

A Note on the Epistemic Containment Principle

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1. Introduction

When a sentence contains two scopal elements, the sentence may allow two interpretations. For example, sentence (1) contains two quantifiers, *someone* and *everyone*:

(1) Someone likes everyone.

(1) allows two interpretations: the wide scope reading of *someone* over *everyone*, and the narrow scope reading of *someone* with respect to *everyone*. Scopal ambiguities as in (1) are attributed to the operation called *Quantifier Raising (QR)* at LF.

Let us consider the scope relation when a sentence contains a modal element and a quantifier phrase (QP). In the sentence that contains a deontic modal and QP, a quantifier shows scope ambiguity with respect to a deontic modal. Sentence (2) is from von Stechow and Iatridou (2003):

(2) Most of our students must get outside funding.

The ambiguity of sentence (2) is brought about by the different continuations as in (3):

- (3) a. for the department budget to work out.
b. the other have already been given university fellowships.

With (3a), sentence (2) has a wide scope interpretation of *must* over *most*, i.e., *for the budget to work, it needs to be the case that most of the students get outside funding*. With (3b), sentence (2) a narrow scope interpretation of *must* with respect to *most*, since the obligation is imposed on those specific students who have not already been given fellowships. The two scope relations in sentence (2) in combination with (3a) and (3b) are schematically shown in (4a) and (4b) respectively:

- (4) a. must (most of our students get outside funding)
 b. most of our students x (x must get outside funding)

von Fintel and Iatridou (2003) argue that in a sentence that contains an epistemic modal and a quantifier, a wide scope interpretation of an epistemic modal over a quantifier is only possible.

- (5) Most of our students must be home by now.

In sentence (5), for example, the quantifier *most* takes narrow scope with respect to the epistemic modal *must*, and thus the sentence is paraphrased only as *it is certain that most of our students are home now*. It cannot take wide scope over the epistemic modal.

On the basis of the observation above, von Fintel and Iatridou (2003) make the following descriptive generalization:

- (6) *Epistemic Containment Principle (ECP)* (preliminary)
 A quantifier cannot have scope over an epistemic modal.

They claim that the ECP is a constraint that blocks QR.

In this paper, I will consider the validity of the ECP and point out some problems. In section 2, I will review some pieces of evidence which are provided by von Fintel and Iatridou (2003). In section 3, I will give supporting data from Japanese for the ECP and claim that the ECP seems to be a universal constraint. In section 4, I will point out some data against the ECP and show that negative quantifiers do not obey the constraint. Section 5 will summarize the paper.

2. Epistemic Containment Principle (ECP)

In this section, I review the claims by von Fintel and Iatridou (2003). Let us consider sentence (7). Sentence (7) apparently allows two interpretations, as shown in (8):

- (7) Every student may have left.
 (8) a. every student x (may x have left)
 b. may (every student have left)

In order to examine whether two interpretations are actually possible, the following context is provided: We are standing in front of an undergraduate residence at the Institute. We do not know where particular students live but we know they all turn their lights off when they leave.

Now some lights are on and some are off. We know that not all of the students are out. It could be that all of them are home and the ones whose lights are off may already be asleep. It is also possible that some of them are away.

Given this background, sentence (7) is judged to be false. The ECP prohibits the wide scope reading of the quantifier *every* as in (8a), which is true in the context given above.¹ On the other hand, the ECP allows the wide scope reading of the quantifier *every* as in (8b). This interpretation is not contextually allowed.

The ECP must be stated as a condition that is concerned specifically with the scopal interaction between an epistemic modal and a quantifier, because epistemic modals do not block other types of binding of variables across them. von Fintel and Iatridou (2003) point out that there are three types of counterexample against the intervention effect of an epistemic modal. First, a *wh*-trace can bind its trace across an epistemic modal:

(9) Who_i must she have hired t_i for that job?

In sentence (9), the epistemic modal *must* does not block the operator-variable chain (who, t_i).

Second, in a multiple *wh*-question in English, an epistemic modal does not block *wh-in-situ* dependencies:

(10) Who₁ said that Susan must have talked with who₂?

In sentence (10), *who*₂ can take matrix scope, which gives rise to the pair-list reading.

Third, a quantifier can bind a pronoun across an epistemic modal:

(11) Every student_i is convinced that I think that the dean may well expel him_i.

von Fintel and Iatridou (2003) conclude that the ECP must be stated as a condition that prohibits LF-raising of a quantifier across an epistemic modal. This is formalized in the following way:

(12) *The ECP as a condition on QR*

At LF, a quantifier cannot bind its trace across an epistemic modal.

*Q_i ... [Epistemic Modal (... t_i ...)]

¹ von Fintel and Iatridou (2003) give the following clear example in which the wide scope interpretation of the quantifier *every* is forced but is ruled out by the ECP, which is indicated by the contradictory continuation:

(i) *Every student may have left but not every one of them has.
They argue that they expect a feeling of contradiction.

When a quantifier phrase occurs in a subject position at S-structure, as in sentence (13), the subject QP always precedes the epistemic modal. von Stechow and Iatridou claim that the ECP forces the subject QP *every student* to be reconstructed at LF and interpreted at the trace position, which is below the modal *must*:

(13) Every student_i must have t_i left.

3. Supporting Evidence for the ECP from Japanese

In this section, I give some examples from Japanese that support the ECP. Let us consider sentence (14), which contains the deontic modal *te(mo)ii* ('may') and the quantifier *hotondono*, which is equivalent to the English quantifier *most*:²

(14) hotondono gakusei-ga ie-ni i te(mo) ii.
most *student-Nom home-Dat* *be* *may*
 'Most of the students may be home.'

As in English, sentence (14) allows two interpretations: the wide scope reading of the deontic modal *te(mo)ii* over the quantifier *hotondono*, which is paraphrased as *it needs to be the case that most of the students are home*, and the narrow scope reading of the deontic modal, in which the permission is imposed on the specific students.

In the sentence which contains an epistemic modal and a quantifier, the ECP predicts that only the wide scope reading of the epistemic modal over the quantifier is possible if it is a universal constraint on a scopal interaction of quantifiers with epistemic modals. Thus, for example, the ECP predicts that sentence (15) only has a reading in which the quantifier is in the scope of the epistemic modal:

(15) hotondono gakusei-ga ie-ni iru kamosirenai.
most *student-Nom home-Dat* *be* *may*
 'Most of the students may be home.'

Sentence (15) contains the quantifier *hotondono* and the epistemic modal *kamosirenai*, which corresponds to English auxiliary *may*. (15) can only be paraphrased as *it may be the case that most of the students are at home*. Narrow scope of *kamosirenai* with respect to

² Japanese modal elements consist of several morphemes, contrary to English modal auxiliaries. *Te(mo)ii* means permission and corresponds to the English modal auxiliary *may*. *Kamosirenai* indicates the low degree of the confidence of a speaker and corresponds to the English auxiliary *may*. As for the detailed discussion of the internal structures of Japanese modal elements, see Yamamoto (2001).

hotondono is impossible: in this scope relation, the particular students who are likely to be home are focused on and they are in the majority.

It seems to be hard to figure out what the relative scope of *hotondono* and *kamosirenai* in (15) is like, let us consider a clearer example. Sentence (16), which contains the QP *dono gakusei-mo*, which means *every student*, is pragmatically odd:

- (16) #*dono gakusei-mo kurasu-de mottomo se-ga-takai.*
 which *student-MO class-in the most tall*
 ‘Every student is the tallest in the class.’

Sentence (17) contains the QP *dono gakusei-mo* and *kamosirenai*. Logically, the sentence allows two scope relations as shown in (18). My informants, however, judge the sentence unacceptable with either reading of (18):

- (17) #*dono gakusei-mo kurasu-de mottomo se-ga-takai kamosirenai.*
 which *student-MO class-in the most tall may*
 ‘Every student may be the tallest in the class.’
- (18) a. every student x (may x be the tallest)
 b. may (every student be the tallest)

The ECP allows sentence (17) to have only the scope relation in (18b). It is, however, pragmatically odd, on a par with the oddness in sentence (17).

Let us consider another clearer example. In sentences (19), the quantifier obligatorily takes wide scope over the modal:^{3,4}

- (19)a. *Mary-wa [dare-ga kite-(mo-) yokute]-mo odoroka-nai*
Mary-Top who-Nom come-(MO-) may-MO be-surprised-NEG
 ‘Mary is not surprised who may come.’
- b. **Mary-wa [dare-ga kuru-kamoshirenakute]-mo odoroka-nai*
Mary-Top who-Nom come-may-MO be-surprised-NEG
 ‘Mary is not surprised who may come.’

Sentence (19b) is ungrammatical, as the ECP predicts.

³ There is somewhat individual difference about the acceptability of sentence (16a). Some informants claim that the sentence is slightly deviant.

⁴ I assume that the *mo*-construction involves a universal quantifier and takes sentential scope.

4. A Sentence Containing a NegQP and an Epistemic Modal

As seen in section 2, in a sentence which contains a subject QP and an epistemic modal, the ECP forces the subject QP to be in the scope of the epistemic modal. Thus the subject QP must undergo reconstruction at LF. When a subject QP is a negative QP (NegQP), however, as in (20), the sentence is ungrammatical:

(20) *Nobody may have pushed him.

The ECP predicts that sentence (20) is grammatical when the NegQP *nobody* is reconstructed at LF and is interpreted in the scope of the modal *may*. von Fintel and Iatridou (2003) add the constraint on reconstruction as below:⁵

(21) *Constraint on Reconstruction*

Negative quantifiers cannot undergo short or long scope diminishment.

Sentence (20) is ungrammatical because it violates constraint (21). Of course, it does not have the wide scope interpretation of the epistemic modal *may* because of the ECP.

Let us consider a sentence which contains a NegQP and another epistemic modal. Sentence (22) involves the subject NegQP *nobody* and the epistemic modal *must*. It is predicted ungrammatical based on the claims made by von Fintel and Iatridou. It is, however, almost acceptable:

(22) ?Nobody must be home.

Sentence (22) only allows the wide scope reading of the epistemic modal *must*. The analysis presented by von Fintel and Iatridou cannot explain the scope relation possible in sentence (22).

There are other examples against the analysis by von Fintel and Iatridou (2003). When QP occurs in the object position, the ECP predicts that all object QPs are interpreted in the scope of an epistemic modal. Let us consider the sentences in (23), which only take wide scope of the epistemic modal over the NegQP:

- (23) a. Mary must help nobody.
b. Mary need help nobody.

⁵ von Fintel and Iatridou identify this constraint in agreement with Lasnik's (1999) claim that there is no scope diminishment (reconstruction) in certain environments.

In sentences (23), the epistemic modals *must* and *need* take wide scope over the NegQP *nobody* and the sentences are paraphrased as *it is certain that Mary helps nobody*.

Not all object QPs, however, take narrow scope. The sentences in (24) only have the narrow scope interpretation of the epistemic modal:⁶

- (24) a. Mary may help nobody.
- b. Mary can help nobody.

Sentences (24) violate the ECP and both of them are paraphrased as *there is no one who is likely to be helped by Mary*. The scope relation in sentences (23) cannot be explained by the ECP, either. Furthermore, the ECP cannot explain the difference in scope relation between *must-NEG* and *need-NEG*, and between *may-NEG* and *can-NEG*. Taking the scope relations in sentences (23) and (24) into consideration, it can be said that scope relation between an object NegQP and a modal is uniquely determined in terms of the meaning of the modal in question.⁷

5. Summary

In this paper, I have examined the validity of the ECP. The ECP can explain scope relation of examples of Japanese and English, but there are not a few data that cannot be explained by the ECP, and the ECP cannot explain the distribution of NegQPs. I have

⁶ It is said that negation cannot have scope over epistemic modals. Let us consider the following examples:

- (i) a. John must not be at home.
- b. John may not be at home.

In sentences (i), the epistemic modals *must* and *may* cannot take narrow scope under the negative marker *not*. von Fintel and Iatridou (2003), however, argue that there are epistemic modals that are almost specialized as taking narrow scope, as shown in sentences (ii):

- (ii) a. John need not be home.
- b. John can't be home

In sentences (ii), the epistemic modals *need* and *can* are in the scope of *not* and the contracted form *n't*, respectively.

von Fintel and Iatridou (2003) give sentences (iii) in order to examine whether the quantifier can take wide scope over the negative marker and the epistemic modal since quantifiers can have wide scope over negation, as shown in sentences (ii):

- (iii) a. Every student can't be home.
- b. Every student need not be home.

Both in (iii) and in (ii), the quantifier *every* takes narrow scope. von Fintel and Iatridou (2003) claim that the ECP block the wide scope interpretation of the quantifier *every*.

von Fintel and Iatridou (2003) show the scope relation among epistemic modals, negation, and quantifiers, but they give no examples that contain a NegQP in a object position.

⁷ Yamamoto(2001) claims that the relative scope between a modal and a negative marker is determined by polarity sensitivity of an individual modal. Modals of necessity such as *must* are positive polarity items and take wide scope over the negative marker, and modals of possibility such as *need* and *can* are negative polarity items and take narrow scope with respect to the negative marker.

suggested that the relative scope between a modal and a NegQP is determined by semantic properties of individual modals.

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