

Embedded questions and quantificational variability effects in Korean*

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Hong, Minpyo. 2015. Embedded questions and quantificational variability effects in Korean. *Linguistic Research* 32(3), 607-630. This paper provides a few descriptive generalizations about the constructions that show the quantificational variability effects (QVEs) in Korean and an informal discussion on their theoretical implications. Specifically, it is noted that indirect yes/no questions as well as wh-questions embedded under factive verbs show the QVE when an entity-denoting individual variable, explicit or implicit, is available. That is, the QVE reading is allowed in any type of wh-questions regardless of the type of the wh-phrases or the nature of their embedded predicates (stativity, telicity, or durativity, etc.) while yes/no questions based on individual-level predicates or generic statements do not show the QVE even if they are embedded under factive verbs. The paper also argues for an approach to the QVE that does not rely on the factivity presupposition that arises from the matrix predicate. (Myongji University)

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1. Introduction: Quantificational variability effects

Since Berman's (1991) contribution to our understanding of the semantics of indirect questions in English, it is well known that some embedded questions show the so-called quantificational variability effects (QVE) in many languages. According to Berman (1991), the wh-phrase of the embedded question in (1a) below, is interpreted in such a way that it assumes the quantificational force of the adverbial quantifier *usually* of the matrix clause, giving rise to the paraphrase in (1b), with its rough logical form translation as in (1c):

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- (1) a. The principal usually finds out which students cheat on the final exam.
 b. For most students who cheat on the final exam, the principal finds out of them that they cheat on the final exam.
 c. MOST_x [student'(x) & cheat'(x)] [find-out'(p, [student'(x)&cheat'(x)])]

That is, the quantificational force of the wh-phrase in the embedded clause is determined by the quantificational adverbial of the matrix clause, and accordingly such a phenomenon is dubbed quantificational variability: the wh-word assumes the quantificational force that comes from somewhere else, mostly from across the clausal boundary. Such a variability effect is observed in the following examples, too:

- (2) a. Sue mostly remembers which of her birthday presents arrived special delivery.
 b. With few exceptions, Mary knows which students submitted which abstracts to which conference.
 c. Bill seldom acknowledges which colleagues he gets a good idea from.
 d. John mostly discovered which books were stolen from the library.

Note, for example, that (2a) above can be paraphrased as 'For most of Sue's birthday presents that arrived special delivery, she remembers that they arrived special delivery.' That is, the domain of quantification or the restrictor for the matrix adverbial quantifier 'mostly' comes from the wh-phrase of the indirect question. Similarly, multiple wh-questions show the same behavior as witnessed in (2b): the multiple occurrences of wh-phrases seem to be quantificationally bound by the matrix quantifier 'few.' Syntactically, these constructions seem to support the long-distance quantificational relation across the otherwise inviolable syntactic islands.

Semantically, the QVE is an interesting phenomenon since the denotation of a question or an interrogative clause, be it direct or indirect, is characterized by its peculiar semantic type. It is obvious that a question should denote an object of a semantic type that is different from a regular declarative sentence whose semantic

type is $\langle s, t \rangle$, i.e., a proposition or a set of possible worlds. Thus, for example, Hamblin (1973) defines the meaning of an interrogative sentence, distinct from that of a declarative, as the set of propositions or the set of possible answers to the question. Karttunen (1977) proposes to modify Hamblin's denotation set in such a way that it only contains the propositions that would count as *true* answers to the question. Groenendijk & Stokhof (1984) argue that a question should denote a partition of possible worlds. One of the questions regarding the constructions that show QVE is: How can we associate the matrix adverbial quantifier with the *wh*-phrase inside a semantic object that denotes a totally different kind, or how is it possible for a quantifier to quantify over a domain inside a question denotation? To account for the QVE of *wh*-phrases in indirect questions, Berman (1991) proposed that some English *wh*-words be treated as a kind of indefinite, in Heim's (1982) sense, and that the indefiniteness of the *wh*-word introduces a free variable so that the embedded question denotes an open proposition.

It is interesting to note that the QVE or the long-distance association between an embedded *wh*-phrase and the matrix adverbial quantifier shows up only in a limited set of contexts, namely when they are embedded under a factive predicate of the matrix clause, as observed by Berman (1991) himself and earlier by Kiparsky & Kiparsky (1971). As shown below, non-factive predicates like *wonder* do not allow such effects:

- (3) The principal usually wonders which students cheat on the final exam.

Here, the matrix adverb *usually* is no longer understood as quantifying over the set of students who cheat on the final exam. Rather, it is interpreted as a frequency adverb that modifies the matrix verb. Thus, factivity seems to be the main element in determining whether a *wh*-phrase will display QVE or not.

Factivity is indeed what Berman relies on for his account of the QVE. Due to the factive nature of the matrix predicates in these constructions, in Berman's analysis, the truth of the complement clause is presupposed and consequently the presupposition is mapped to the restrictor, providing the domain of quantification for the adverbial quantifier. Such an accommodation of presuppositions was well documented. For example, Schubert & Pelletier (1989) noted that the adverbial quantifier *always* in (4) below should be understood as quantifying over the situations in which a cat is dropped:

(4) A cat always lands on its feet.

That is, the domain of quantification for *always* is not explicitly provided in the sentence but comes from the fact that the sentence should be evaluated with respect to the background where a cat is dropped. So, presuppositions often provide the domain of quantification for quantifiers. Note that Berman's presupposition-based account gives a plausible solution to why non-factive predicates such as *wonder* in (3) above do not show QVE: it is because the truth of the embedded clause is not presupposed, failing to provide the domain of quantification for the matrix adverbial.

Since Berman (1991), factivity of the matrix predicate has long been recognized as an important determinant of the quantificational variability in the literature.¹ An emerging question is: Are there any other factors, be they lexical, syntactic or semantic, that hinge on the quantificational variability, either by facilitating or delimiting the long-distance quantification? A careful examination of relevant constructions from Korean, a language that does not share any historical background or development with English, would shed an important light on our understanding of the phenomenon.

This paper examines the QVE that seems to arise in various constructions in Korean. Section 2 discusses the variability effects of embedded *wh*-interrogatives and *yes/no* questions in Korean, along with an examination of the influences that may come from various types of predicates in both embedded and matrix clauses as well as from the difference between adverbial quantifiers and classifier-based quantifiers in the matrix clause. It will be pointed out that some *yes/no* questions also display the QVE in Korean. Section 3 is devoted to the discussion of theoretical implications of the findings from section 2. Section 4 summarizes the main points and discusses a few residual issues involving the QVE in Korean embedded clausal constructions.

2. Embedded questions

This section examines various factors that seemingly hinge on the QVE in Korean embedded questions. I begin with whether there is any difference between *wh*-questions and *yes/no* questions.

¹ However, see Lahiri (1991, 2002) and Beck & Sharvit (2002) for different approaches. A brief discussion of Lahiri's (1991, 2002) analysis is given below in section 3.

2.1 Question types: *wh*- vs. *yes/no* questions

When a *wh*-question is embedded in a matrix clause with a factive predicate, Korean *wh*-questions show the similar QVE, in line with English.² That is, the matrix quantificational adverbial is interpreted with respect to the domain of quantification provided by the *wh*-phrase of the embedded question, regardless of the type of *wh*-phrases involved in the sentence. Consider (5a) below, a Korean translation of (1a) above, where the quantificational domain for the matrix quantifier *taypwupwun* ‘most’ comes from the embedded question, giving rise to the rough logical form translation in (5b). That is, the sentence is understood as ‘for most persons that cheat (on the exam), the professor knows that the person cheats.’

- (5) a. Kyoswu-nun [nwu-ka khenningha-nunci] taypwupwun al-koissta.
 professor-Top. [who-Nom. cheat-Q] most know-Prog.
 ‘The professor mostly knows who cheats (on the exam).’
 b. MOST_x [person'(x) & cheat'(x)] [know'(p, [person'(x)&cheat'(x)])]

Note, however, that when the quantifier occurs inside the indirect question as in (6) below, it cannot quantify over the *wh*-phrase and sounds a bit awkward without an explicit domain for the quantifier. If the sentence is judged as acceptable at all, the only possible reading is that the professor knows who cheats in most of the exams, where the domain for the embedded quantifier comes from an implicit argument of ‘cheat’ in the embedded clause.

² A terminological note regarding my use of the term QVE is in order here before moving on to the discussion of Korean examples. To some authors (e.g., Yoon 2008, Kim & Kaufmann 2007, Gill, Harlow & Tsoulas 2004, among others) QVE refers to the phenomenon where the Korean *wh*-word combines with an additive particle *-to* ‘too’ or disjunctive particle *-na* ‘or’ and gives rise to an existential quantifier reading (negative polarity) or universal quantifier (free choice) readings. However, I do not consider such examples as illustrating the QVE, mainly because the nature of relevant particles *-to* ‘too’ and *-na* ‘or’ is not clearly defined in the literature. It is quite dubious to me whether the particles have any quantificational force at all. Thus I limit the term QVE in this paper to refer to the quantificational association across clausal boundaries between a *wh*-phrase and an adverbial quantifier. See Hong (2011) for a brief discussion on how to treat the disjunctive morpheme flanked by the indefinite (*anwu-na*) as a free choice item or a universal quantifier.

- (6) ?Kyoswu-nun [nwu-ka taypwupwun khenningha-nunci] al-koissta.
 professor-Top. [who-Nom. most cheat-Q] know-Prog.
 ‘?The professor knows who mostly cheats (on the exam).’

As far as native speakers' intuition tells, all other types of *wh*-phrases in the embedded question display similar QVEs, or allow a long distance association with the matrix quantifier. The effect is not dependent on the type of matrix quantifiers, either: *ta* ‘all,’ *taypwupwun* ‘mostly,’ *taykay* ‘usually,’ and *cenbwu* ‘all,’ *cokum* ‘a few/little’ allow such a reading as shown below.³

- (7) a. John-un [Mary-ka mwues-ul mekess-nunci] ta kiekha-koissta.
 John-Top. [Mary-Nom. what-Acc. ate-Q] all remember-Prog.
 ‘John all remembers what Mary ate.’
 ALL_x [thing'(x) & ate'(m,x)] [remember'(j, [thing'(x) & ate'(m,x)])]
- b. John-un [Mary-ka eti-ey kass-nunci] taykay kiekha-koissta.
 John-Top. [Mary-Nom. where-Loc. went-Q] usually remember-Prog.
 ‘John usually remembers where Mary went.’
 MOST_x [place'(x) & went'(m)(x)] [remember'(j, [place(x)&went'(m)(x)])]
- c. John-un [Mary-ka enjey khogolass-nunci] cokum kiekha-koissta.
 John-Top. [Mary-Mom. when snored-Q] some remember-Prog.
 ‘John remembers a little about when Mary snored.’
 SOME_x [time'(x) & snored'(m)(x)] [remember'(j, [time'(x) & snored'(m)(x)])]

Adnominal or adverbial *wh*-phrases such as *etten* ‘which,’ *ettehkhey* ‘how’ and even the reason *wh*-phrase, *way* ‘why,’ show the QVE, too. Consider the following sentences:⁴

³ For a discussion on classifier-based (numeral) quantifiers, see section 2.3 below.

⁴ In the logical form representation, I treat the adverbial *wh*-words ‘how’ in (8b) and ‘why’ in (8c) as if they were direct arguments of the embedded predicate for simplicity’s sake. Such a choice does not hinge on the main point though.

- (8) a. John-un [etten haksayng-i khenningha-nunci] taypwupwun
 John-Top. [which student-Nom. cheat-Q] mostly
 al-koissta.
 know-Prog.
 ‘John mostly knows which students cheat (on the exam).’
 MOST_x [student'(x) & cheat'(x)] [know(j, [student'(x)&cheat'(x)])]
- b. John-un [Mary-ka ettehkhey wus-nunci] taypwupwun al-koissta.
 John-Top. [Mary-Nom how smile-Q] mostly know-Prog.
 ‘John mostly knows how Mary smiles.’
 MOST_x [manner'(x) & smile'(m)(x)] [know(j, [manner'(x) & smile'(m)(x)])]
- c. John-un [Mary-ka way nuccamca-nunci] taypwupwun al-koissta.
 John-Top. [Mary-Nom. why oversleep-Q] mostly know-Prog.
 ‘John mostly knows why Mary oversleeps.’
 MOST_x[reason'(x)&oversleep'(m)(x)] [know(j,[reason'(x)&oversleep' (m)(x)])]

Incidentally, it is quite interesting that the reason wh-phrase *way* ‘why’ in (8c) above shows the similar effects in Korean given its otherwise peculiar behavior, e.g., their reluctance to form an negative polarity item with an additive particle (*nwukwu-to* ‘who-also’ vs. **way-to* ‘why-also’) or a free choice item with a disjunctive morpheme (*nwukwu-na* ‘who-or’ vs. **way-na* ‘why-or’).⁵

Unlike factive predicates, however, non-factive verbs in the matrix clause do not allow the QVE, again in line with the English examples. Compare the sentences above with the following:

- (9) a. ?John-un [nwu-ka sihem-ey hapkyekhays-nunci] taypwupwun
mwulessta.
 J.-Top. [who-Nom. exam-Loc. passed-Q] mostly asked
 ‘?John mostly asked (me) who passed the exam.’
- b. ?Kyoswu-nun [nwu-ka khenningha-nunci] taypwupwun kungkumhayssta.
 professor-Top. [who-Nom. cheat-Q] mostly wondered
 ‘?The professor mostly wondered who cheated (on the exam).’

⁵ See Yoon (2008) for a syntactic and diachronic discussion on why the reason *wh*-phrases do not readily allow for a negative polarity item formation or a free choice item combination, cross-linguistically.

Non-factive predicates like *mwutta* ‘ask’ or *kwungkumhayhata* ‘wonder’ show a sharp contrast with factives such as *alta* ‘know’ *moluta* ‘not-know’ *potohata* ‘report’ *malhata* ‘tell’ *alanayta* ‘discover’ etc. in that they do not allow the variability effects. So, an approximate generalization at this point is that Korean indirect *wh*-questions embedded under factive predicates show the QVE.

Let us now turn to *yes/no* questions and see if they give rise to similar effects. Surprisingly, Korean embedded *yes/no* questions do allow the matrix adverbial quantifier to quantify over the domain from the *yes-no* question. Consider the following:

- (10) a. John-un [Mary-ka khenningha-nunci] taypwupwun al-koissta.
 John-Top. [Mary-Nom. cheat-Q] mostly know-Prog.
 ‘John mostly knows whether Mary cheats (on the exam).’
 b. MOST_s [situation(s) & cheat'(m) in s] [know'(j, [cheat'(m) in s])]

The domain of quantification for the matrix adverbial here consists of the situations in which Mary’s cheating event takes place, which comes from the embedded *yes/no* question. That is, the sentence gives us the reading where for most situations in which Mary cheats, John knows that she cheats in that situation, as indicated in (10b), the same effect as we witnessed in *wh*-questions.⁶

What is different from the *wh*-question constructions, however, is the additional meaning element on top of (10b), which I would like to call the strong reading, namely that for most situations in which Mary does not cheat, John knows that she does not cheat in that situation (i.e., MOST_s [situation(s)&¬cheat'(m) in s] [know'(j, [situation(s)&¬cheat(m) in s])]). Such a tendency for strong interpretation can be made explicit when the embedded Q-morpheme is flanked by a negative alternative question marker, as shown below:

- (11) a. John-un [Mary-ka khenningha-nunci an-ha-nunci] taypwupwun
 al-koissta.
 John-Top. [Mary-Nom. cheat-Q not-do-Q] mostly know-Prog.
 ‘John mostly knows whether Mary cheats (on the exam) or nor.’

⁶ One of the referees points out that once a situation variable is introduced for a semantic description of sentences in (10) and (11), it should apply across the board, including the cases of *wh*-based questions discussed previously. I will leave the issue open for future work.

- b. MOST_s [situation(s)&cheat'(m) in s] [know(j, [cheat(m) in s])] &
 MOST_s [situation(s)& \neg cheat'(m) in s] [know(j, [\neg cheat(m) in s])]

Different tense markings in the matrix and/or embedded clauses point to the same conclusion as illustrated below:

- (12) John-un [Mary-ka tampai-lul phiwu-ess-nunci]
 John-Top. [Mary-Nom. cigarette-Acc. smoke-Pst-Q]
 taypwupwun kumpang alanayssta.
 mostly right away discovered
 'John mostly discovered/noticed right away whether Mary smoked.'

Native speaker intuition seems very clear in this case, particularly thanks to the temporal adverb *kumpang* 'right away' in the matrix clause: It means that, for most of the situations in which Mary smoked, John discovered right away that she smoked in those situations, along with its strong reading, namely that, for most of the situations in which Mary did not smoke, he discovered right away that she did not. The strong reading seems to be one of the characteristics of embedded yes/no questions in Korean since such a reading is not salient in *wh*-questions.

In sum, we have seen that Korean embedded questions, both *wh*- and yes/no questions, show the QVE when they are embedded in the matrix clause with a factive predicate. A novel observation made in this section is that yes/no questions do allow their implicit situation variables to enter into a quantificational relationship with the matrix adverbial quantifier. Another finding relevant to the embedded yes/no question interpretation in Korean is that yes/no questions seem to favor the strong interpretation.

2.2 Embedded predicates

While discussing the behavior of yes/no questions above, we saw that the situation variable of the embedded question enters into a quantificational relationship with the matrix quantifier, providing the domain of quantification for the matrix adverbial quantifier. Then, given the long-noted observation that a situation variable or an event variable is usually introduced by a certain class of predicates (e.g.,

Davidson 1967, Kratzer 2008), a natural question that arises at this point is: Does the nature of predicates matter, or how does the QVE interact with the type of predicates that occur in embedded questions? In this section, we will investigate the influence of predicate types on the interpretation of Korean embedded questions.

Let us begin with stative predicates as opposed to nonstatives. Our initial observation is that *wh*-questions are not sensitive to the stativity of their predicates. Both statives and nonstatives allow the quantificational variability, as illustrated below:

- (13) a. John-un [nwu-ka celm-unci] taypwupwun al-koissta.
 John-Top. [who-Nom. young-Q] most know-Prog.
 'John mostly knows who is young.'
- b. John-un [Mary-eykey mwues-i philyoha-nci] taypwupwun al-koissta.
 John-Top. [M.-Dat. what-Nom. need-Q] most know-Prog.
 'John mostly knows what Mary is in need of.'
- c. John-un [nwu-ka ttwuy-nunci] taypwupwun al-koissta.
 John-Top. [who-Nom. jump-Q] most know-Prog.
 'John mostly knows who jumps.'
- d. John-un [Mary-ka mwues-ul mek-nunci] taypwupwun al-koissta.
 John-Top. [Mary-Nom. what-Acc. eat-Q] most know-Prog.
 'John mostly knows what Mary eats.'

Stative predicates like being young (13a) or being in need of something (13b) do not show any difference from nonstatives such as 'jump' (13c) or 'eat' (13d): they both allow the quantificational association across the clausal boundary.

Note also that the lexical aspect or aktionsart of the predicate, regardless of its telicity or durativity, does not influence the variability effect either, which is illustrated in the following examples:

- (14) a. John-un [mwul-i eti-eyse say-nunci] taypwupwun al-koissta.
 J.-Top. [water-Nom. where-Loc leak-Q] most know
 'John mostly knows where the water leaks.'
- b. John-un [Mary-ka eti-lul ungsiha-nunci] taypwupwun al-koissta.
 J.-Top. [M.-Nom where-Acc. gaze-Q] most know
 'John mostly knows where Mary gazes at.'

- c. John-un [i ciyek-eyse nwu-ka cip-ul cic-nunci]
 J.-Top. [this area-Loc. who-Nom. house-Acc. build-Q]
 taypwupwun al-koissta.
 most know
 ‘John mostly knows who builds houses in this area.’
- d. John-un [kicha-ka ency tochakha-nunci] taypwupwun al-koissta.
 J.-Top. [train-Nom. when arrive-Q] most know
 ‘John mostly knows when the train arrives.’
- e. John-un [mwues-i theci-ess-nunci] taypwupwun al-koissta.
 J.-Top. [what-Nom. bang-Pst-Q] most know
 ‘John mostly knows what banged/exploded.’

Regardless of whether the predicate denotes activities like 'leak' in (14a) or 'gaze' in (14b), accomplishments like 'build a house' in (14c), achievements like 'arrive' in (14d), or even semelfactives like 'bang' in (14e), they all show the quantificational association between the embedded *wh*-words and the matrix quantifier.

When stative predicates appear in embedded yes/no questions, however, the variability effect seems to vary depending on further specifications of the predicate. When the predicate is an individual-level predicate, for example, it does not allow the quantificational variability.⁷ Compare the two sentences below:

- (15) a. ?John-un [Mary-ka celm-unci] taypwupwun al-koissta.
 John-Top. [Mary-Nom. young-Q] most know-Prog.
 ‘John mostly knows whether Mary is young.’
- b. John-un [Mary-eykey ton-i philyoha-nci] taypwupwun al-koissta.
 John-Top. [M.-Dat. money-Nom. need-Q] most know-Prog.
 ‘John mostly knows whether Mary is in need of money.’

⁷ One of the referees points out that (15a) sounds much better when the embedded subject *Mary* is replaced by *sonnim* ‘guest/customer’ as below:

- (i) ?John-un [sonnim-i celm-unci] taypwupwun al-koissta.
 John-Top. [guest-Nom. young-Q] most know-Prog.
 ‘John mostly knows whether guests/customers are young.’

It does seem to improve the acceptability, but for reasons of unclear origin, I still have reservations about the judgement.

Stage-level predicates however seem to show the variability effect, and thus the matrix *taypwupwun* 'most' in (15b) above is interpreted as quantifying over the domain of stages or situations in which Mary is in need of money: for most of the situations or incidents in which Mary needs money, John knows that she does in those situations. The lack of QVE in yes/no questions with individual level predicates is further evidenced in the following examples where the yes/no questions consist of predicates like *yenglihata* 'smart' or *meli-ka cohun saram-ita* 'be an intelligent person,' typical instances of individual-level predicates:⁸

- (16) a. ?John-un [Mary-ka yengliha-nci] taypwupwun al-koissta.
 John-Top. [Mary-Nom. smart-Q] most know-Prog.
 'John mostly knows whether Mary is smart.'
- b. ?John-un [Mary-ka meli-ka cohun saram-i-nci] taypwupwun al-koissta.
 John-Top. [Mary-Nom. brain-Nom. good person-be-Q] most know-Prog.
 'John mostly knows whether Mary is intelligent.'

Our observations above seem to lead us to safely conclude that Korean embedded yes/no questions with individual-level predicates do not display the QVE.

Next, let us further move on to generic statements in yes/no questions. Consider the following examples:

- (17) a. ?John-un [hay-ka tongccok-eyse ttu-nunci] taypwupwun al-koissta.
 John-Top. [sun-Nom. east-Loc. rise-Q] most know
 'John mostly knows whether the sun rises in the east.'
- b. ?John-un [saca-ka phoywudongmwul-i-nci] taypwupwun al-koissta.
 John-Top. [lion-Nom. mammal-be-Q] most know
 'John mostly knows whether lions are mammals.'
- c. ?John-un [cikwu-ka twungku-nci] taypwupwun al-koissta.
 John-Top. [Earth-Nom. round-Q] most know
 'John mostly knows whether Earth is round.'

⁸ The referee who mentioned (15a) also points out that the embedded subject somehow influences the acceptability of the sentences in (16), namely that the sentences become acceptable when the embedded subjects (*Mary*) are replaced by *haksaeng* 'student': e.g., *John-un [haksaeng-i yengliha-nci] taypwupwun al-koissta* "John mostly knows whether a student is smart." Here, I do agree with the referee but leave the issue for future work.

- d. ?John-un [sakwa-ka ta-nci] taypwupwun al-koissta.
 John-Top. [apple-Nom. sweet-Q] most know
 'John mostly knows whether apples are sweet.'

These examples indicate that all the generic sentences are judged deviant when they occur in embedded yes/no questions, defying the QVE.

A tentative generalization so far is that Korean wh-questions under factive predicates show the QVE, regardless of the type of wh-words or the type of embedded predicates. We noted even the reason wh-phrase *way* 'why' is subject to the QVE. However yes/no questions with individual-level predicates or generic statements do not allow the QVE. What does it imply? It apparently seems that various types of objects of semantic type *e* feed the domain of quantification for the matrix adverbial quantifier. That is, QVEs are expected in Korean when an entity-denoting individual, explicit or hidden, is available in the embedded question, regardless of whether it is an event, state, situation, degree, manner, or reason, to mention a few. This explains why all types of wh-questions freely allow the quantificational variability while only a limited set of yes/no questions show the variability effect. In wh-questions, the wh-phrase itself introduces the entity-denoting individual. In yes/no questions, it depends on whether the predicate can introduce a hidden situation or event variable. If the predicate in the embedded question can introduce an entity variable, as in the case of non-stative predicates, it shows the variability effect. Individual-level predicates and generic sentences do not show the variability effect because they fail to introduce such an entity-denoting individual.

2.3 Types of matrix quantifier: Classifiers vs. adverbials

In this section, we will see if variations in the kind of matrix quantifier will affect the quantificational variability of embedded questions.⁹ The variations I have in mind is the classifier-based quantifiers vs. adverbial quantifiers. So far, we have

⁹ My discussion of classifier-based quantifiers in this section is inspired by Tomioka (2014) and Tomioka (ms), in which he argues that Japanese embedded questions should be treated as a kind of nominal, not a clausal construction. I will remain neutral on the syntactic status of the Korean embedded questions. But see section 4 for a brief discussion on Tomioka's position.

considered only those examples in which the matrix quantifier does not involve classifiers. However, Korean is long noted for its rich morphology in measure words and classifiers, and it would be interesting to see if classifier-based quantifiers show the same effects. Let us consider the following, where *myeng*, an explicit classifier for humans is used instead of the neutral quantifier *taypwupwun* 'most':¹⁰

- (18) a. Kyoswu-nun [nwu-ka khenningha-nunci] yele myeng al-koissta.
 professor-Top. [who-Nom. cheat-Q] many CL know-Prog.
 'The professor knows many of who cheat (on the exam).'
- b. MANY_x [person'(x) & cheat'(x)] [know(p, [person'(x)&cheat'(x)])]

The sentence is acceptable as is, and the classifier phrase can indeed be associated with the wh-phrase of the embedded question, giving us the reading given roughly in (18b) above: For many of those who cheat (on the exam), John knows that they do. Note that the sentence becomes awkward when the classifier appears inside the embedded question. See below:

- (19) *Kyoswu-nun [nwu-ka yele myeng khenningha-nunci] al-koissta.
 professor-Top. [who-Nom. many CL cheat-Q] know-Prog.
 '(Int.)The professor knows of many who cheat (on the exam).'

It is not only the person classifier that is allowed in the construction. Various types of classifiers do seem to allow such a long-distance association. Consider the following:

- (20) a. John-un [Mary-ka etten umsik-ul cohaha-nunci] han twu kaci
 al-koissta.
 J.-Top. [M.-Nom. which food-Acc. like-Q] one two kind know-Prog.
 'John knows one or two kinds of food which Mary likes.'
- b. John-un [Mary-ka mwusun chayk-ul sass-nunci] se ne kwon
 allyecwuessta.

¹⁰ One of the referees is curious about the syntactic structure of (18a), presumably about the syntactic status of the classifier phrase in particular. As this paper is not concerned with a syntactic description of relevant sentences, I will simply remain silent about the issue.

- J.-Top. [M.-Nom. what book-Acc. bought-Q] three four CL informed
 ‘John informed (me) of a couple of books that Mary bought.’
- c. YTN-un [nwu-ka noymwul-ul patass-nunci] yele myong potohayssta.
 YTN-Top. [who-Nom. bribe-Acc. received-Q] many CL reported
 ‘YTN reported many of who was bribed.’

As far as the matrix classifier-based quantifier matches the semantic content of the embedded wh-phrase, the QVE is allowed. Contrary to the wh-questions, yes/no questions do not seem to readily allow such an association with a classifier-based quantifier, particularly when the classifier is applicable to one of the arguments of the embedded predicate. This is illustrated in the examples below:

- (21) a. *John-un [Mary-ka chayk-ul sass-nunci] se ne kwon allyecwuessta.
 J.-Top. [M.-Nom. book-Acc. bought-Q] three four CL informed
 ‘(Int.)John informed (me) of a couple of books that Mary bought.’
- b. *YTN-un [uywontul-i noymwul-ul patass-nunci] yele myeng
 potohayssta.
 YTN-Top. [congressmen-Nom. bribe-Acc. received-Q] many CL
 reported
 ‘(Int.)YTN reported many of the congressmen who was bribed.’

Here, the classifier *kwon* in (21a) is for books, and *myeng* in (21b) is for persons. And the sentences are judged as unacceptable. They contrast sharply with the following, where a non-classifier-based quantifier appears in the matrix clause, as we saw in the previous section:¹¹

- (22) a. John-un [Mary-ka chayk-ul sass-nunci] taypwupwun allyecwuessta.
 J.-Top. [M.-Nom. book-Acc. bought-Q] most informed
 ‘(Int.)John mostly informed (me) whether Mary bought books.’
- b. YTN-un [uywontul-i noymwul-ul patass-nunci] taypwupwun
 YTN-Top. [congressmen-Nom. bribe-Acc. received-Q] most

¹¹ Note, however, that the matrix quantifier does not quantify over the books (in 22a) or congressmen in (22b), but over the events or situations in which the embedded clause holds true, as we saw earlier.

potohayssta.

reported

‘(Int.)YTN mostly reported whether the congressmen were bribed.’

Interestingly, however, when the matrix classifiers express an incident or situation denoted by the embedded predicate, they often allow the quantificational variability, especially when the classifier phrase is case-marked by the matrix verb, as shown in the following examples:

- (23) a. YTN-un [Lee uywon-i noymwul-ul patass-nunci] twue ken-ul
 YTN-Top. [Rep. Lee-Nom. bribe-Acc. received-Q] a couple CL-Acc.
 potohayssta.
 reported
 ‘Int.)YTN reported a couple of cases of whether Rep. Lee was bribed.’
- b. John-un [Mary-ka tampai-lul phiwess-nunci] han twu ken-ul
 J.-Top. [M.-Nom cigarette-Acc. smoked-Q] one two CL-Acc.
 alanayssta.
 discovered
 ‘John discovered a few of Mary's smoking incidents.’

Here, the classifier *ken*, which is applicable to events, cases, occasions, or incidents, does seem to allow a quantificational association with the events denoted by the embedded yes/no questions, as shown in the English translations above. This is in line with our generalization in the previous section: In embedded yes/no questions, the domain of quantification for the matrix quantifier is provided by the covert variable introduced by the embedded predicate. Thus, when the semantic type of the variable introduced in the embedded question agrees with that of the classifier denotation of the matrix quantifier, the sentence is judged as acceptable.

2.4 Unselected indirect questions

There is an interesting class of interrogative sentences in Korean whose morpho-syntax resembles ordinary embedded questions but their interpretation is quite different from the regular indirect questions. They are what Kim & Tomioka

(2014) call 'unselected embedded questions.' In this section, we will briefly see if they also show the QVE. Consider the following sentences:

- (24) a. [Pam sai-ey pi-ka oass-nunci] matang-i ceceissta.
 [night during-Loc. rain-Nom. came-Q] ground-Nom. wet
 '(I wonder) whether it rained overnight, (as) the ground is wet.'
- b. [Mwuel mekess-nunci] John-un cenyek-ul kepwhayssta.
 [what-Acc. ate-Q] John-Top. dinner-Acc. refused
 '(I wonder) whether John ate something, (as) he refused (to have) dinner.'

Here, morpho-syntactically, the constituents in bracket are indirect questions, as they are marked by a typical indirect question morpheme *-nunci*. A closer look reveals that they are not selected by a relevant predicate, which motivated Kim & Tomioka (2014) to call them 'unselected.' Now, would a matrix quantifier be able to associate with an event variable of the embedded yes/no question in these constructions? As illustrated below, however, the matrix adverbial quantifiers quantify over one of the arguments of the matrix predicate, not over the event variable of the indirect question:

- (25) a. #[Pam sai-ey pi-ka oass-nunci] matang-i taypwupwun ceceissta.
 [night during-Loc. rain-Nom. came-Q] ground-Nom. most wet
 "(I wonder) whether it rained overnight, (as) most of the ground is wet."
- b. #[Mwuel mekess-nunci] John-un cenyek-ul taypwupwun kepwhayssta.
 [what-Acc. ate-Q] John-Top. dinner-Acc. most refused
 '(I wonder) whether John ate something, (as) he mostly refused (to have) dinner.'

These sentences are judged as acceptable but its interpretation is quite different from the examples we saw in previous sections. Here, the quantifier *taypwupwun* quantifies over *matang* 'ground' from the matrix subject in (25a) and over *cenyek* 'dinner' from the matrix object in (25b). It does not quantify over the events or situations of the embedded yes/no question. Thus, we conclude without further argument that unselected questions do not show the QVE.

3. Implications

So far, we have reviewed various types of Korean embedded questions in terms of their QVE. The following are a few descriptive generalizations we have obtained: (i) wh-questions embedded by factive predicates show the QVE, regardless of the type of wh-words or the nature of embedded predicates; (ii) yes/no questions embedded by factive predicates show the QVE too, unless the embedded questions consist of individual-level predicates or generic statements; (iii) classifiers often interact with the domain of quantification provided by the embedded question; (iv) unselected indirect questions do not show the QVE. In this section, I will discuss what these findings imply regarding our understanding of the issues involved in the semantics of questions.

As mentioned briefly in the introduction, the QVE poses an interesting theoretical challenge to semanticists mainly due to the semantic type of the question denotation. Specifically, the challenge hinges on how to provide the domain of quantification for the matrix quantifier. For example, a new mechanism, whatever it is, is needed to turn the question denotation (e.g., set of propositions) into a set of entities so that the set of entities can feed the quantificational restrictor for the quantifier of the matrix clause. For Berman (1991), this issue was bypassed, at least for the wh-questions embedded under factive predicates, which he treats as open propositions, since he appealed to the presupposition from factivity that is mapped directly to the restrictor of the matrix quantifier, with the help of Heim's (1982) treatment of indefinites as free variable introducers. In a sense, the wh-questions under factive predicates are not questions *per se*; only those embedded by non-factive predicates are true questions whose denotation is a set of propositions in Berman's theory.

But is such a move intuitively plausible? That is, are the otherwise morpho-syntactically same indirect questions in (26a) and (26b) below different in their denotations just because they are embedded under different matrix predicates?

- (26) a. John usually discovered which students cheated on the exam.
 b. John usually wondered which students cheated on the exam.

In fact, this is essentially what Lahiri (1991, 2002) and Beck & Sharvit (2002)

take on the issue. Lahiri (1991, 2002), for example, treats QVE as a result of direct quantification on the amount of possible answers to the question. Putting details aside, in Lahiri's analysis, the direct quantification by the matrix adverbial quantifier is made possible since he introduces a lattice-theoretic structure for the question denotation, similar to Link's (1983) treatment of mass terms and plural terms, still maintaining the assumption that a question denotes a set of possible answers to the question. Recently, Uegaki (2015) also argues for the position that predicates like 'know' select for questions.

It seems that Korean examples we saw earlier and the generalizations we obtained from them can help us to choose between these two accounts. Berman's (1991) factivity-based account, or more precisely, his reliance on presupposition accommodation, will face some difficulties in coming up with a plausible explanation of the Korean data involving embedded yes/no questions. This is because, as we saw previously, yes/no questions do show the QVE in Korean, which means to Berman that the presupposition from the semantic content of the yes/no question should be accommodated to the restrictor, so that the presuppositions feed the domain of quantification for the matrix quantifier. But a typical yes/no question does not have such a presupposition, neither in English nor in Korean, as we see below:

- (27) a. John knows whether Mary likes him.
 b. John-un [Mary-ka caki-lul cohaha-nunci] al-koissta.
 John-Top. [Mary-Nom. self-Acc. like-Q] know-Prog.
 'John knows whether Mary likes him.'

Thus, to account for the lack of presupposition in yes/no questions, Berman will have to devise a new way of creating such non-existing presuppositions, a huge burden on his part. In contrast, Lahiri's (1991, 2002) theory can provide a uniform account of our observation on Korean embedded yes/no questions since his analysis allows a direct quantification over the embedded question denotation, be it a yes/no question or a wh-question. Thus, Korean examples seem to favor Lahiri's analysis, or any account that does not discriminate question denotations under factive predicates from those under non-factives.

Another point worth noting from our previous observations on the lack of QVE in yes/no questions when they contain individual-level predicates and generic

statements is that Korean data seem to support the ban on vacuous quantification, a well-known phenomenon in natural language semantics.¹² In those constructions, the matrix quantifier, whether it is adverbial or classifier-based, ends up with no domain of quantification, violating the ban and making the whole sentence unacceptable.

4. Summary and related constructions

So far, we have considered various Korean embedded interrogative constructions that show the QVE or the availability of long-distance association between a matrix quantifier and a quantificational domain provider in the embedded clause. A few novel observations include: (i) *wh*-questions embedded under factive predicates show the QVE; (ii) *yes/no* questions embedded by factive predicates show the QVE too, unless those *yes/no* questions contain individual-level predicates or generic statements; (iii) classifiers often interact with the domain of quantification provided by the embedded question; (iv) unselected indirect questions do not show the QVE. We also discussed what theoretical implications the Korean quantificational variability phenomena have, in particular, in choosing between two existing theories of indirect question semantics. I will conclude the paper by extending our perspectives to see if there are any non-interrogative constructions that display similar effects.

Internally-headed relative clauses seem to be one of the candidates that show a long-distance association between a matrix quantifier and the embedded domain-provider. Consider the examples in the following:¹³

- (28) a. [John-i table wi-ey cake-ul nwatwun kes]-ul koyangi-ka
 [J.-Nom. table on-Loc. cake-Acc. put thing]-Acc. cat-Nom.
 taypwupwun mekepelyessta.
 most ate
 ‘The cat ate most of the cake John put on the table.’

¹² Kratzer (1995: 131), for example, formulates the ban as follows:

(i) Prohibition Against Vacuous Quantification

For every quantifier *Q*, there must be a variable *x* such that *Q* binds an occurrence of *x* in both its restrictive clause and its nuclear scope.

¹³ Native speakers’ judgements on the acceptability of those internally-headed relative clauses seem to vary. See Cho (2014) for a recent discussion on the acceptability issue.

- b. John-un [anay-ka nayngcangko-ey kwail-ul nwatwun kes]-ul
 J.-Nom. [wife-Nom. fridge-Loc. fruit-Acc. put thing]-Acc.
 ta pelyessta.
 all threw away
 'John threw away all the fruits his wife put in the fridge.'

The matrix quantifiers *taypwupwun* 'most' and *ta* 'all' quantify over the domains ('the cake' and 'the fruits') that are inside the internally-headed relative clauses. Note incidentally that the reading we get in (28) are not the same as what we got in embedded yes/no question constructions because here in (29) the matrix quantifier quantifies over the domain provided by one of the embedded arguments, not over the situations or events.

Similar effects are detected in clausal constructions embedded under perception verbs, which are quite similar to embedded yes/no questions and the internally-headed relative clauses. Compare (29a) and (29b) below:¹⁴

- (29) a. John-un [Mary-ka kenningha-nun kes]-ul taypwupwun poassta.
 J.-Top. [M.-Nom. cheat-Rel. thing]-Acc. most saw
 'John mostly saw Mary cheating.'
 b. John-un [Mary-ka kenningha-nunci] taypwupwun poassta.
 J.-Top. [M.-Nom. cheat-Q] most saw
 'John mostly saw Mary cheating.'

Except for the factivity presupposition in (29a) and the preference for the strong reading that comes from the embedded yes/no question in (29b), the two sentences seem to display a similar reading. That is, they both mean that for most of Mary's cheating situations or events, John saw the situations/events in which she did.

Also worth noting is the peculiarities of embedded declarative clauses containing individual-level or generic statements. Consider the following:

¹⁴ See Kim (2009) for a discussion on the semantic similarities and differences between internally-headed relative clauses in (28), embedded clauses under perception predicates as in (29) and those under factive predicates. She does not discuss the effects of individual-level predicates or generic statements in those constructions, though.

- (30) a. ?John-un [Mary-ka yengliha-ta-nun kes]-ul taypwupwun
 J.-Top. [M.-Nom. smart-Decl.-Rel. thing]-Acc. most
 alko-issta.
 know-Prog.
 ‘?John mostly knows that Mary is smart.’
- b. ?John-un [cikwu-ka twungkul-ta-nun kes]-ul taypwupwun
 J.-Top. [Earth-Nom. round-Decl.-Rel. thing]-Acc. most
 alko-issta.
 know-Prog.
 ‘?John mostly knows that Earth is round.’

Just like the individual-level predicates and generic statements in yes/no questions, their declarative counterparts do not allow the long-distance quantificational association.

In this paper, I have not attempted to provide a formal account of the QVE in embedded questions and their relationship to relevant declarative constructions. I would like to defer it for another occasion. However, I want to point out that any serious attempts to account for the QVE in Korean embedded questions will have to address such similarities found in their declarative counterparts too. One possibility is the approach taken by Uegaki (2015), in which he argues that predicates like *know* unanimously select for a question, even when the embedded clause is realized as a declarative sentence.¹⁵ That is, he treats the embedded declarative clause in *John knows that Mary smokes* as a kind of question, which undergoes a type-shifting process. It will be interesting to see if the Korean data supports the assumption or not, which I leave for future work.

¹⁵ Uegaki's analysis is motivated by the following contrast in entailment patterns between 'know' and 'believe' when an NP is selected as their complements. He does not discuss the QVE though. See Uegaki (2015) for details.

- (i) John believes the rumor that Mary cheated on the exam.
 >> John believes that Mary cheated on the exam.
- (ii) John knows the rumor that Mary cheated on the exam.
 >/> John knows that Mary cheated on the exam.

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