unselective Binding:

a. Keneng$^{s}_{aux}$ Zhangsan mai-guo shenme*?/.
may Zhangsan buy-ASP what
'What might Zhangsan have bought? (*Interrogative)'
'Zhangsan might have bought something. (Existential)'

b. * Keneng$^{s}_{aux}$ Zhangsan zenme(-yang)$_{ins.}$ qu xuexiao?
may Zhangsan how-way$_{ins.}$ go school
'With what mean might Zhangsan go to school?'

c. * Keneng$^{s}_{aux}$ Zhangsan wei-(le)-shenme da Lisi?
may Zhangsan for-(ASP)-what beat Lisi
'For what reason may Zhangsan beat Lisi?'

(61) Covert Movement

a. * Keneng$^{s}_{aux}$ Zhangsan zenme$^{manner}_{adv}$ zebei Lisi?
may Zhangsan how blame Lisi
'In what manner may Zhangsan blame Lisi?'

b. * Keneng$^{s}_{aux}$ ta renwei tiankong weishenme$^{reason}_{adv}$ shi lan-de?
may he think sky why be blue-DE
'Why may he think that the sky is blue'

The observations can be also extended to the EM$^{s}_{adv}$,[8] with *keneng* being replaced with *yexu* or *dagai*. The dubious fact here is that empirically the subjective epistemic modal "contained" the whole clause, rather than intervening in-between, and no interrogative *wh*-construal can be formed in its scope. I will give this situation a descriptive generalization, just like the case in (59), which we will return to both of them for an unified explanation.

(62) Anti-subjective Containment Generalization
No interrogative *wh*-construals can be formed in the scope of EM^{s}.
*[EM^{s} $\succ$ [Q-op$_i$ ... x_i]]

In a nutshell, in this subsection I provide Mandarin Chinese data to investigate the interaction between epistemic modals and syntactic dependencies. On the one hand, the A-dependency is generally compatible with epistemic modals. On the other hand, the *wh*-dependencies are interfered by epistemic modals and three generalizations are formulated to be explained. Table 3 is provided to summarize this subsection.

(63) Epistemic Interference Effects

Table 3: Tests and Results for 2.2.3

	Unselective binding dependency	Cvert *wh*-adverbial movement	Oovert *wh*-phrasal movement
[Q-op$_i$ ... EM$^{o}_{aux}$ [... x_i ...]]	✓	×	✓
[Q-op$_i$ ... EM$^{s}_{adv}$ [... x_i ...]]	×	×	×
[EM^{s} $\succ$ [Q-op$_i$ ... x_i ...]]	×	×	×

2.3 An Interim Summary

In this section, the relevant issues and some controversies were pointed out and corroborated with the Mandarin Chinese data. Firstly, the two asymmetries observed in Tancredi (2007) and Huitink (2008) were confirmed. Secondly, with the analytic nature of Mandarin Chinese SBEs, the status of the asymmetric ECP effect were

[8] Since English sentences generally disallow the sentence-initial epistemic modals, the similar patterns should be like the following:

(1) * Perhaps, what$_i$ has John bought t_i for his son's birthday?

(2) * Probably, how$_i$ has Bill fixed the computer t_i in the afternoon?

verified. Finally, it was observed that *wh*-dependencies are sensitive to the epistemic interference effects, but A-dependencies are not. To conclude this section, I revise and restate the relevant issues to be explained, as illustrated in (64).

(64) a. The subjectivity/objectivity asymmetry.
b. The EM_{adv}/EM_{aux} asymmetry.
c. The mapping for modal syntax and semantics.
d. Asymmetric ECP effect Generalization.
e. Epistemic Interference Effects
f. No interference in A-dependencies

3 The Schema

In this section I will provide a feature-centered cartographic account for the Asymmetric ECP Effect Generalization, including a specific syntactic hierarchy for epistemic modality and the mapping for the two asymmetries. I will first introduce the components in the account, and these components will collaborate for the explanation in the end of this section.

3.1 The Adverbial/Auxiliary Asymmetry

Rizzi (2004) argued for a refined version for one of his most influential syntactic theories, Relativized Minimality (Rizzi 1990), for the modern minimalist era. The core of the refining is the classification of four types of syntactic features, as illustrated in (65).

(65) Feature Types:
a. Argumental: person, number, gender, case...
b. Quantificational: Wh, Neg, measure, focus...
c. Modifier: evaluative, epistemic, Neg, frequentative, celerative, measure, manner...
d. Topic

The *argumental* type involves the traditional *phi*-features, and the last special type, *topic*, differs from the normal A′-dependency. Here we focus on the *quantificational* type and *modifier* type. According to Rizzi, these two types of A′-dependency should be distinguished, backed up by the studies of intervention effects. On the one hand, the *quantificational* type includes features which license *wh*-operators, measure adverbials, negative expressions, etc, (i.e. the traditional A′-operators). On the other hand, the *modifier* type involves features of other left-peripheral adverbials (Rizzi 1997 and Cinque 1999), such as modal adverbials and evaluative adverbials.

According to this feature system, all of the SBEs in our case belong to the *quantificational* type. Specifically, both focus operators and the irrelais negation *bu* are *bona fide* quantificational operators. In addition, *dou* has long been analyzed as a quantificational operator which distributes a given QP within its quantificational domain. As a consequence, it is natural to classify the feature of *dou* with the *quantificational* type.

As for our protagonist, epistemic modal, a slight modification is proposed. If the [epistemic] feature was classified with the *modifier* type, we could find no straightforward relation between SBEs and epistemic modals. However, we have good

reasons to believe that epistemic modals are not only *modifier*-type adverbials, but also *quantificational* type operators. On the one hand, theoretically speaking, the canonical modal semantic analysis has revealed that the interpretation of $[\![\text{MODAL}(p)]\!]$ involves quantification over possible worlds with respect to the modal base (Kratzer 1977, 1991), for instance:

(66) Let c be the context, i the index of evaluation, and f_c the modal base:
  a. $[\![may(p)]\!]^c = 1$ iff $\exists w' \in f_c(i) : [\![\varphi]\!]^{w'} = 1$
  b. $[\![must(p)]\!]^c = 1$ iff $\forall w' \in f_c(i) : [\![\varphi]\!]^{w'} = 1$

On the other hand, one of the strongest empirical argument in favor of the modified classification would have come from its licensing ability of *wh*-indefinites. Specifically, Li (1992) has noticed that *wh*-indefinites can be used exclusively in the context where the truth value is not positively fixed in a definite manner, and Lin (1998a) extended this observation and found that a *wh*-indefinite can be licensed in a range of semantic environments, including epistemic modality. As pointed out in his later work (Lin 2004: p.460), the scope of a *wh*-indefinite could vary with its licensing operator, as long as the licensing condition were satisfied, for example:

(67) Ta haoxiang^e mei/bu chi shenme (dongxi) de-yangzi
  he seem not eat what thing seem
  'It seems that he did/does not eat anything.'
  'It seems that there is something such that he did/does not eat it.'

This sentence is ambiguous with two different relative scope interpretation between the *wh*-indefinite and negation ($\neg \succ \exists / \exists \succ \neg$). A logical rationale aiding our proposal, then, is that the epistemic adverbial, *haoxiang*, could be quantificational and bind the *wh*-indefinite to produce the wide scope interpretation with respect to negation. Thus, backed up by these persuasive studies and the original insights in Rizzi (2004), I propose that [epistemic] is *quantificational* for EM_{aux}, and cross-classificational for EM_{adv}, of *quantificational* (qtf) and *modifier* (mod) type.

(68) Two Types of [epistemic] Feature:
  a. EM_{aux}: $[\text{epistemic}]^{qtf}$
  b. EM_{adv}: $[\text{epistemic}]^{qtf}_{mod}$

In sum, the first step is to find out the consensus between SBEs and epistemic modals, and to derive the distinction between epistemic adverbial and epistemic auxiliary. I adopt the feature classification in the theory of revised relativized minimality, with the proposed modification on the feature type of [epistemic] based on the quantificational nature of epistemic modality. As a consequence, epistemic modals and SBEs are stringed by the Rizzi's (2004) feature system; namely, all of them are related to the *quantificational* type. In addition, the new classification for the two types of [epistemic] feature also helps to bring out the desired distinction for the $\text{EM}_{adv}/\text{EM}_{aux}$ asymmetry.[9] In the next subsection, I will discuss another asymmetry in the syntax-semantics interface.

3.2 The Subjectivity/Objectivity Asymmetry

Our second step is to derive the subjectivity/objectivity asymmetry. To achieve the goal, I assume, following Tsai (2009b), the topographical view on modality.

[9] I'm grateful to Ting-chi Wei (p.c.) for pointing this out to me and for the relevant discussions.

Specifically, the modal topography says that the epistemic modal should be located higher beyond TP, playing the role of being a syntactic functional projection.

(69) $[_{CP} \ldots \text{MP}^{e} \succ [_{TP} \ldots \text{MP}^{d} \succ [_{vP} \ldots \text{MP}^{dyn} \succ [_{VP} \ldots]]]]$

My proposal, then, is to adopt the fine structure of left-perhiphery (Rizzi 1997) and propose that epistemic modals can also be hosted at ForceP. Specifically, MP^{e} is the locus for objective epistemic modal, while ForceP is for subjective epistemic modal, respectively, as illustrated in (70).

(70) $[_{CP}\ \text{ForceP}\ \overset{\text{EM}^{s}}{\underset{\downarrow}{\_\_}} \succ \text{TopP}^{*} \succ \text{FocP} \succ \text{TopP}^{*} \succ \text{M}^{e}\text{P}\ \overset{\text{EM}^{o}}{\underset{\downarrow}{\_\_}} \succ \text{FinP} \succ [_{TP} \ldots]]$

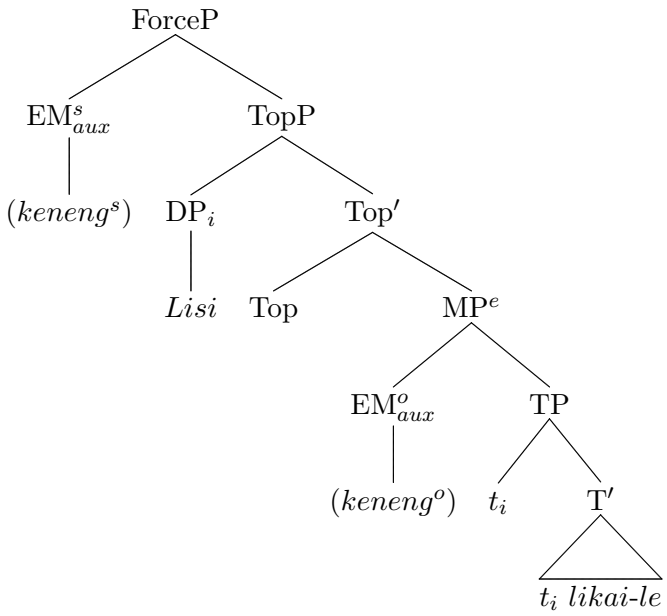
This proposal was sustained by the insights into the two types of epistemic modality (Lyons 1977, and see also Iatridou 1990, Nuyts 2001, Papafragou 2006 for relevant discussions). One of the central claims in Lyons is that the subjective epistemic modal is infused into the illocutionary force of the utterance, while the objective one is infused into the truth-conditional proposition. Specifically, the function of the subjective epistemic modal is similar with the performative verb, which pragmatically performs the speech act such as conjecture or inference from the speaker. From this aspect, the semantic interpretation of subjective *may* in the sentence, *it may*^{s} *be raining*, would imitate another one with a performative verb, such as *I think/guess that it is raining*. Furthermore, this proposal was taken over by Huitink (2008), who argued for a speech-act modifier approach for subjective epistemic modals. According to Huitink, a subjective epistemic modal was a down-toner which alternatively weakens the illocutionary force. Specifically, given the assumption that the default illocutionary force of a sentence is *declarative*, the function of *may*^{s} is to turn it into *conjecture*. More specifically, the semantic interpretation was related to belief and COMMITMENT STATE in the sense of Krifka (2001).

(71) Let c_s be the commitment state and p the proposition:
$[\![may^{s}(p)]\!] = \lambda c_s$. c_s + *speaker* is weakly committed to p, where
an individual x is weakly committed to p iff
p is compatible with the belief of x.

(Huitink 2008: 2076)

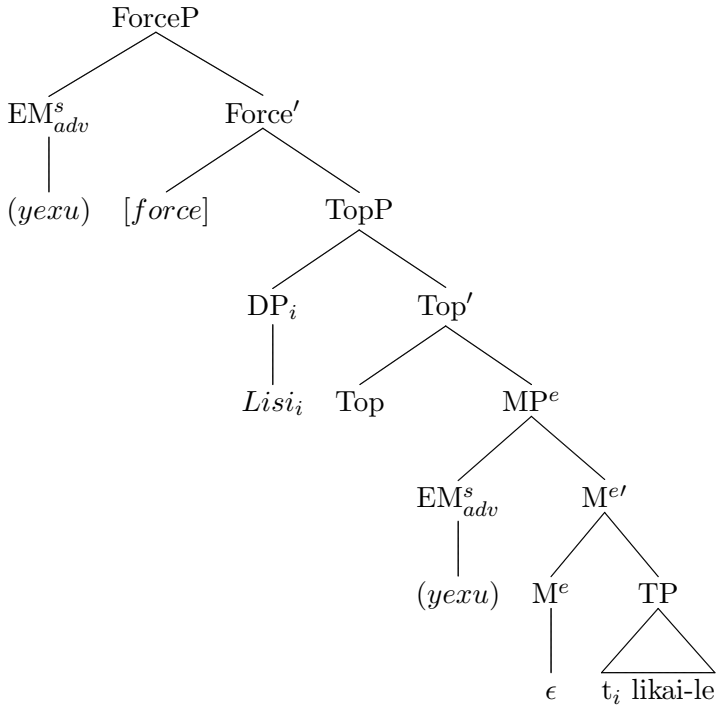
On the other hand, the objective epistemic modal is interpreted in the canonical Kratzerian modal semantics, which related proposition to truth condition in the possible world semantics, without any contribution to the illocutionary force and the speech act, as in (66). Backed up by the above semantic backgrounds, our proposal can be considered as a modal mapping hypothesis in interface. On the one hand, the objective epistemic modal takes a propositional maximal projection, TP, as its argument and extends itself as MP^{e}. On the other hand, the subjective epistemic modal is located at ForceP, for being economically accessible by the subsequent semantic and pragmatic interfaces.

(72) Two Types of Epistemic Modality:



Let us consider the derivation in the theory of modern minimalism. As pointed out in Chomsky (2006) and his related studies (Chomsky 2005, 2007), our grammar produces the Generalized Argument Structure, the traditional thematic structure within vP level and the cartographic functional hierarchies within CP level (Cinque 2006, Rizzi 1997, 2004, and among others), through External Merge. As for our structure, each of EM$^{s}_{aux}$ and EM$^{o}_{aux}$, through external merge, takes different generalized arguments: the whole utterance for EM$^{s}_{aux}$ and the propositional maximal projection for EM$^{o}_{aux}$. As a consequence, both of their syntax-semantic argument requirements are satisfied, and no further syntactic operation is necessary. In a similar fashion, EM$_{adv}$ can be introduced into the syntactic derivation, with two different specifiers being created, *Spec*-MP^{e} and *Spec*-ForceP, for instance:

(73) Two Types of Epistemic Modal Specifier:



As for *Spec*-ForceP, no syntax-semantic mismatch is observed since the EM^{s}_{adv} was base-generated in ForceP to turn it into the "subjective" domain, with the subsequent pragmatic requirement on speech act being satisfied. As for *Spec*-MP^{e}, however, things went wrong. If an EM^{s}_{adv} were base-generated at *Spec*-MP^{e}, as the derivation proceeds on, the ForceP would no longer be correlated with subjectivity anymore. In other words, an EM^{s}_{adv} is expected to be always hosted in the domain of ForceP, since its function is to modify the illocutionary force of a given sentence. In the case when EM^{s}_{adv} was inherently hosted in *Spec*-MP^{e}, the intended subjective domain would be higher than where the EM^{s}_{adv} was hosted, resulted into a mismatch to be fixed. I argue that this is fixed by the syntactic operations, AGREE and MOVE, especially with the novel perspective that agreement is the pioneer for movement (Miyagawa 2010).

According to Chomsky (2007), agreement is arranged through the PROBE-GOAL relation. Specifically, a probe is an uninterpretable feature [*u*feature] which searches its c-commanding domain for a matching goal in order to be valued. After valuation, the uninterpretable feature got deleted in the syntactic derivation. However, Miyagawa (2010) noticed that in this framework nothing about the syntactic operation could be preserved as accessible records for the subsequent linguistic components. This could become even more problematic within the domain of functional projections, because they are largely related to the informational structure. To mend this flaw, it was proposed by Miyagawa that movement functions to preserve the record by moving the goal into the domain of the probe, as illustrated in (74).

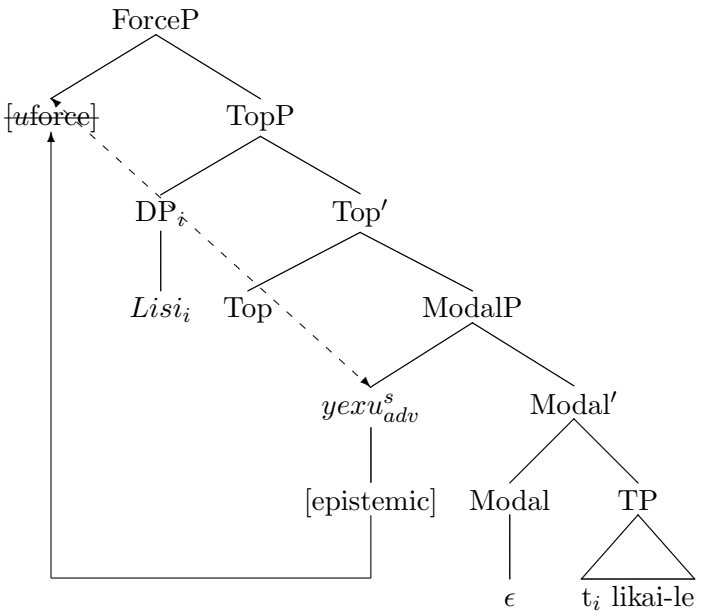
(74) $[\ldots[\text{H}^{probe}_{[uF]}\ldots[\ldots\text{YP}^{goal}_{[iF]}\ldots]]] \rightarrow [\ldots[[_{Spec-H}\text{YP}^{goal}_{j\,[iF]}\ [\text{H}^{probe}]]\ \ldots[\ldots\underline{t_j}\ldots]]]$

agree (between $\text{H}^{probe}_{[uF]}$ and $\text{YP}^{goal}_{[iF]}$); *move* (from $\text{YP}^{goal}_{j\,[iF]}$ to $\underline{t_j}$)

By assuming Miyagawa's theoretical framework, let us suppose that the [force] feature came into the derivation unvalued, [*u*force], which searches its scope for a matching goal. Its value can be determined by left-peripheral adverbials, since empirically a left-peripheral adverbial would affect the illocutionary force of its containing clause (see Tsai 2009a for relevant discussions). In our case, [*u*force] agreed with the $[\text{epistemic}]^{qtf}_{mod}$ feature of EM^{s}_{adv} and got deleted after valuation. At this moment, nothing left in ForceP for the subsequent semantic interpretation. Consequently, movement was motivated, copying the $[\text{epistemic}]^{qtf}_{mod}$ feature and moving it to ForceP, to guarantee the syntax-semantic match for the subsequent interfaces,[10] as illustrated in (75).

(75) The Syntax of ForceP Valuation:

[10] One might argue that theoretically this differs from the original proposal in Miyagawa (2010) in that it should be the whole XP being moved into the well-known SPEC-HEAD AGREEMENT CONFIGURATION. Nevertheless, it is worth to be noted that, on the one hand, the [epistemic] feature is not moved for the traditional EPP requirement (Chomsky 1981), and consequently no phonological requirement is guaranteed. On the other hand, as pointed out to me by Wei-Tien Dylan Tsai (p.c.), feature movement can be considered as a parallel operation of XP-movement from the aspect that it is the minimalist unit being COPIED and DELETED (Chomsky 2001), while the range for copy of phrasal movement is the whole XP chunk.



In (75) the [*u*force] feature agrees with *yexu* to be valued and deleted, and the $[\text{epistemic}]^{qtf}_{mod}$ feature is moved to replace the deleted [*u*force] feature for the whole clause to be accessible for the subsequent semantic-pragmatic interfaces to perform the speech act *conjecture*.

To summarize so far, in the last section I derived the EM_{adv}/EM_{aux} in the feature system of Rizzi (2004), and in this section I turn to the other one, the subjectivity/objectivity asymmetry. Based on the insightful semantic studies in Lyons (1977) and Huitink (2008), I propose a modal mapping hypothesis within the framework of the cartographic approach (Rizzi 1997 and Tsai 2009b). Accordingly, the semantics of the two types of epistemic modality correspond to two different syntactic functional projections respectively. Besides, if a *prima facie* EM^s_{adv} was inherently hosted at *Spec*-MP^e, the syntactic operations, agreement and movement (Miyagawa 2010), would be motivated to fix the syntax-semantics mismatch by moving the $[\text{epistemic}]^{qtf}_{mod}$ feature into the domain of ForceP. In a nutshell, I have finished the derivations for the two asymmetries, and my last step in the next subsection is to pursue the constraint on feature movement to solve the puzzle.

3.3 Covert Movement and Intervention Effect

The $[\text{epistemic}]^{qtf}_{mod}$ feature movement proposed in the last subsection is not unlimited. In fact, recent studies on movement has revealed that feature movement could be more rigidly constrained than phrasal movement.

Since Beck (1996), the notion of intervention effect has received attention promptly (Beck and Kim 1997, Kim 2002, 2005, Tomioka 2007, and among many others). One important respect among these insightful studies is the notion of feature/phrasal movement distinction (Pesetsky 2000). Specifically, it was argued by Pesetsky that in English when a clause contains more than one *wh*-phrase, the first *wh*-phrase, wh_1-in-situ, would undergo feature movement, while the rest of the in-situ *wh*-phrases would undergo covert-phrasal movement. This claim was verified by the construction of antecedent-contained deletion (ACD). Since ACD has a recurring conundrum for the interpretation of the elided VP, it has long been assumed that phrasal movement like QR could help to solve the problem by moving the QP and

replacing it with a trace. That is, a sentence involves ACD like (76a) must have a LF like (76c) through QR as in (76b), for instance:

(76) a. John invited [$_{QP}$ everyone that Mary did [$_{VP}$ Δ]].
b. QR: [[$_{QP}$ everyone that Mary did [$_{VP}$ Δ]] John [$_{VP}$ invited t]]
c. VP-copy:
[[$_{QP}$ everyone that Mary did [$_{VP}$ invited t]] John [$_{VP}$ invited t]]

Because the resolution of ACD relies crucially on phrasal movement, Pesetsky (2000: 30) defended his argument by showing that wh_1-in-situ, since it undergoes feature movement, is unable to license ACD as in (77a), unlike wh_2-in-situ in (77b).[11].

(77) a. * I need to know [$_{wh_2}$ which girl] Sue ordered [$_{wh_1}$which boy that Mary also did [$_{VP}$ Δ]] to congratulate t_{wh_2}.
b. [$_{wh_1}$ Which girl] invited [$_{wh_2}$ which student that John did [$_{VP}$ Δ]]?

Based on this argument, Pesetsky (2000: 60) further observed that only wh_1-in-situ would induce the intervention effect, but not wh_2-in-situ, as illustrated in (78).

(78) a. * [$_{wh_2}$ Which book] didn't [$_{wh_1}$ which person] read?
b. [$_{wh_1}$ Which person] didn't read [$_{wh_2}$ which book]?

In (78b) *which book* undergoes covert phrasal movement across the SBE, negation *didn't*, and no intervention effect is observed. On the contrary, in (78a) *which person* undergoes feature movement across *didn't*, but this time the intervention effect is induced and the sentence is ruled out. Pesetsky concluded these observations by attributing them to the difference between the two types of movement and bringing out a syntactic descriptive condition on feature movement, which states that a quantifier-restriction dependency cannot be separated by an intervening SBE.

Yang (2008) followed this line and further provided an account for the featural intervention effect. One of his central arguments is that the featural intervention effect can be reduced to the traditional minimality effect by adopting our familiar feature system mentioned in the previous subsection. Yang (2012: 56) took the following Mandarin Chinese examples to show that when the *quantificational* feature, like [Wh], of *wh*-adverbial undergoes feature movement across another *quantificational* intervener, the intervention effect would be induced.

(79) a. * Suoyouren/Meigeren dou renwei Lisi weishenme/zenme cizhi?
all.people/everyone DOU think Lisi why^{adv}/how^{adv} resign
'Why$_i$/How$_i$ did all people/everyone think Lisi would resign t$_i$?'
b. * Meiyouren/Henshaoren renwei Lisi weishenme/zenme cizhi?
nobody/few.people think Lisi why^{adv}/how^{adv} resign
'Why$_i$/How$_i$ did nobody/few people think Lisi would resign t$_i$?'

What happened to the covert phrasal movement, with no intervention effect being detected? To respond to this distinction, Yang further argued that the intervention effect was obviated by phrasal movement because the whole feature chunk was pied-piped with the fronting *wh*-phrase (see also Starke 2001). That is, a *wh*-phrase with the more complex feature chunk could move across a simpler one, but not *vice versa*.

(80) a. * [___... [F$_1$, F$_2$]...[F$_1$]...] $\rightarrow$ [[F$_{1i}$]...[F$_1$, F$_2$]...[t$_i$]...]

[11]Note that (77a) cannot be attributed to the superiority effect because the D-Linking *which* is chosen.

b. $[\_\_\ldots[\mathrm{F}_1]\ldots[\mathrm{F}_1,\ \mathrm{F}_2]\ldots] \rightarrow [[\underline{\mathrm{F}_1,\ \mathrm{F}_2}]_i\ldots[\mathrm{F}_1]\ldots\underline{\mathrm{t}_i}\ldots]$

Consequently, the theory of revised relativized minimality, as Yang argued convincingly, could naturally solve the mysterious puzzles of the intervention effect.

The constraint of intervention effect on feature movement is the last step for our puzzle, and now we are ready for the Asymmetric ECP Effect Generalization. The next subsection will provide the explanation.

3.4 The Account

The account for the Asymmetric ECP Effect Generalization, repeated below as (81), involves two parts, the cartographic structure and the intervention effect.

(81) Asymmetric ECP Effect Generalization:
SBEs can take scope over EM^o_{aux}, but not over EM^s_{aux} and EM^s_{adv}.
a. $[\mathrm{QP}_i/\mathrm{SBE} \succ \mathrm{EM}^o_{aux}\ [\ldots\ x_i\ \ldots]]$
b. $^*\,[\mathrm{QP}_i/\mathrm{SBE} \succ \mathrm{EM}^s_{aux}/\mathrm{EM}^s_{adv}\ [\ldots\ x_i\ \ldots]]$

Recall our hypothesis for syntax-semantics mapping of epistemic modality, as illustrated in (82).

(82) $[_{CP}\ \mathrm{ForceP}\ \underset{\downarrow}{\underline{\ \ }}^{\mathrm{EM}^s} \succ \mathrm{TopP}^* \succ \mathrm{FocP} \succ \mathrm{TopP}^* \succ \mathrm{M}^e\mathrm{P}\ \underset{\downarrow}{\underline{\ \ }}^{\mathrm{EM}^o} \succ \mathrm{FinP} \succ [_{TP}\ \ldots]]$

According to the hypothesis, EM^o_{aux} is located right beyond TP, so there are still rooms available within CP for further functional projections. In other words, SBEs can be merged either higher or lower around MP^e to take different scope with respect to EM^o_{aux}, for instance:

(83) a. Mei-ge ren keneng dou shi xiongshou.
every-CL people may DOU is murderer
'It may be the case that everyone are murderers.'
b. $[_{FP}\ \ldots\ [_{TopP}\ \textit{Mei-ge ren}_i\ [_{M^eP}\ \textit{keneng}^o_{aux}\ [_{douP}\ \textit{dou}\ [_{TP}\ t_i\ \textit{shi}\ \ldots]]]]]$.
c. Mei-ge ren dou keneng shi xiongshou.
every-CL people DOU may is murderer
'As for everyone x, it may be the case that x is the murderer.'
d. $[_{FP}\ \ldots\ [_{douP}\ \textit{Mei-ge ren}_i\ \textit{dou}\ [_{M^eP}\ \textit{keneng}^o_{aux}\ [_{TP}\ t_i\ \textit{shi xiongshou}]]]]$.

(84) a. Tamen keneng zhi zhidao Zhangsan xihuan jüfaxue.
they may only know Zhangsan like syntax
'It may be the case that they only know that Zhangsan likes syntax.'
b. $[_{FP}\ \ldots\ [_{TopP}\ \textit{Tamen}_i\ [_{M^eP}\ \textit{keneng}^o_{aux}\ [_{FocP}\ \textit{zhi}\ [_{TP}\ t_i\ \textit{zhidao}\ \ldots]]]]]$.
c. Tamen zhi keneng zhidao Zhangsan xihuan jüfaxue.
they only may know Zhangsan like syntax
'It is only the case that they may know that Zhangsan likes syntax.'
d. $[_{FP}\ \ldots\ [_{TopP}\ \textit{Tamen}_i\ [_{FocP}\ \textit{zhi}\ [_{M^eP}\ \textit{keneng}^o_{aux}\ [_{TP}\ t_i\ \textit{zhidao}\ \ldots]]]]]$.

(85) a. Zhangsan keneng bu xihuan zhe-jia canting.
Zhangsan may not like this-CL restaurant
'Zhangsan may not like this restaurant.'

b. $[_{FP} \ldots [_{TopP}\ Zhangsan_i\ [_{M^eP}\ keneng^o_{aux}\ [_{NegP}\ bu\ [_{TP}\ t_i\ xihuan \ldots]]]]]$.

c. Zhangsan bu keneng xihuan zhe-jia canting.
John not may like this-CL restauran
'It can't be the case that Zhangsan like this restaurant.'

d. $[_{FP} \ldots [_{TopP}\ Zhangsan_i\ [_{NegP}\ bu\ [_{M^eP}\ keneng^o_{aux}\ [_{TP}\ t_i\ xihuan \ldots]]]]]$.

On the other hand, as pointed out in Rizzi (1997, 2001), a given sentence is "closed upward" by ForceP in the end of its derivation. Since EM^s_{aux} inherently occupies ForceP through external merge and takes the whole CP as its argument, no further position is available for additional functional projections anymore. Consequently, no SBE can take scope over EM^s_{aux}.

(86) a. Keneng mei-ge ren dou shi xiongshou.
may every-CL people DOU is murderer
'It may be the case that everyone are murderers.'

b. $[_{ForceP}\ Keneng^s_{aux}\ [_{douP}\ mei\text{-}ge\ ren_i\ dou\ [_{TP}\ t_i\ shi\ xiongshou]]]$.

(87) a. Keneng tamen zhi zhidao Zhangsan xihuan jüfaxue.
may they only know Zhangsan like syntax
'It may be the case that they only know that Zhangsan likes syntax.'

b. $[_{ForceP}\ Keneng^s_{aux}\ [_{TopP}\ Tamen_i\ [_{FocP}\ zhi\ [_{TP}\ t_i\ zhidao\ [_{CP} \ldots\ ]]]]]$.

(88) a. Keneng Zhangsan bu xihuan zhe-jia canting.
may Zhangsan not like this-CL restaurant
'It may be the case that Zhangsan doesn't like this restaurant.'

b. $[_{ForceP}\ Keneng^s_{aux}\ [_{TopP}\ Zhangsan_i\ [_{NegP}\ bu\ [_{TP}\ t_i\ xihuan \ldots]]]]$.

The cartographic account for (86)-(88) can also explain half of the syntactic behaviors of EM^s_{adv}. That is, when EM^s_{adv}s are inherently hosted at ForceP, it would naturally take wide scope over other SBEs. However, when the EM^s_{adv} were generated relatively lower at *Spec*-M^{e}P, two possible derivations are generated. On the one hand, if a SBE takes scope over the EM_{adv}, the featural intervention effect would be induced. Consider the problematic case (36b), repeated below as (89).

(89) * Mei-ge xüesheng dou yexu likai-le.
every-CL student DOU perhaps leave-SFP
'For every student x, it is perhaps that x has left.'

According to our hypothesis, the $[\text{epistemic}]^{qtf}_{mod}$ of $yexu^s_{adv}$ in (89) should have undergone feature movement to ForceP. However, the *quantificational* [epistemic] feature movement would be blocked by another intervening *quantificational* feature, as illustrated in (90).

(90) * $[_{[uforce]}\ [_{douP}$ mei-ge ren$_i$ dou$_{[Dist]^{qtf}}$ $[_{M^eP}$ yexu$_{[epistemic]^{qtf}_{mod}}$ $[_{TP}$ likai-le]]]].

Specifically, after agreement, the [epistemic] feature is going to move to replace the deleted [*u*force] feature. However, at this time, feature movement is blocked by another intervening *quantificational* feature, presumably [Dist], of *dou*, and the

derivation crashed.[12] Besides, since [focus] and [Neg] also belong to the *quantificational* type, the featural intervention effect would be induced by an intervening focus operator *zhi* or negation *bu* in-between the movement path. Thus, no SBE can have scope over an EM^{s}_{adv}. On the other hand, when a SBE is merged relatively lower than an EM^{s}_{adv}, there is no intervener in-between the movement path anymore. Consequently, only the relative scope, [$\diamond \succ$ SBE], is allowed.

(91) $[_{[uforce]}\ [_{TopP}$ mei-ge ren$_i$ $[_{M^eP}$ yexu$_{[epistemic]^{qtf}_{mod}}$ $[_{douP}$ dou$_{[Dist]^{qtf}}$ $[\ldots]]]]]$.

As pointed out to me by Lavi Wolf (p.c.), this mechanism implies a plausible derivation for the subjective reading of an EM_{aux} even when it is not base-generated in ForceP, as illustrated in (92)[13].

(92) $[_{[uforce]}\ [_{TopP}$ mei-ge ren$_i$ $[_{M^eP}$ keneng$_{[epistemic]^{qtf}}$ $[_{douP}$ dou$_{[Dist]^{qtf}}$ $[\ldots]]]]]$.

That is, an epistemic modal auxiliary can be interpreted subjectively as long as no intervener is detected in-between the path of feature movement. This sheds some light on the ECP effect in English.

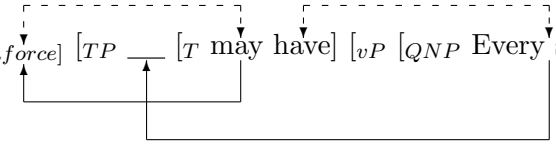
(93) Every student may have left.
  a. $(\forall \succ \diamond)$/*ECP
  b. $(\diamond \succ \forall)$/✓ECP

Specifically, as noted in Tancredi (2007), the ECP effect can be observed in (93) only if *may* is interpreted subjectively. Unlike Mandarin Chinese, English does not structurally distinguish the subjective epistemic modal from the objective one, and this seems to attribute the subjectivity/objectivity asymmetry in English to the lexical property. According to my analysis, however, the ECP effect is induced because the *quantificational* [epistemic] undergoes feature movement to ForceP, and thus scopes over the QNP. A potential problem here is why the QNP does not act as an intervener for feature movement. Specifically, the head of the A-dependency is a QNP which must poccess the *quantificational* features. If the [epistemic]^{qtf} feature were moved upward, it could have been obstructed by the QNP, a flaw left to our analysis. To mend this flaw, a technical solution is to follow the theory of Feature Inheritance and the proposal of simultaneous movement (Chomsky 2005, 2006, 2007). Specifically, I assume that feature inheritance is operated after the given Phase has been completely structured. Within CP phase, this means that syntactic operations such as agreement and movement have to be postponed until the ForceP is derived. After the merger of ForceP, [*u*force] and the inherited Case feature and phi-feature at T operated agreement and movement simultaneously, and as a consequence, the potential featural intervention effect from QNP subject can be obviated,[14] as sketched in (94).

[12]Note that $[\text{epistemic}]^{qtf}_{mod}$ of EM^{s}_{adv} is a cross-classificational single feature. Thus, the obviation configuration in (80b) is not satisfied. That is to say, $[\text{epistemic}]^{qtf}_{mod}$ is not a complex feature chunk which can cancel the intervention effect.

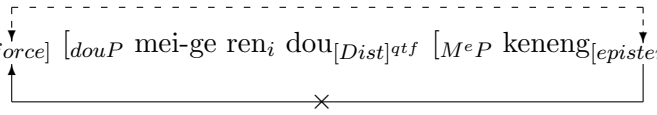
[13]I am grateful to Lavi Wolf (p.c.) for bringing this to my attention.

[14]Obviously this technical solution is inert to true A′-interveners, e.g. focus, negation, and *dou*, because the syntactic positions of these in situ A′-interveners are determined inherently without any change through agreement or movement, unlike QNPs.

(94) 

In (94) the [epistemic] feature of *may* and the QNP agree with [*u*force] and T to be moved to ForceP and *Spec*-TP, simultaneously and respectively. As a consequence, no featural intervention effect could be induced.

The last question is why, in (83c) for example, the [*u*force] feature did not obligatorily agree with the EM^{o}_{aux} and attract its [epistemic]^{qtf} feature in a parallel fashion as (90), resulted into the featural intervention effect, as illustrated in (95).

(95) 

In other words, there is an option for an EM_{aux} to either stay in situ under its objective reading or move to be interpreted subjectively, while an EM_{adv} must undergo feature movement to ForceP. This distinction corresponds to Huitink's (2008) observation that an EM^{o}_{aux} differs from subjective epistemic modals in that an EM^{o}_{aux} contributes nothing to the illocutionary force. From the syntactic perspective, this means that the structure with an objective epistemic modal ends with the default value, *declarative*, for ForceP, as in (96).

(96) $[_{ForceP\ [declarative]}\ [_{douP}$ mei-ge ren$_i$ dou$_{[Dist]^{qtf}}$ $[_{M^eP}$ keneng$_{[epistemic]^{qtf}}$ [...]]]].

The answer to this question may lie in the classification of the two types of [epistemic] feature. Specifically, I suggest that the cross-categorial [epistemic]$^{qtf}_{mod}$ feature of EM_{adv} has a stronger requirement to arrange a relation with illocutionary force because the feature of $modifier$ type indicates that its container is a left-peripheral element. As for epistemic modal adverbials, this could mean that it is not only a modal operator, but also a speech act modifier. Thus, an arrangement between the epistemic modal adverbial and illocutionary force should be guaranteed. In contrast, the [epistemic]^{qtf} feature of EM_{aux} indicates that the given item is a quantificational modal operator only. In this way, there is no rigid requirement for the correlation between EM_{aux} and ForceP.

The answer is stipulative to some degree, but the distinction is quite substantial. Moreover, (96) would bring out a far-reaching prediction that among the epistemic modals, the EM^{o}_{aux} is the one, and perhaps the only one, which allows no agreement with the illocutionary force in a single clause. At first sight, this seems to be a simple consequence of our analysis, but it will play an important role and become evident in the following section.

4 *Wh* Scheme

In this section I aim to extend the theoretical framework to account for the three generalizations of Epistemic Interference Effects. This section will begin with a brief introduction of the canonical analysis for the semantics-pragmaitcs interface of *wh*-questions and the reinterpretation of Clausal Typing Hypothesis (Cheng 1991). Subsequently, the three generalizations will naturally follow our account, as soon as the correlation between *wh*-questions and its speech act is acknowledged.

4.1 *Wh*-questions in Interface

Since our explanation crucially relies on ForceP, it is instructive to introduce the canonical analysis of *wh*-questions in the syntax-semantics interface, which would help us to understand more about the correlation between *wh*-questions and its illocutionary force.

The formal semantics of *wh*-questions was framed by Hamblin (1973) and elaborated in Karttunen (1977). According to Hamblin, the meaning of the *wh*-question denotes the set of its correspondent answers, and the set was redefined as the true answers in Karttunen, as sketched in (97).

(97) ⟦Which girl does John like⟧?
$= \lambda p \exists x[\textsc{girl}(w)(x) \wedge p = \lambda w' \,.\, \textsc{like}(w')(x)(\textsc{John})]$

Furthermore, in order to get an uniform analysis for direct questions and indirect questions, Karttunen further argued that the direct question can be explicated like an indirect question by adding an implicit performative verb to the LF in the semantic level (see also Ross 1970).

(98) ⟦Which girl does John like⟧?
$= [\textsc{ask}(\textsc{you})(\textsc{i})[\lambda p \exists x[\textsc{girl}(x)(w) \wedge p = \lambda w' \,.\, \textsc{like}(w')(x)(\textsc{john})]]]$

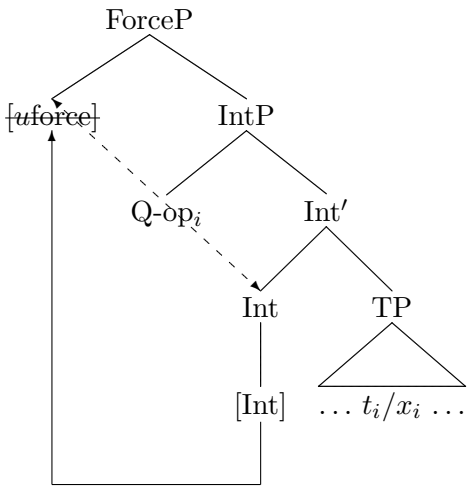
Accordingly, a *wh*-question can be considered as a combination between the question formula plus a speech act ASK, performed to demand the correspondent answers.

On the other hand, the similar proposal has been made also in the syntax literature. One of the most influential work is the clausal typing hypothesis (Cheng 1991). According to Cheng, there is a close relation between C and *wh*-expressions. That is, a sentence containing a *wh*-expression should be "typed" as an interrogative clause. Specifically, the process of "clausal typing" is to correlate C to the *wh*-expression, either by *wh*-movement to *Spec*-CP as in English or by adding a question final particle like *ne* or *ma* in C to bind the *wh*-phrase in Mandarin Chinese.

These insights, I think, can be incorporated fitly into our theoretical framework. Specifically, I assume, following Rizzi (2001), the INT(ERROGATIVE)P as the locus of *wh*-expressions within the left-periphery.[15] When a [*u*force] feature came into the derivation, it would agree with IntP, presumably with interpretable [Int] feature, and the given clause would be interpreted by the subsequent pragmatic component as *interrogative* type to perform the speech act *ask* as in (98). In fact, this can be considered as a reinterpretation of the clausal typing hypothesis (see also Pesetsky and Torrego 2007 for similar proposal), as illustrated in (99). Finally, in what follows I will turn the the three generalizations one by one to demonstrate how they are captured in our framework.

(99) ForceP-IntP Agreement:

[15] Although Rizzi (2001) argued for a specific status, clausal *wh*-operators only, for IntP by endowing it with a special feature, in this article I follow the locality view in Abels (2012) and take IntP as the locus for *wh*-expressions.



4.2 The 1st Generalization

Consider the first generalization on the asymmetric interaction between $\text{EM}^s_{adv}/\text{EM}^o_{aux}$ and *wh*-construals, repeated below as (100).

(100) Asymmetric Epistemic Intervention Generalization:
A Q-operator cannot bind its variable/trace across an EM^s_{adv}.
a. [Q-op$_i$ … EM^o_{aux} […$wh(x_i)/t_i$ …]]
b. * [Q-op$_i$ … EM^s_{adv} […$wh(x_i)/t_i$ …]]

Let us begin from the grammatical structure (100a). This structure simply follows our analysis for interrogative clause in (99), as illustrated in (101).

(101) a. Who may John have hired for that job?

$[_{ForceP}\ [_{uforce}]\ [_{IntP[Int]}$ Who$_i$ [may$^o_{aux}$ John have hired t_i for that job]]]?

b. Zhangsan keneng$^o_{aux}$ mai-guo shenme?
Zhangsan may buy-ASP what
'What might Zhangsan have bought?'

$[_{ForceP}\ [_{uforce}]\ [_{IntP[Int]}$ Q$_i$-op [ZS keneng$^o_{aux}$ mai-guo shenme$_i$]]]?

In (101a), *who* moves to IntP, and [*u*force] agrees with its [Int] feature. This clause is thus valued and typed as *interrogative*. In (101b), the Q-operator is merged in IntP, and the subsequent derivation follows. No syntax-semantics mismatch are observed. However, the derivation for (100b) is different. (102) and (103) show the plausible derivations, but in fact none of them are allowed.

(102) a. * Who has John perhaps$^s_{adv}$ hired for that job?

b. * $[_{ForceP}\ [_{uforce}]\ [_{IntP[Int]}$ Who$_{[WH]i}$ [has John perhpas$^s_{adv[epistemic]}$…]]]?

c. * [$_{ForceP}$ [$_{uforce}$] [$_{IntP[Int]}$ Who$_{[WH]i}$ [has John perhpas$^{s}_{adv[epistemic]}$ . . .]]]?

(103) a. * Zhangsan yexu$^{s}_{adv}$ mai-guo shenme?
Zhangsan perhaps buy-ASP what
'What is the thing x such that Zhangsan perhaps has bought x?'

b. * [$_{ForceP}$ [$_{uforce}$] [$_{IntP[Int]}$ Q$_i$-op [ZS yexu$^{s}_{adv[epistemic]}$ [$_{VP}$. . .shenme$_i$]]]]?

c. * [$_{ForceP}$ [$_{uforce}$] [$_{IntP[Int]}$ Q$_i$-op [ZS yexu$^{s}_{adv[epistemic]}$ [$_{VP}$. . .shenme$_i$]]]]?

The derivations in (102b) and (103b) seem to be unproblematic because they just imitate the derivation in (101), but the EM$^{s}_{adv}$ is unhappy because this derivation would result into an interrogative clause which mismatches with the interpretation of EM$^{s}_{adv}$. That is, an EM$^{s}_{adv}$ intends to contribute to the illocutionary force to express *conjecture*, but this time the [*u*force] feature is grasped by [Int]. As a consequence, although the syntactic derivation is fine, the semantics-pragmatics mismatch rules out the given sentence. On the other hand, a non-local agreement between [*u*force] and [epistemic] did not save the mismatch. In fact, the derivations become even worse, as in (99c) and (100c). This time the *wh*-expression is unhappy because the speech act, *conjecture*, is incompatible with the interpretation of the *wh*-expression. Furthermore, the syntax of ForceP valuation is also problematic since an intervening *wh*-operator, with the *quantificational* feature [WH], would induce the featural intervention effect, blocking the [epistemic]$^{qtf}_{mod}$ feature movement. In a nutshell, although both of the *wh*-expression and the EM$^{s}_{adv}$ intend to type the clause, there is no legitimate derivation to satisfy both of them. Thus, the Asymmetric Epistemic Intervention Generalization is derived.

Our account also yields the desired result on *wh* typology. Recall our observation in section 2 that a Mandarin Chinese sentence like (103a) can be acceptable only when the *wh*-phrase is under its existential reading. This is exactly because the *wh* unselective binder, the Q-operator, and IntP were not introduced into the derivation. Without the Q-operator and IntP, the [*u*force] feature can agree with the EM$^{s}_{adv}$ to match the clause type and the speech act. Consequently, the resultant structure is a non-interrogative clause with the *wh*-variables bound by existential closure (Tsai 1999). On the contrary, this does not work in English since all of its *wh*-expressions are *bona fide* operators which must undergo movement to IntP.

In sum, the rationale behind our explanation is that a single clause is hard to have two divergent illocutionary forces and to express two different speech acts simultaneously, *asking* for an answer on the one hand and subjectively *conjecturing* on the same thing on the other, and the first generalization is explained as a contradiction on feature interpretability at ForceP because of the competition for [*u*force] between the *wh*-expression and the EM$^{s}_{adv}$.

4.3 The 2nd Generalization

The Asymmetric Epistemic Intervention Generalization and its explanation can be well extended to the syntactic behaviors of *wh*-adverbials in English, for instance:

(104) a. How may John have fix the car t$_i$?

b. Why may Sue have thought that the teacher blamed Bill t_i?

c. Where may Mary have claimed that she bought a book t_i ?

(105) a. * How has John perhaps fixed the car t_i?

b. * Why has Sue perhaps thought that the teacher blamed Bill t_i?

c. * Where has Mary perhaps claimed that she bought a book t_i?

In (104) there is no problem for *wh*-adverbial to move across *may*, but not across *perhaps*, as in (105), an asymmetry which has been captured. However, this is not the case in Mandarin Chinese, as pointed out in our second generalization:

(106) Symmetric Epistemic Intervention Generalization:
A *wh*-adverbial cannot move covertly across an epistemic modal.
*[Q_i-$_{op}^{adv}$ ... EM [... t_i ...]]

a. * Zhangsan keneng$^{o}_{aux}$ zenme$^{manner}_{adv}$ zebei Lisi?
Zhangsan may how blame Lisi
'How may Zhangsan blame Lisi?'

b. * Zhangsan yexu$^{s}_{adv}$ zenme$^{manner}_{adv}$ zebei Lisi?
Zhangsan perhaps how blame Lisi
'What is the manner such that Zhangsan perhaps blame Lisi in?'

Since we have been through the discussions about the typology of *wh*-movement (Pesetsky 2000 and Yang 2008) in section 3.3, the Symmetric Epistemic Intervention Generalization can be reconsidered from a different angle. The ungrammatical instances in (105) and (106b) may just follow our explanation in the previous subsection, but there must be certain additional factors to rule out (106a) but not (104), because an EM$^{o}_{aux}$ does not compete fot the illocutionary force with *wh*-expressions according to our account. In other words, why are *wh*-adverbials allowed to undergo phrasal movement, but not covert movement, across an EM$^{o}_{aux}$?

The answer has been suggested in the collaboration between our dichotomous [epistemic] feature classification and the featural intervention effect in Pesetsky (2000) and Yang (2012). It has been argued convincingly in Yang that Mandarin Chinese *wh*-adverbials must undergo feature movement to CP, which would be blocked by an intervening *quantificational* feature. According to our proposal, [epistemic] feature of an EM$^{o}_{aux}$ is exactly of the *quantificational* type. As a consequence, *wh*-feature movement in (106a) would be blocked by the intervening [epistemic]^{qtf} feature, as in (107), while phrasal movement in (104) can obviate it, as in (108).

(107) * [... [$_{IntP}$ ___ [Zhangsan keneng$^{o}_{aux[epistemic]^{qtf}}$ zenme$_{[Wh]}$ zebei Lisi]]]?

(108) [... [$_{IntP}$ How$_i$ [may$_{[epistemic]^{qtf}}$ John have fixed the car t_i]]]?

This analysis has an interesting prediction. In English if a *wh*-phrase undergoes feature movement to CP, we will expect the Symmetric Epistemic Intervention Generalization to also generalize English. According to Pesetsky (2000), a wh_1-in-situ is exactly of this kind, and our prediction seems to be on the right track. In (109a), the wh_1-in-situ, *which student*, undergoes feature movement, and it is blocked by an intervening *may* as in (106b).

(109) a. [$_{wh_2}$Which book]$_i$ has [$_{wh_1}$which student] read t_i?

b. * [$_{wh_2}$Which book]$_i$ may [$_{wh_1}$which student] have read t_i?

This is precisely a strong argument in favor of the feature-centered account in this article. If the feature system in Rizzi (2004) was not assumed, an intervening epistemic modal would block all of the *wh*-dependencies. As a consequence, no *wh*-dependency should be allowed in a clause containing an epistemic modal. However, the overall situation said it isn't so. On the contrary, our feature-centered account can provide a natural clearcut between phrasal movement and feature movement. That is, since the [epistemic]^{qtf} intervention effect is induced exclusively by feature movement, but not phrasal movement, we have a correct prediction for the phrasal/feature movement distinction with respect to EM$^{o}_{aux}$, and subsequently the Symmetric Epistemic Intervention Generalization will become a natural consequence, rather than an *ad hoc* condition for Mandarin Chinese. That is, it is reduced to the featural intervention effect.

In sum, although the [epistemic]^{qtf} feature does not participate in the syntactic operation like its cross-classificational counterpart, it still would become an intervener for other *quantificational* feature movement, which is the origin of the second generalization.

4.4 The 3rd Generalization

(110) Anti-subjective Containment Generalization
No interrogative *wh*-construals can be formed in the scope of EM^{s}.
*[EM^{s} $\succ$ [Q-op$_i$ ... x_i]]

The puzzle of this generalization is that it is hard, as we have mentioned, to be attributed to any intervention effects because the subjective epistemic modals are located at the top of the syntactic hierarchy.

(111) a. * Keneng$^{s}_{aux}$ Zhangsan mai-guo shenme?
may Zhangsan buy-ASP what
'What might Zhangsan have bought? (*Interrogative)'

b. * Keneng$^{s}_{aux}$ Zhangsan zenme$^{manner}_{adv}$ zebei Lisi?
may Zhangsan how blame Lisi
'In what manner may Zhangsan blame Lisi?'

(112) a. * Perhaps, what$_i$ has John bought t_i for his son's birthday?

b. * Probably, how$_i$ has Bill fixed the computer t_i in the afternoon?

To solve this puzzle, I argue that this is a consequence of the syntactic derivation. Specifically, since external merger of an uninterpretable feature must feed agreement (Chomsky 2005, 2006, 2007), without an uninterpretable feature, no agreement can be arranged anymore. As for our case, the derivation proceeds until the last step before the final syntactic position, ForceP, was structured. In the previous cases, the next step is to introduce the [*u*force] feature, but this time it was the subjective epistemic modal being merged at ForceP, as illustrated in (113).

(113) [$_{ForceP}$ Keneng$^{s}_{aux[epistemic]}$ ... [$_{TP}$ Zhangsan mai-guo shenme]]

This structure is thus interpreted with the illocutionary force being valued inherently as *conjectural*, with *shenme* being existential quantified. In other words, no uninterpretable feature came into the derivation. Suppose now that a *wh*-operator was introduced earlier in the derivation, as in (114) and (115).

(114) $[_{ForceP}$ Keneng$^{s}_{aux[epistemic]}$ $[_{IntP}$ Q_i-op [Zhangsan $[_{VP}$ ... shenme$_i$]]]]

(115) $[_{ForceP}$ Perhaps$^{s}_{adv[epistemic]}$ $[_{IntP}$ what$_i$ [has John bought t_i for ...]]]

The problem of syntax-semantics mismatch would arise again because no agreement can be arranged between ForceP and the *wh*-operator due to the lack of [*u*force] feature, as illustrated in (113) and (114).

(116) * $[_{ForceP}$ Keneng$^{s}_{aux[epistemic]}$ $[_{IntP[Int]}$ Q_i-op [Zhangsan $[_{VP}$ ... shenme$_i$]]]]

(117) * $[_{ForceP}$ Perhaps$^{s}_{adv[epistemic]}$ $[_{IntP[Int]}$ what$_i$ [has John bought t_i for ...]]]

This analysis captures the insight of the Anti-subjective Containment Generalization. As the generalization described itself, no interrogative *wh*-construals can be formed in the scope of a subjective epistemic modal, because every time when the ForceP was occupied by a subjective epistemic modal through external merger, no room would be available for additional illocutionary force anymore. Thus, a structure like (116) and (117) can never tolerate the *wh*-operator.

To sum up, although the three generalizations of the Epistemic Interference Effect are at first sight mysterious, through this section, we have seen that they are in fact natural consequences and supportive evidences given the feature-centered cartographic account.

The overall theoretical framework offered here might be reminiscent of the LF movement approach in McDowell (1987), but, in fact, differs from it to a certain extend. On the one hand, according to McDowell's analysis, the modal operators have to be obligatorily moved to C(omp). This severe view on modal movement could have neglected the two asymmetries and their asymmetric interaction with SBEs and *wh*-operators. For example, it could have wrongly predicted the epistemic modals to always take widest scope. On the other hand, if the movement involved were taken place in LF, the ungrammatical Mandarin Chinese data would become problematic. Specifically, the LF movement approach should have predicted the EM$_{adv}$ to move across a SBE, resulted a grammatical structure with inverse scope. However, this is not true in Mandarin Chinese, where the ungrammatical data indicate that the derivation crashed in syntax. In this way, the LF movement approach seems to be less preferred.

5 Further Consequences

This section contains two short discussions. On the one hand, I will respond to the A/A′ distinction. On the other hand, the consequence of the analysis for contradiction on illocutionary force will be discussed.

5.1 The A/Ā-Distinction

One question left to be explained is why epistemic modals show no interference with the A-dependency, for example:

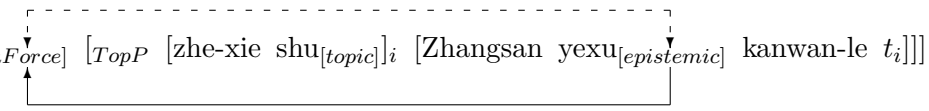
(118) a. Zhangsan$_i$ keneng renwei Lisi hen taoyan ta$_i$
Zhangsan may think Lisk very hate he
'Zhangsan$_i$ may think that Lisi hates him$_i$.'

b. Zhangsan$_i$ yexu renwei Lisi hen taoyan ta$_i$
Zhangsan perhaps think Lisk very hate he
'Zhangsan$_i$ perhaps thinks that Lisi hates him$_i$.'

As noted in von Fintel and Iatridou (2003), any radical intervention account could have neglected this feasibility. However, our account is not so radical since it is governed by the feature classification in the theory of revised relativized minimality (Rizzi 2004), which has suggested the A/A′-distinction *per se*. In (118b) the argument, *Zhangsan*, bears only the *argumental* type features, which would not block the feature movement of EM^{s}_{adv}. Besides, A-dependency, unlike A′-dependency, commonly involves no *quantificational* feature movement, and the epistemic modal in (118a) would not become an intervener. That is, without the feature of the same type, no featural intervention effect would be observed.

A further consequence here is that a constituent with *topic* feature is predicted not to become an intervener for $[\text{epistemic}]^{qtf}_{mod}$ feature movement, because *topic* feature is an independent special category (Rizzi 2004). Our discourse language can provide the desired example.

(119) Zhe-xie shu, Zhangsan yexu kanwan-le t_i.
this-CL book Zhangsan perhaps read-finish-Asp
'These books, Zhangsan perhaps has finished.'



In (119) the fronted DP as a topic does not block the $[\text{epistemic}]^{qtf}_{mod}$ feature movement. This is exactly what we expect and captured by the feature-centered account. Furthermore, if the feature system were not assumed, some additional assumption must be pursuit to capture the A/A′/Topic-distinction because topic position is neither a traditional A-position nor a normal A′-position.

5.2 More on Force

In the discussion of the three *wh* generalizations, we have seen that two illocutionary force elements would induce a contradictory competition for ForceP. As a consequence, a subjective epistemic modal is incompatible with a *wh*-expression. One prediction here is that a subjective epistemic modal is also incompatible with other illocutionary force related elements, for example:

(120) Wo shuo yao chi canting, ta zenme zhu-le wancan!
I say want eat restaurant he how-come cook-ASP dinner
'I said that (we) are going to the restaurant, how come he cooked for dinner.'

Zenme 'how come' in (120) is not an ordinary *wh*-expression. Rather, it expressed the counter expectation from the speaker with *exclamative* force. In (119) the speaker exclaimed the sentence since it was expected that no one should have cooked for dinner. (121) shows that this exclamative expression is compatible with an EM^{o}_{aux} exclusively, but not an EM^{s}_{adv}

(121) a. Wo shuo yao chi canting, ta zenme keneng$^{o}_{aux}$ zhu wancan!
I say want eat restaurant he how-come may cook dinner
'I said that (we) are going to the restaurant, how come he may have cooked for dinner.'

b. * Wo shuo yao chi canting, ta zenme yexu$^{s}_{adv}$ zhu wancan!
I say want eat restaurant he how-come perhaps cook dinner
'I said that (we) are going to the restaurant, how come he perhaps has cooked for dinner.'

The examples illustrate that the contradictory competition for ForceP is not an *ad hoc* stipulation for the interaction between epistemic modals and *wh*-questions. Rather, if a single clause contained more than one illocutionary force element, the clause would become unacceptable, because both of them would intend to type the clause through agreement, which is an ineligible process. Here is another example:

(122) a. Zhangsan juran keneng da-ying-guo Lisi!
Zhangsan unexpectedly may beat-win-ASP Lisi
'Unexpectedly, Zhangsan may have defeated Lisi.'
b. * Zhangsan juran yexu da-ying-guo Lisi!
Zhangsan unexpectedly perhaps beat-win-ASP Lisi
'Unexpectedly, Zhangsan perhaps has defeated Lisi.'

In (122a) the only illocutionary force element is the evaluative adverbial *juran* 'unexpectedly' (Tsai 2009a), and no contradiction is detected. On the contrary, in (122b) both *juran* and *yexu* are electable for [*u*force], but again there is no legitimate way to satisfy both of them, and thus this sentence crashed.

6 Concluding Remarks

The six issues discussed in this article are outlined as in (122).

(123) About Epistemic Containment:
a. The subjectivity/objectivity asymmetry.
b. The EM_{adv}/EM_{aux} asymmetry.
c. The mapping for modal syntax and semantics.
d. Asymmetric ECP effect Generalization.
e. Epistemic Interference Effects.
f. A/A′/Topic-distinction.

With respect to (123), Mandarin Chinese data are provided to investigate the status of the two asymmetries in the interaction between epistemic modals and SBEs, which yields the Asymmetric ECP Effect Generalization and the Epistemic Interference Effects to be explicated. To solve the puzzles, I offered a feature-centered cartographic account, based on the theory of revised relativized minimality (2004) and the novel agreement-movement approach in Miyagawa (2010). As we have seen, the account not only explained the puzzles but also brought out the desired consequence such as the mapping for the two asymmetries and the A/A′-distinction. However, various related issues are still left open, for example, the modal typology about the notion of subjectivity. Nevertheless, (123), I think, is still crucial for future researches.

References

[1] Abels, Klaus. 2012. The Italian left periphery: A view from locality. *Linguistic Inquiry* 43: 229-254.

[2] Anand, Pranav, and Dannis Tang. 2004. Redistributing *dou*: cleaving exhaustivity from distributivity. In *Proceedings of the 23rd WCCFL*, ed. Vineeta Chand et al., 15-28.

[3] Anand, Pranav, and Valentine Hacquard. 2009. Epistemics with attitude. In *Proceedings of SALT 18* ed. Tova Friedman and Satoshi Ito. 19-36.

[4] Aoun, Joseph, and Y.-H. Audrey Li. 1993. *Syntax of scope.* Cambridge, MA: MIT Press.

[5] Beck, Sigrid. 1996. *Wh*-constructions and transparent Logical Form. Ph.D. diss., University of Tuebingen.

[6] Beck, Sigrid. 2006. Intervention effects follow from focus interpretation. *Natural Language Semantics* 14: 156.

[7] Beck, Sigrid, and Shin-Sook Kim. 1997. On *wh*- and operator scope in Korean. *Journal of East Asian Linguistics* 6: 339384.

[8] Butler, Jonny. 2003. A minimalist treatment of modality. *Lingua* 113: 967-996.

[9] Cheng, L.-S. Lisa. 1991. On the typology of *wh*-questions. Ph.D. diss., MIT.

[10] Cheng, L.-S. Lisa. 1995. On dou quantification. *Journal of East Asian Linguistics* 4: 197-234.

[11] Chomsky, Noam. 1981. *Lectures on Government and Binding.* Dordrecht, Netherlands: Foris.

[12] Chomsky, Noam. 2001. Derivation by phase. In *Ken Hale: A life in language*, ed. Michael Kenstowicz, 1-52. Cambridge, MA: MIT Press.

[13] Chomsky, Noam. 2005. Three factors in language design. *Linguistics Inquiry* 36: 1-22.

[14] Chomsky, Noam. 2006. On phases. In *Foundational issues in linguistic theory*, ed. Robert Freidin, Carlos Otero, and Maria-Luisa Zubizaretta. Cambridge, MA: MIT Press.

[15] Chomsky, Noam. 2007. Approaching UG from Below. *In Interfaces + recursion = language?: Chomsky's minimalism and the view from syntax-semantics*, ed. Uli Sauerland and Hans-Martin Gartner, 1-29. New York: Mouton de Gruyter.

[16] Cinque, Guglielmo. 1999. *Adverbs of functional heads: a cross-linguistic perspective.* New York: Oxford University Press.

[17] Cinque, Guglielmo. 2006. Restructuring and functional heads. In *Structures and beyond: The cartography of syntactic structures*, ed. Adriana Belleti, vol. 3, 132-191. New York: Oxford University Press.

[18] Drubig, Hans Bernhard. 2001. On the syntactic form of epistemic modality. Ms. Available at http://www.sfb441.uni-tuebingen.de/b2/papers/DrubigModality.pdf

[19] von Fintel, Kai, and Sabine Iatridou. 2003. Epistemic containment. *Linguistic Inquiry* 34: 173-198.

[20] Fox, Danny. 2000. *Economy and semantic interpretation.* Cambridge, MA: MIT Press.

[21] Hamblin, C. L. 1973. Questions in Montague English. *Foundations of Language* 10: 41-53.

[22] Huang, C.-T. James. 1982. Logical relations in Mandarin Chinese and the theory of grammar. Ph.D. diss., MIT.

[23] Huitink, Janneke. 2008. Scope over epistemics in English and Dutch. In *Current issues in unity and diversity of languages, collection of the papers selected from the CIL* 18: 2077-2089. Korea University, Seoul, Korea.

[24] Iatridou, Sabine. 1990. The past, the possible, and the evident. *Linguistic Inquiry* 21: 123-135

[25] Jackendoff, Ray. 1972. *Semantic interpretation in generative grammar*. Cambridge, MA: MIT Press.

[26] Karttunen, Lauri. 1977. Syntax and semantics of questions. *Linguistics and Philosophy* 1: 3-44.

[27] Kim, Shin-Sook. 2002. Intervention effects are focus effects. *Japanese/Korean Linguistics* 10: 615628.

[28] Kratzer, Angelika. 1977. What 'must' and 'can' must and can mean. *Linguistics and Philosophy* 1: 337-355.

[29] Kratzer, Angelika. 1991. Modality. In *Semantics: An international handbook of contemporary research*, ed. Von Stechow, A and Wunderlich, D., 639-650. Berlin: de Gruyter.

[30] Krifka, Manfred. 2001. Quantifying into question acts. *Natural Language Semantics* 9: 1-40.

[31] Li, Y.-H. Audrey. 1992. Indefinite *wh* in Mandarin Chinese. *Journal of East Asian Linguistics* 1: 125-155.

[32] Lin, Jo-wang. 1996. Polarity licensing and *wh*-phrase quantification in Mandarin Chinese. Ph.D. diss., UMass.

[33] Lin, Jo-wang. 1998a. On existential polarity *wh*-phrases in Mandarin Chinese. *Journal of East Asian Linguistics* 7. 219-255.

[34] Lin, Jo-wang. 1998b. Distributivity in Mandarin Chinese and its implications. *Natural Language Semantics* 6: 201-243.

[35] Lin, Jo-wang. 2004. Choice function and scope of existential polarity *wh*-phrases. *Linguistics and Philosophy* 27: 451-491.

[36] Lin, Jo-wang, and C.-C. Jane Tang. 1995. Modals as verbs in Mandarin Chinese: A GB perspective. *Bulletin of the Institute of History and Philology Academia Sinica* 66: 53105.

[37] Lin, T.-H. Jonah, and W.-H. Karen Tseng. 2010. M-merger and the A-not-A questions in Mandarin Chinese. Paper presented in the 18th IACL. USA: Harvard University.

[38] Lin, T.-H. Jonah. 2011. Finiteness of Clauses and Raising of Arguments in Mandarin Chinese. *Syntax* 14: 48-73.

[39] Lyons, John, 1977. *Semantics*. Cambridge: Cambridge University Press.

[40] May, Robert. 1985. *Logical form: its structure and derivation*. Cambridge, MA: MIT Press.

[41] McDowell, Joyce. 1987. Assertion and Modality. Ph.D. Diss., University of Southern California.

[42] Miyagawa, Shigeru. 2010. *Why agree? Why move? Unifying agreement-based and discourse-configurational languages*. Cambridge, MA: MIT Press.

[43] Nuyts, Jan. 2001. Subjectivity as an evidential dimension in epistemic modal expressions. *Journal of Pragmatics* 33: 383400.

[44] Papafragou, Anna. 1998. Inference and word meaning: The case of modal auxiliaries. *Lingua* 105: 1-47.

[45] Papafragou, Anna. 2006. Epistemic modality and truth conditions. *Lingua* 116: 1688-1702.

[46] Pesetsky, David. 1987. Wh-in-situ: Movement and unselective binding. In *The representation of (in)definiteness*, ed. Eric J. Reuland and Alice ter Meulen, 98129. Cambridge, MA: MIT Press.

[47] Pesetsky, David. 2000. *Phrasal movement and its kin*. Cambridge, MA: MIT Press.

[48] Pesetsky, David, and Esther Torrego. 2007. The syntax of valuation and the interpretability of features. In *Phrasal and clausal architecture: Syntactic derivation and interpretation*, ed. S. Karimi, V. Samiian and W.Wilkins, 262-294. Amsterdam: Benjamins.

[49] Reinhart, Tanya. 2006. Interface strategies: Optimal and costly computations. Cambridge, MA: MIT Press.

[50] Rizzi, Luigi. 1990. Relativized Minimality. Cambridge, MA: MIT Press.

[51] Rizzi, Luigi. 1997. The fine structure of the left periphery. In *Elements of grammar*, ed. Liliane Haegeman, 281-337. Dordrecht: Kluwer Academic Publishers.

[52] Rizzi, Luigi. 2001. On the position "Int(errogative)" in the left periphery of the clause. In *Current studies in Italian syntax, essays offered to Lorenzo Renzi*, eds. Guglielmo Cinque and Giampaolo Salvi, 287-296. Amsterdam: Elsevier.

[53] Rizzi, Luigi. 2004. Locality and left periphery. In *Structures and beyond: The cartography of syntactic structures*, ed. Adriana Belletti, vol. 3, 223-251. New York: Oxford University Press.

[54] Ross, John, R. 1970. On declarative sentences. In *Readings in English Transformational Grammar*, ed. R.A. Jacobs and P.S. Rosenbaum, pp. 222-272. Washington: Georgetown University Press.

[55] Soh, Hui-Ling. 2005. Wh-in-situ in Mandarin Chinese. Linguistic Inquiry 36: 143155.

[56] Starke, Michal. 2001. Move Dissolves into Merge: a theory of locality. Ph.D. dissertation, Universityof Geneva.

[57] Stepanov, Arthur, and W.-T. Dylan Tsai. 2008. Cartography and licensing of *wh*-adjuncts: A crosslinguistic perspective. *Natural Language and Linguistic Theory* 26: 589-638.

[58] Tancredi, Christopher. 2007. A multi-model modal theory of I-semantics. Ms. University of Tokyo.

[59] Tomioka, Satoshi. 2007. Pragmatics of LF intervention effects: Japanese and Korean interrogatives. *Journal of Pragmatics* 39: 15701590.

[60] Tsai, W.-T. Dylan. 1999. On economizing the theory of A-bar dependencies. Ph.D. diss., MIT.

[61] Tsai, W.-T. Dylan. 2008. Left-periphery and *how-why* alternation. *Journal of East Asian Linguistics* 17: 83-115.

[62] Tsai, W.-T. Dylan. 2009a. High Applicatives are not high enough: A cartographic solution. Paper presented in FOSS-6. Taiwan: National Taiwan Normal University.

[63] Tsai, W.-T. Dylan. 2009b. Actuality entailments and the topography of Mandarin Chinese modals. Paper presented in the 7th GLOW in Asia. India: English and Foreign Languages University, Hyderabad.

[64] Tsai, W.-T. Dylan. 2010. EPP as a *Topic* feature: evidence from Mandarin Chinese applicatives, modals, and refutory *wh*s. Paper presented in the 8th GLOW in Asia. China: Peking University.

[65] Tseng, W.-H. Karen. 2010. Generalized post-syntactic movement in Mandarin Chinese. MA Thesis, National Tsing Hua University.

[66] Westmoreland, Robert. 1998. Information and intonation in natural language modality. Ph.D. diss., Indiana University.

[67] Yang, C.-Y. Barry. 2002. Quantification and its scope interpretation in Mandarin Chinese. MA Thesis, National Tsing Hua University.

[68] Yang, C.-Y. Barry. 2008. Intervention effects and the covert component of grammar. Ph.D. diss., National Tsing Hua University.

[69] Yang, C.-Y. Barry. 2012. Intervention effect and *wh*-construal. *Journal of East Asian Linguistics* 21: 43-87

[70] Zhang, N. Niina. 1997. Syntactic dependencies in Mandarin Chinese. Ph.D. Diss. University of Toronto.