Overriding syntactic islands with prosodically marked *wh*-scope in South Kyŏngsang Korean and two dialects of Japanese

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This article explores the effect of discourse context and prosody on the resolution of *wh*-scope ambiguity in Tokyo Japanese, Fukuoka Japanese, and South Kyŏngsang Korean. It focuses on *wh*-islands in particular. There is little consensus in the literature as to whether *wh*-island effects are present in Japanese or Korean (Huang 1982, Nishigauchi 1990, Lee 1982, Suh 1987, among others). A production study, in which a scope-ambiguous *wh*-interrogative was preceded by a disambiguating discourse context, demonstrates that speakers' scope interpretation is consistent with the preceding discourse context. An additional comprehension study reveals that prosodic *wh*-scope marking observed in the languages studied improves the acceptability of the matrix scope readings in violation of *wh*-islands. The experimental results support the view that *wh*-island effects can be overridden by plausible discourse contexts as well as the appropriate prosodic marking of *wh*-scope. These results highlight the interaction of grammatical knowledge, contextual factors, and prosody.

1. Introduction

1.1 The *wh*-island effect

Traditional linguistic analysis has depended heavily on impressionistic acceptability judgments about written examples, ignoring other factors such as contextual/ discourse plausibility, processing difficulty, and prosody. However, psycholinguistic empirical findings reveal that the processing involved in linguistic judgments requires complex relations with various linguistic and non-linguistic properties (Thelen & Smith 1994, Elman et al. 1996, Schütze 1996, Barsalou et al. 2007). When there is a lack of agreement on judgments, experimental and instrumental work that takes into consideration multiple cues is particularly useful. Korean and Japanese are so-called *wh*-in-situ languages; thus a *wh*-phrase occupies the same position that its non-wh counterpart does, as in (1).¹ *Wh*-phrases are represented by **boldface** as in the Japanese example in (1).

- a. *Taroo-wa hon-o katta-no?* Тагоо-тор book-ACC bought-q 'Did Taroo buy the book?'
 - b. *Taroo-wa nani-o katta-no?* Taroo-тор what-Acc bought-q 'What did Taroo buy?'

Unlike in English, where movement of *wh*-phrases to their scope position is mandatory, no obligatory *wh*-movement is observed in Korean or Japanese. It is traditionally considered that in these languages an in-situ *wh*-phrase undergoes *covert* movement (Huang 1982); while the in-situ *wh*-phrase moves to its scope position at LF, the movement is *covert* in that it does not affect the phonology. Let us look at the difference between languages with *overt* and *covert* movement, respectively, in a bi-clausal interrogative with an embedded *wh*-phrase. An English example is given below, where traces of the moved interrogative words are indicated by italicized *t*.

- (2) a. John knows [Mary likes NP]
 - b. embedded scope: [Does John know [what Mary likes *t*_{what}]]?
 - c. matrix scope: [What does John know [Mary likes t_{what}]]?

When an NP located in an embedded clause is the interrogative word *what*, it moves either to the initial position of the embedded clause, resulting in a yes/no question (as in (2b)) or to that of the matrix clause, resulting in a *wh*-question (as in (2c)). As is obvious in (2), due to the *overt wh*-movement in English, the two types of questions are clearly distinguishable. However, since Japanese and Korean do not have obligatory displacement of interrogative words, this means of marking scope is not normally available in these languages. This raises the possibility that an embedded *wh*-phrase in a bi-clausal interrogative in Korean and Japanese is scope-ambiguous, as shown in (3).

- (3) *Keisatu-wa* [Yumi-ga dare-ni atta-ka] siritagatteita-no? police-TOP [Yumi-NOM who-with met-COMP] wondered-Q?
 - a. [Did the police wonder [who Yumi met]]?
 - b. [Who did the police wonder [whether Yumi met t_{who}]?

^{1.} Abbreviations used throughout this paper are as follows: ACC-accusative, COMPcomplementizer, CP-complementizer phrase, NOM-nominative, NP-noun phrase, TOP-topic, Q-interrogative ending, Ve-embedded verb, Vm-matrix verb.

Similar observations are reported for in-situ *wh*-phrases in English (Baker 1970), as shown in (4).

(4) [Who₁ knows [who₂ bought what]]?

What is of interest is the semantic scope of the in-situ *wh*-phrase *what*: it can take either embedded scope with who_2 in the embedded clause or matrix scope with who_1 in the matrix clause. The latter reading where *what* takes matrix scope is somewhat unexpected based on the ungrammaticality of the question in (5), where the *wh*-phrase violates the *wh*-island effect.

(5) *What do you know [whether he bought t_{what}]?

The unavailability of the matrix scope reading for *what* in (5) is traditionally attributed to *wh*-island constraint (Chomsky 1973, et seq.). The *wh*-island constraint bans the embedded *wh*-phrase from taking scope out of the island created by an interrogative element *whether* in (5). The apparent violation of the *wh*-island effect in (4) and the ambiguity of the scope of the in-situ *wh*-phrase are attributed to the absence of overt *wh*-movement: an in-situ argument *wh*-phrase is immune to the *wh*-island effect (Huang 1982, Lasnik & Saito 1984, 1992).

However, the issue of whether or not the violation of *wh*-islands is acceptable in Japanese or Korean (wh-in-situ languages) has long been controversial. In contrast to Lasnik and Saito (1984, 1992), it has been claimed by some researchers that *wh*-phrases in an embedded *wh*-question may not take matrix scope in Japanese (Nishigauchi 1990, Watanabe 1992, Yoshida 1998, Richards 2000). Similar disagreement regarding island effects involving an argument *wh*-phrase and a wh Comp has been reported in Korean: while the matrix scope interpretation was not judged to be acceptable by H.S. Lee (1982), H.S. Han (1992), or H.S. Choe (1995), it was judged available by Suh (1987), Hwang (2007), and Hwang (2011a). It should be noted that most of these claims are made based on informal acceptability judgments.

Another issue with respect to *wh*-island effects is whether the effects are syntactic phenomena (Chomsky 1973, Clements 1984, Rizzi 1990, Cinque 1991, among others). Alternatively, there have been accounts claiming that *wh*-effects are motivated by linguistic components other than the syntax (Szabolsci & Zwarts 1993, Abrusan 2011) or by comprehension difficulty (Gibson 1998, Kluender and Kutas 1993, Hawkins 1999, Phillips et al. 2005, Hofmeister and Sag 2010, among others).² In the current study, two linguistic factors — prosody and pragmatic

^{2.} Island effects are observed in a wide range of constructions, and their realizations are variable across constructions and languages. Thus it is difficult to account for all island effects in a uniform way. See Phillips (2013) for more discussion.

plausibility — are considered in examining discrepancies in judgments regarding *whether*-island violations involving argument *wh*-phrases in Japanese and Korean.

1.2 Prosodic marking of *wh*-scope

The matrix scope reading — the apparent violation of the *wh*-island effect — was found to be acceptable in recent studies where prosody was taken into careful account (Tomioka 1997, Deguchi & Kitagawa 2002, Ishihara 2003, Hirotani 2005, Kitagawa & Hirose 2012). In Tokyo Japanese (henceforth TJ), it has recently been claimed that the semantic scope of a *wh*-phrase is prosodically marked in such a way that the F0 range of a *wh*-phrase is expanded, while the F0 range of post-wh material is compressed (Deguchi & Kitagawa 2002, Ishihara 2002, 2003, Hirotani 2005, Kitagawa 2005, Kitagawa & Hirose 2012). This prosody-scope correlation makes an interesting prediction to the effect that the potential ambiguity with respect to *wh*-scope in the construction given in (3) can be prosodically resolved.

In particular, Kitagawa (2005a) explicitly argues that the matrix-scope interpretation is permitted but disfavored, due to the unusual presuppositions and the monotonous prosodic pattern required for the matrix scope reading. This discussion suggests that the bias toward the embedded scope interpretation can be ameliorated by providing plausible contexts, as well as the expected prosodic pattern, for the matrix scope interpretation.

This approach has been instrumentally tested in the role of context and prosody in TJ (Hirose & Kitagawa 2007, Kitagawa & Hirose 2012). Hirose and Kitagawa (2007) report the results of a production test in which speakers accept both scope readings when an appropriate context is given for a specific scope reading. Also, the utterances recorded reflect prosodic scope marking, as F0 peaks of matrix verbs in embedded questions are greater than those in matrix questions. However, in comparing the role of prosodic cues in a matrix verb and those in a *wh*-phrase for the disambiguation of *wh*-scope, Kitagawa and Hirose (2012) report that the F0 cue in a *wh*-phrase is a better indicator for most speakers.

The role of prosody was also tested by Hirotani (2005). Hirotani reports that, while 84% of the stimuli with the prosody associated with embedded scope were interpreted as taking embedded scope, only 43% of stimuli with matrix scope prosody were interpreted as taking matrix scope. Hirotani argues for the optional nature of the prosodic scope marking in TJ based on the relatively low acceptance rate associated with the matrix interpretation. However, Hirotani does not discuss the nature and effect of *wh*-islands or the embedded scope preference in detail. It is probable that in her stimuli the prosodic cue alone in TJ was not sufficient for listeners to override the bias in favor of the embedded scope reading in the resolution of the scope ambiguity.

The comprehension tests in TJ conducted by Hirotani (2005) and Hirose and Kitagawa (2007) yielded similar results in that the compressed F0s of matrix verbs are not consistently interpreted as a prosodic marker of the matrix *wh*-scope. These previous studies provide important information about the role of context and prosodic *wh*-scope marking in TJ, but the main take-away lesson from them is that F0 range expansion or compression does not exclusively indicate *wh*-scope. It has been well established that information structural status such as focus or givenness influences F0 register in Japanese. For instance, focus raises the F0 of the focused element and compresses that of the post-focal material (Pierrehumbert & Beckman 1988, Nagahara 1994, Sugahara 2003). Also, new information is marked by a higher F0 than given material in TJ (Venditti 2000, Sugahara 2003). Thus, listeners in previous studies could have interpreted F0 compression as a signal for given information rather than as a *wh*-scope marker.

In contrast to TJ, Fukuoka Japanese (henceforth FJ) and South Kyŏngsang Korean (henceforth SKK) do not have the limitation inherent in TJ; in these languages, prosodic marking of information structural status and wh-scope are distinct (Hwang 2011a, c). FJ refers to the variety of Japanese spoken in the area surrounding the city of Fukuoka, in northwestern Kyushu. FJ marks wh-scope prosodically by an exceptional high flat F0 contour (Hayata 1985, Kubo 1989, 1990, Smith 2010, 2013). Smith (2013), based on the results of her production study, confirms that some young-adult speakers of FJ still produce this F0 contour for *wh*-interrogatives. With respect to the disambiguation of *wh*-scope, she found the expected F0 contour was assigned as described in the literature by nearly half of the speakers, though she tested wh-mo constructions, rather than the counterpart of the whether construction.³ Interestingly, an extremely similar prosodic pattern has been reported in SKK, spoken in southeastern Korea (Kubo 1993, Hwang 2006). This high plateau pattern in FJ and SKK is specific to wh-scope marking, independent of the prosodic encoding of information structural status signaled by F0 height manipulation (Hwang 2011a). Thus, FJ and SKK appear to be particularly well suited for testing the role of prosody in *wh*-scope disambiguation involving wh-island effects. Furthermore, the F0 compression pattern in TJ is also observed in FJ and SKK. Some speakers of FJ yield a TJ-style F0 compression rather than the high plateau pattern, perhaps due to the pervasive influence of TJ, the standard variety of Japanese. In SKK, on the other hand, it was found that the phonetic

^{3. &#}x27;-*mo*' is a scalar particle which gives a universal or free choice reading when associated with a *wh*-phrase. One of the test sentences from Smith (2013) is presented below.

Dare-ga norimaki-o ut-te *mo* iito? who-NOM sushi.roll-ACC sell-TE COMP okay 'Is it okay, no matter who sells sushi rolls?'

implementation of prosodic scope marking correlates with the accent type of a *wh*-phrase. All *wh*-phrases exhibit a rising accent pattern, followed by a high plateau. However the two *wh*-items *myech* 'how many' and *nwukwu* 'who' allow alternating accent patterns that may employ a rising or falling tone (Hwang 2011b).⁴ If these *wh*-items are produced with a falling tone, the *wh*-scope is marked by F0 compression (Hwang 2011a). A similar phenomenon is observable in FJ (Hwang 2011a, b). These facts allow us to test the effect of distinct surface patterns on the prosodic marking of *wh*-scope in FJ and SKK.

This study replicates and extends previous research by including two more relatively understudied languages which exhibit more robust prosodic wh-scope marking, as described above. In this study, the notion *acceptability* is understood to be a complex notion determined by multiple factors, rather than one solely determined by the formal/structural properties of written examples. It is worth reiterating that most of the previous literature on this topic develops syntactic accounts relying on impressionistically perceived acceptability judgments typically based on written examples, without considering pragmatic plausibility or prosody. In the present study, following the line of approach which takes non-syntactic factors into serious account, I investigate experimentally how these factors interact, through a series of production and comprehension tests. Based on the results of these experiments, I support Kitagawa's (2005a) claim that the perceived degradedness of the matrix scope interpretation of wh-items embedded in wh-islands as in (3b) is due to, in part, two factors; the relative difficulty of finding plausible discourse contexts for such questions and the difficulty of assigning the prosodic pattern required for the matrix scope reading.

2. Production test

The goal of this experiment is to investigate whether a discourse context which supports a matrix scope interpretation would affect the interpretation of *wh*-scope and facilitate the matrix reading, as well as to determine whether the distinct scope interpretations are reflected in the pitch contours.

^{4.} While Kubo (1993) notes that, intuitively, the falling accent pattern is 'emphatic,' I found that both patterns can be used even in the same situation by a single speaker. There was a preference for one accent pattern over the other, with the direction of preference depending on the speaker. Whereas two speakers among the four I consulted consistently used the rising pattern yielding the high plateau contour, the other two used the falling tone for *nwukwu* 'who' except for a few tokens.

2.1 Materials

Four interrogatives using two different endings were elicited for each language -TJ, FJ, and SKK. Each of the test interrogatives contained an embedded question with a *wh*-phrase in-situ, and thus was potentially scopally ambiguous, as in (3). Only wh-phrases in argument positions, i.e. 'who' and 'what', were used. Two matrix verbs were tested: 'asked' (tazúneta for TJ and FJ, mwúlessta for SKK) and 'to be investigating' (sirábeteru for TJ and FJ, cosahakoíssta for SKK). All words in the target interrogatives were accented. In constructing the test material, priority was given to pragmatic naturalness over segmental environments. The question ending varied: formal (-ka for TJ and FJ, -pnika for SKK) and informal endings (-no for TJ, -to for FJ, -eyo for SKK). All four endings are consistent with both scope readings. One test sentence was modeled after Kitagawa (2005a), but modified to accord with the most natural speech style in each of the target languages. Recall that speakers have a strong preference to interpret *wh*-phrases as taking embedded scope. In order to examine whether discourse factors can guide the assignment of wh-scope and override the wh-island effect, each question was preceded by different discourse contexts which facilitated either the matrix or embedded scope reading. One SKK test sentence in the informal style preceded by the contexts of the two scope interpretations is presented in (6). Speaker A is the context provider (the experimenter) and B is the subject. (See the Appendix for the full set of stimuli.)

- (6) Example of a test interrogative in SKK with scope disambiguating contexts a. embedded scope
 - A: Yumi-ka cinan thoyoil-ey salhaytanghayss-tayyo. Yumi-NOM last Saturday-on was.killed-heard
 'I heard that Yumi was killed last Saturday' kulentey, kunal Yumi-ka nwukwunka-lul mannassta-nuntey. but that.day Yumi-NOM someone-ACC met-is.said
 'It is said that Yumi met someone on that day' Kyengchal-i ce-hantey-to wassess-eyo. police-NOM me-to-too had.come-ending
 'The police came to my place, too'
 B: kulayse, kyengchal-un kunal Yumi-ka nwukwu-lul
 - so police-тор that.day Yumi-NOM who-ACC *mannassnun-ci mwuless-eyo*? met-COMP asked-ending 'So, did the police ask who Yumi met on that day?'

b. matrix scope

A:	Yumi-ka cinan thoyoil-ey salhaytanghayss-tayyo.					
Yumi-NOM last Saturday-Loc was.killed-heard 'I heard that Yumi was killed last Saturday'						
						Kulentey, yonguyca-ka iss-ese kunal Yumi-ka
	but suspect-NOM exist-and that.day Yumi-NOM					
	ku salam-ul mannassnun-ci cosaha-napwayo.					
	that person-ACC met-COMP investigate-seem					
	'but it seems that there is a suspect, and the police are investigating					
whether Yumi met him on that day.'						
	Kyengchal-i ce-hantey-to mwul-ule wassess-eyo.					
police-NOM me-to-too ask-in.order.to had.come-ending 'The police came to my place in order to question me, too'						
						B:
	so police-тор that.day Yumi-NOM who-ACC					
	mannassnun-ci mwuless-eyo?					
	met-сомр asked-ending					
	'So, who is it that the police asked whether Yumi met on that day?'					

Note that the test sentence used by speaker B is identical in both contexts, but the scopes of the in-situ *wh*-phrase favored by the two discourse contexts are distinct. Most importantly, the fact that the police asked speaker A about who Yumi might have met is implied by the preceding discourse in (6b). This favors an interpretation of B's question in (6b) where it is presupposed that the police asked, for some person *x*, whether Yumi met *x*. This presupposition in turn requires that the question be interpreted as a matrix *wh*-question asking about the identity of *x*. The written contexts were given in the script along with the test interrogatives so that subjects were able to check the contexts repeatedly.

2.2 Participants and recording

Two male and two female speakers participated in the recording for each language. For TJ, undergraduate and graduate native speakers of TJ at Cornell University and the University of Tokyo were recorded. All four FJ speakers were undergraduate students at Fukuoka University. SKK speakers were all undergraduate students at either Changwŏn National University or Kyŏngsang National University. Both types of question (preferred matrix scope and preferred embedded scope) were recorded by each speaker. Intervals of at least ten minutes were given between questions with distinct scope interpretations. The list of questions was repeated twice. The recordings were conducted in the sound-attenuated booths at Cornell University or at the University of Tokyo for TJ. For SKK and FJ speakers, a quiet office at Fukuoka University or at Changwŏn National University was used. All recordings were made using a portable Marantz digital recorder (PMD 660) and a SHURE SM 57 microphone.

Before recording, practice time lasting from fifteen to twenty minutes was given in order to obtain natural utterances. Speakers were asked to read the script carefully. However, it was observed that most speakers did not pay attention to the provided context and uttered every phrase of the test sentences with a predetermined prosodic pattern regardless of the context. Recall that the matrix scope interpretation tends not to be readily available without contexts that favor the reading, and the purpose of the production test was to explore the role of pragmatic/discourse contexts in relation to matrix scope questions. Thus, in order to confirm speakers' comprehension of the contexts, I first asked background questions concerning the content such as 'who was killed?' or 'is there a suspect?' before speakers were asked to produce the target questions. Since the context was given in written form, speakers often read it carefully again, and then answered the questions a second time. After confirming that speakers understood the situation given, the conversation was verbally practiced: participants were asked to listen to the context which was uttered by the experimenter and to read a test sentence with a potentially ambiguous wh-interrogative. The recording session for each speaker lasted approximately one hour including practice time and breaks. All speakers were paid for their participation at the end of the recording session.

2.3 Measurements

A total of 128 (2 scopes \times 2 endings \times 4 sets \times 4 speakers \times 2 repetitions) test sentences for each language were analyzed.⁵ The data were digitized with a 22,050 Hz sampling rate and 16-bit quantization. Labeling and measurements were made using Praat version 5.0.03. Phrase boundaries were manually marked on each utterance. In measuring fundamental frequencies, both the F0 peak and valley for each phrase were extracted. Final rising boundary tones (H%) were excluded as they often reach a higher F0 than the F0 peak of the accented mora in matrix verbs.

In determining how to effectively compare F0 contours of questions taking distinct scope, F0 contours of scopally ambiguous questions were overlapped. As distinct phonetic implementations were observed (high plateaus and F0 compression) it is necessary to examine the two prosodic patterns separately. I first consider the *wh*-intonation characterized by F0 compression before turning to the high plateau type.

^{5.} One male speaker of FJ (FJM0) did not accept the matrix scope interpretation. Thus, he was not recorded for matrix scope questions.

Figure 1 presents overlapped F0 contours of questions in (6) uttered by a male speaker of SKK (SKKM1). Recall that *nwukwu* 'who' in SKK can yield the F0 compression pattern if it is produced with a falling tone. The *wh*-phrase of the matrix question exhibits a somewhat higher F0 peak than that of the embedded question. A more appreciable difference is observed in the F0 peaks of the matrix verbs; the F0 peak of the matrix verb in the embedded question is approximately 37 Hz higher than that in the matrix question.



Figure 1. F0 contours of F0 compression in SKK: 'did the police ask who Yumi met on that day?' (embedded) vs. 'who is it that the police asked whether Yumi met on that day?' (matrix)

However, a somewhat different pattern is observed in other utterances. Figure 2 shows the F0 contours of a matrix and an embedded scope question uttered by a male speaker of TJ (TJM2). In the utterance below, the *wh*-phrase in the matrix scope question exhibits a markedly higher F0 peak than that in the embedded scope question. On the other hand, no substantial difference is observed between the F0 peaks of the matrix verbs because the matrix verb of the embedded question is already quite compressed.



Figure 2. F0 contours of F0 compression in TJ

This pattern is in accordance with the results reported by Hirose and Kitagawa (2007). Two of the four subjects in the production test yielded significantly higher F0 peaks for *wh*-phrases in matrix scope questions than for those in embedded scope questions. Consider the results expected based on previous studies for the F0 compression pattern schematized in (7).



In (7) above, the F0 differences between *wh*-phrases and matrix verbs are idealized and compared across the two scope conditions. As illustrated here, the difference in F0 peak between the *wh*-phrase and the matrix verb is quite salient when interpreted with matrix scope, but markedly smaller when interpreted with embedded scope.

In contrast, the prosodic scope marking involving a high plateau exhibits more consistent patterns across speakers. Figure 3 and Figure 4 show F0 contours of scopally ambiguous questions uttered by a female speaker of FJ (FJF2) and a female speaker of SKK (SKKF2), respectively.

In both figures, the two contours start diverging at the embedded Comp as marked by a circle; a discrete falling tone is observed in the embedded question whereas the high plateau continues in the matrix question.



Figure 3. F0 contours of the high plateau in FJ



Figure 4. F0 contours of the high plateau in SKK

Notice that the F0 peak of the matrix verb in the embedded question exhibits an F0 value similar to the peak of the high plateau, showing that F0 peaks of matrix verbs are not informative as a point of comparison. Instead, the primary F0 differences between the distinct questions are observed in embedded verb phrases and Comp (Ve-Comp) as schematically illustrated in (8).



For this reason, the F0 change (F0 peak — F0 valley) in the embedded verb phrase was compared across the two scope conditions for the high plateau type in SKK and FJ. Before turning to the results in the following section, it should be noted that a phenomenon not noted by Kubo (1989, 1990) was observed in embedded verbs in some FJ interrogatives, when a *wh*-phrase takes embedded scope. Specifically, if a mora of the embedded verb was accented, the verb maintained its lexical accent, exhibiting the requisite falling F0 tone following the accented mora suggesting a departure from the high plateau pattern in FJ. This finding is in accord with the observation reported by Smith (2010).

2.4 Results and discussion

2.4.1 Tokyo Japanese

Mean F0 changes in TJ are graphically presented in Figure 5. As all tokens exhibited the F0 compression pattern in TJ, results of sixty- four questions for each *wh*-scope were pooled.



Figure 5. Mean F0 change between the wh-phrase and matrix verb in TJ

As illustrated above, considerable differences are observed both in *wh*-phrases and matrix verbs: The F0 peak of the *wh*-phrase is raised and that of the matrix verb is compressed in matrix questions compared to those in embedded questions. Paired t-tests indicate that F0 values for *wh*-phrases and matrix verbs, as well as the mean F0 change, are significantly different depending on the *wh*-scope (t (1,126) = -13.67, *p* < .0001 for *wh*-phrases, t (1,126) = 8.21, *p* < .0006 for matrix verbs, t (1, 126) = -17.99, *p* < .0001 for F0 changes).

Given the possibility of speaker differences in the production of *wh*-intonation for TJ (Kitagawa & Hirose 2012), it is necessary to consider the results of each speaker separately. Figure 6 shows the results for each speaker of TJ.

While two of the speakers (TJF1, TJF2) yield appreciable F0 differences both in *wh*-phrases and matrix verbs, the other two (TJM1, TJM2) exhibit quite comparable F0 peaks in matrix verbs regardless of *wh*-scope. The results of statistical analyses of all four speakers are summarized in Table 1, separated by speaker. As indicated in Table 1, paired t-tests confirm that the peak F0 of *wh*-phrases (whpeak F0) and the mean F0 change are significantly different depending on the scope interpretation across speakers. This finding is similar to the results reported by Kitagawa and Hirose (2012) in that F0 peak of a matrix verb does not seem to be the most consistent prosodic cue for some speakers. However, this result is distinct from that of Kitagawa and Hirose (2012) in that the peak F0 difference of matrix verbs (Vm peak F0) between the two *wh*-scope questions is not statistically significant for one speaker (TJM2). It may be the case that the F0 change is the best indicator of scope disambiguation, and speakers have different strategies to produce the appropriate F0 change for intended *wh*-scope, by manipulating F0 of *wh*-phrase or that of matrix verb, or both.



Figure 6. Mean F0 change between the *wh*-phrase and matrix verb in TJ for individual speakers

Table 1. Results of paired t-test for each speaker in T	J
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speaker	variables	t-value (1,30)	p-value
TJM1	wh peak F0	-9.60	p<0.0001*
	Vm peak F0	2.82	$p = 0.0194^*$
	F0 change	-11.66	p<0.0001*
TJM2	wh peak F0	-8.76	p<0.0001*
	Vm peak F0	1.53	<i>p</i> =0.1476
	F0 change	-9.11	p<0.0001*
TJF1	wh peak F0	-5.47	$p < 0.0001^*$
	Vm peak F0	11.81	$p < 0.0001^*$
	F0 change	-10.27	$p < 0.0001^*$
TJF2	wh peak F0	-7.00	$p < 0.0001^*$
	Vm peak F0	10.43	$p < 0.0001^*$
	F0 change	-11.70	p<0.0001*

2.4.2 Fukuoka Japanese and South Kyŏngsang Korean — High plateau pattern FJ and SKK showed similar results as graphically presented in Figure 7. As no between-speaker variation was observed, further analysis was performed on the pooled averages for all speakers.

In both languages, a substantial F0 drop is exhibited in embedded questions, but no appreciable F0 drop is observed in matrix questions. By way of comparison, Smith (2013) reported similar results, though some speakers did not show a consistent scope-prosody match in her study. This discrepancy could be attributed to the difference of construction in the experiments. Recall that Smith tested the *wh-mo*, rather than the *wh-whether* construction. It is interesting to note that 2 out of 7 participants indeed exhibited matrix-scope bias, which was not observed in the *wh-whether* construction.



The statistical significance of this observation is confirmed by t-tests, as summarized below.

variables	t-value (1,114)	<i>p</i> -value	
peak F0	-1.16	<i>p</i> =0.25	
valley F0	-3.52	$p = 0.0006^*$	
F0 change	7.79	$p < 0.0001^*$	

Table 2. Results of t-test for high plateau in FJ

Table 3. Results of t-test for high plateau in SKK

variables	t-value (1,99)	<i>p</i> -value	
peak F0	-0.2	<i>p</i> = 0.85	
valley F0	-3.59	<i>p</i> = 0.0006*	
F0 change	10.47	$p < 0.0001^*$	

In summary, when plausible contexts were given, matrix scope interpretations were largely acceptable, and distinct scope readings yielded phonetically different

intonation patterns marking the semantic scope of the *wh*-phrases. The prosodic *wh*-scope marking attested in the languages investigated supports Kitagawa's argument that the matrix reading is not ungrammatical, but disfavored. However, not all speakers accepted the matrix reading even when the matrix-favoring context was given. Thus, contextual plausibility does not seem to be the only factor responsible for the bias against the matrix interpretation. Before turning to the comprehension test, I will discuss the F0 compression pattern produced by some FJ and SKK speakers in the following section.

2.4.3 Fukuoka Japanese and South Kyŏngsang Korean — F0 compression pattern

For FJ, the F0 compression pattern was produced by a male speaker (FJM2) in four and eight tokens for embedded and matrix questions, respectively. Mean F0 peaks of *wh*-phrases and matrix verbs are graphically presented in Figure 8. This speaker patterns together with the male speakers of TJ in that a noticeable F0 difference is observed only in *wh*-phrases, but not in matrix verbs. Statistical significance was not tested since the number of tokens obtained for this prosodic pattern in FJ was not sufficient for a statistical analysis.⁶



Figure 8. Mean F0 change between the wh-phrase and matrix verb in FJ

A more robust difference between the two scopes was observed in SKK. Eleven embedded and sixteen matrix questions uttered by speakers SKKF1 and SKKM2 yielded the pattern of F0 compression. In SKK, when compared with embedded questions, matrix questions exhibit considerably greater F0 peaks of *wh*-phrases and lower F0 peaks of matrix verbs. Interestingly, the F0 peak of matrix verbs in embedded questions is noticeably higher than that in matrix questions, reaching an F0 nearly comparable to that of *wh*-phrases. Again, statistical analyses were omitted due to the limited number of tokens.

^{6.} Smith (2013) also reports that some young-adult speakers of FJ produced the compression pattern. Although it would be interesting to explore whether this "new" pattern is identical to the TJ pattern, this pattern in FJ is not further discussed since it is beyond the scope of this study.



Figure 9. Mean F0 change between the wh-phrase and matrix verb in SKK

While the prosodic patterns were robust and consistent across speakers in SKK, considerable speaker differences were found in the production of *wh*-intonation in TJ and FJ. Furthermore, some anomalies in *wh*-intonation were also observed in FJ. It is conceivable that these speaker differences and anomalies in production could affect the comprehension of *wh*-scope. Thus, in the following section, we turn to the role of prosody in the resolution of scope ambiguities.

3. Comprehension test

Comprehension tests were conducted in order to investigate the role of *wh*-intonation with respect to *wh*-scope in scope-ambiguous *wh*-interrogatives. Specifically, the experiments were designed to test whether the matrix scope interpretation is available when prosodic marking signals that reading. In exploring the prosodic effect without the influence of pragmatic plausibility, no specific context was provided. The effect of the two distinct prosodic patterns (the high plateau and F0 compression) was also examined.

3.1 Stimuli

A subset of the interrogatives recorded in the production test was utilized. In selecting stimuli, priority was given to utterances naturally articulated at a comfortable rate of speech. Also, phonetic implementation of the prosodic scope marking was considered, with an effort made to include both high plateau and F0 compression patterns in FJ and SKK. Across the languages, test sentences, together with fillers, were tested in four sessions, each of which contained an equal number of stimuli. In each session, eight test stimuli (four for each reading) and twelve fillers were tested in a random order. However, the stimuli were presented in an identical order for all participants.

In regards to the prosodic patterns of the stimuli, all test stimuli exhibited F0 compression in which the right edge was aligned with the Comp that the

wh-phrase was associated with. As shown in the previous section, the phonetic details of the F0 compression pattern in TJ and FJ were different depending on the speaker. Thus, both types of F0 compression were included among the stimuli for those languages. For FJ and SKK, both surface realizations of *wh*-intonation were tested.

3.2 Participants and procedures

A total of twenty-nine (19 male and 10 female) TJ speakers, twenty-five (3 male and 22 female) FJ speakers, and thirty-two (22 male and 10 female) SKK speakers participated in the tests. Participants were all born and raised in the target linguistic region. At the time of the tests, the participants were undergraduate or graduate students at Changwon National University (SKK), the University of Tokyo or Senshu University (TJ), and Kyushu University or Fukuoka University (FJ). No participants possessed a history of any hearing disorder.

The test was conducted using Inquisit software in a computer laboratory at Changwon National University for SKK, in the phonetics laboratory or in a quiet office at the University of Tokyo or Senshu University for TJ, and in a quiet office at Kyushu University or Fukuoka University for FJ. Participants were seated in front of a computer screen and told that they would hear a series of questions. They were asked to choose an appropriate answer immediately after hearing each question. Two choices as possible answers were then provided on the screen: a yes/no answer for the embedded scope interpretation (e.g., 'yes, they did') and the identity of a person or an object for the matrix scope interpretation (e.g., 'Her boyfriend'; the answer for the question in (6)). The options were numbered and displayed at the center of the screen as in (9).

(9) 1. Yes, they did. 0. Her boyfriend

Thus, listeners had to disambiguate *wh*-scope in order to be able to determine the answer. After subjects chose an answer by pressing the 1 or 0 key on the keyboard, an interval of two seconds was given before proceeding to the next question. They were instructed to answer exactly and only what they were asked. This was done to exclude the possibility that they would choose the identity answer even after assigning an embedded *wh*-question interpretation, as an identity answer implies a 'yes' answer to an embedded question while providing further information. For instance, in Japanese and Korean, when one is asked whether one saw someone, it is not unnatural to answer 'her boyfriend', omitting 'yes'. Also, I informed the Japanese participants that the stimuli were recorded by native speakers of their dialect for the sake of minimizing potential bias that they might have due to the fact that the experimenter was not a native speaker of Japanese. It seems that this information quite

successfully eliminated the bias, as most participants stated that the stimuli sounded totally natural after completing the test. The response time was measured from the offset of each stimulus to the time at which a participant pressed a response key.

3.3 Results and discussion

This section presents the results of the *wh*-scope assignment and response times I obtained from twenty-nine speakers of TJ, thirty speakers of FJ, and thirty-two speakers of SKK. Results of five FJ participants had to be discarded as they randomly chose answers yielding less than 20% of correct answers for both scope readings. Also, response times exceeding 10,000 milliseconds were excluded as outliers. Discarding the outliers resulted in 463 (embedded) and 458 (matrix) results in TJ, and 398 (embedded) and 400 (matrix) in FJ. In SKK, 512 responses were further analyzed for each scope reading.⁷

3.3.1 Effect of wh-intonation on wh-scope assignment in Tokyo Japanese In order to investigate whether the prosodic scope marking manifested in production also guides listeners' comprehension of wh-scope, percentages of the embedded scope reading were calculated for each prosodic pattern. Figure 10 below shows the percentages of the matrix reading (%Mat) for each the prosodic pattern in the stimuli, averaged for all participants for TJ. The percentage of the matrix scope reading was remarkably greater when prosody indicating a matrix scope was given. A t-test confirmed that the prosodic effect is significant in wh-scope assignment (t(1,30) = 27.72, $p < .0001^*$).



Figure 10. Percentages of matrix readings by wh-intonation in TJ

^{7.} The numbers of responses for each scope reading prior to discarding outliers were 464 (TJ), 400 (FJ), and 512 (SKK).

In order to examine which acoustic parameters are correlated with the assignment of *wh*-scope, scatterplots were generated in which percentages of the matrix reading (%Mat) were plotted against peak F0s of *wh*-phrases, peak F0s of matrix verbs and F0 changes between *wh*-phrases and matrix verbs. The scatterplots in Figure 11 suggest that %Mat is substantially correlated with the peak F0s of *wh*-phrases (R^2 = 0.7042), or with the peak F0s of matrix verbs (R^2 = 0.6607). However, the plot of %Mat against F0 changes reveals an even stronger correlation between those two variables (R^2 = 0.8306).



Figure 11. Scatterplots of matrix reading percentages against wh peak F0 (leftmost), Vm peak F0 (middle) and F0 change (rightmost), with spline fits for TJ

3.3.2 Effect of wh-intonation on wh-scope assignment in Fukuoka Japanese In order to investigate the role of different phonetic realizations of the prosodic scope marking, %Mat and RT depending on the intended wh-scope were calculated separately by the prosodic pattern of wh-intonation. As shown in Figure 12, %Mat was remarkably greater when the prosody indicating matrix scope was given, regardless of the actual prosodic pattern (that is, whether the pattern was high plateau or compression). A t-test showed that %Mat is significantly different between the prosodic scope markings of the stimuli (t(1,14) = 19.7463, $p < .0001^*$ for high plateau, and t(1,14) = 6.9081, $p = .005^*$ for compression).



Figure 12. Percentages of matrix readings by *wh*-intonation for high plateau (left) and compression (right) patterns in FJ

In comparing the two prosodic patterns, it appears that the high plateau pattern yields slightly greater %Mat, compared with the F0 compression pattern. However, t-tests indicated that the difference of %Mat between the prosodic patterns was not significant, regardless of the intended *wh*-scope (t(1,13)=-0.4898, *p*=.6324 for embedded scope, t(1,14)=-1/1083, *p*=.2864 for matrix scope).

Subsequent statistical analyses of regression were performed separately for the phonetic implementation of the prosodic *wh*-scope marking. Scatterplots of %Mat for the high plateau are provided in Figure 13. Recall that the F0 change for this pattern indicates the pitch fall from the embedded verb to the Comp.



Figure 13. Scatterplots of matrix reading percentages against Ve peak F0 (leftmost), Ve-Comp valley F0 (middle) and F0 change (rightmost), with a spline fit for FJ

As illustrated above, the effect of peak F0s of embedded verbs on %Mat was clearly small ($R^2 = 0.1385$). The fitted line of %Mat against valley F0s of Ve-Comp suggests a quite strong correlation between those variables ($R^2 = 0.6980$). However the plot reveals that %Mat is more strongly correlated with F0 changes when the high plateau pattern is given ($R^2 = 0.7812$).

Returning to the F0 compression pattern, it appears that there is no strong relationship between %Mat and the peak F0s of *wh*-phrases ($R^2=0.4863$). Nevertheless, %Mat is strongly correlated with the peak F0s of matrix verbs ($R^2=0.8815$). It therefore seems that peak F0s of matrix verbs are the crucial prosodic cue for FJ speakers to disambiguate *wh*-scope when the F0 compression pattern is given. Additionally, the fitted line of %Mat against F0 changes suggests that they are quite strongly correlated ($R^2=0.7951$).



Figure 14. Scatterplots of matrix reading percentages against wh peak F0 (leftmost), Vm peak F0 (middle) and F0 change (rightmost), with a spline fit for FJ

3.3.3 Effect of wh-intonation on wh-scope assignment in South Kyŏngsang Korean

SKK exhibited the most consistent results among the languages investigated. %Mat depending on *wh*-intonation of both patterns is illustrated below. %Mat was remarkably greater when prosody indicating matrix scope was given for both patterns. Notice that the deviances are much smaller compared to those in TJ or FJ. A t-test showed that the effect of the prosodic scope marking is significant in disambiguating *wh*-scope (t(1,14) = 132.36, *p* < .0001* for the high plateau pattern, and t(1,14) = 46.34, *p* < .0001* for the compression pattern). This potentially ambiguous *wh*-scope was nearly perfectly disambiguated by the prosodic cue of scope marking in this language.



Figure 15. Percentage of matrix scope readings by *wh*-intonation for high plateau (left) and compression (right) patterns in SKK

As for the prosodic patterns, regardless of *wh*-scope, the high plateau pattern of prosodic scope marking exhibited a slightly higher rate of correct responses. However, the difference of %Mat between the prosodic patterns was not statistically significant for either embedded scope (t(1,14)=0.1919, p=.8505) or matrix scope (t(1,14)=0.6757, p=.5103) questions.

In examining the acoustic correlates of scope assignment when the high plateau pattern was exhibited, consider the scatterplots for %Mat against the peak and valley F0s of embedded verb-Comp and F0 changes provided in Figure 16.



Figure 16. Scatterplots of matrix reading percentages against Ve peak F0 (leftmost), Ve-Comp valley F0 (middle) and F0 change (rightmost), with a spline fit for SKK

Overall, the results of regression analyses for SKK patterned together with those in FJ for the high plateau type, with SKK yielding high R^2 values across the acoustic variables. The fitted line of %Mat against peak F0s of embedded verbs does not account for the distribution (R^2 =0.4868). The scatterplot of %Mat against valley F0s for embedded verb-Comp suggests a weak correlation between the variables (R^2 =0.6996). However the plot reveals a strong correlation between %Mat and F0 changes (R^2 =0.8387).

Turning to the F0 compression pattern, scatterplots of %Mat were plotted against the peak F0 of *wh*-phrases, peak F0 of matrix verbs and F0 changes. Overall, all the acoustic parameters in SKK exhibited greater R² values compared to those in TJ or FJ, implying that SKK speakers were more attentive to the prosodic cues.



Figure 17. Scatterplots of matrix reading percentages against wh peak F0 (leftmost), Vm peak F0 (middle) and F0 change (rightmost), with a spline fit for SKK

The scatterplot suggests quite a strong relationship between the percentage of matrix readings (%Mat) and the peak F0 of *wh*-phrases ($R^2 = 0.8204$). Additionally, the correlation between %Mat and peak F0 of matrix verbs was remarkably strong ($R^2 = 0.9949$). The fitted line of %Mat against F0 changes accounted for more than 82% of the distribution ($R^2 = 0.8257$).

The very strong correlation between scope assignment and the peak F0 of matrix verbs in SKK conforms remarkably well to the pattern of the prosodic scope marking by F0 compression observed in TJ. Recall that, in the case of the F0 compression pattern for the construction at issue, differences between *wh*-questions of distinct scope are expected to be observed in the peak F0s of matrix verbs. It is worth noting that acoustic differences between the two readings were better realized in the stimuli of SKK; SKK speakers consistently produced substantial F0 differences on matrix verbs depending on the *wh*-scope of the question. Given the completely distinct acoustic cues and the remarkably large R² value for the peak F0s of matrix verbs in SKK, it is not surprising that SKK participants distinguished *wh*-scope based solely on the prosodic cue of F0 compression with a high rate of success. In contrast, TJ speakers did not consistently yield different peaks F0 of matrix verbs in production. Thus, it is not surprising that listeners did not primarily rely on the matrix verbs for scope disambiguation.

3.3.4 Response times

The average response times (RT) for correct interpretation of *wh*-scope depending on prosodic pattern are illustrated in Figure 18. For embedded scope questions, the response times in the languages were strikingly similar when the phonetic implementation of the prosodic scope marking was F0 compression.



Figure 18. Mean response times of correct responses for embedded scope (left) and matrix scope (right) questions by prosodic pattern

It is worth noting that the average response times for both prosodic types in FJ (1021 ms) and SKK (874 ms) were much shorter, compared to that in TJ (1131 ms). Thus, the shorter response times, when averaged across prosodic types in FJ and SKK for embedded scope questions, can be attributed to the high plateau pattern.

As for the matrix questions, the response time for the correct assignment of matrix scope yielded by the F0 compression pattern in FJ appeared to be quite similar to that in TJ. It is not surprising that the matrix scope reading requires longer response times. Previous research has revealed a great deal of evidence that longer *wh*-dependencies (i.e. the matrix scope reading in this case) involve a greater processing load (Gibson 1998, 2000; Hawkins 1999; Arnon et al. 2005; Phillips et al. 2005; among others). Furthermore, this finding is in accord with the results of self-paced reading studies in Japanese (Miyamoto & Takahashi 2002, Aoshima et al. 2003), in which readers slowed down in the region of an embedded verb phrase if the embedded Comp was not associated with a preceding *wh*-phrase, yielding a matrix scope reading. Hirotani (2005) reports a similar finding, that response times for matrix responses are relatively longer than the embedded responses.

In contrast, both prosodic patterns in SKK exhibited appreciably shorter response times when compared with those in TJ and FJ. It is not obvious why SKK speakers comprehend the matrix scope more quickly. This difference may be attributable to cross-linguistic syntactic differences between Japanese and Korean: it has been observed that the Korean Comp corresponding to *whether* creates a relatively weak island or no island at all (Lee 1982, Suh 1987). Another possibility is that the status of the high plateau influences the acceptability of matrix scope. That is, the high plateau pattern plays a dominant role as a *wh*-scope marker, overriding any disfavor or processing difficulty associated with the matrix scope. In contrast, FJ lacks the obligatory high plateau pattern in production, and further, the pattern was not considered an exclusive scope marker of wh-phrases in comprehension. See the further discussion in §4.2.

4. General discussion

We have observed that the *wh*-island effect *can* be overridden under certain circumstances. In this section, I discuss two likely factors, each of which may be partially responsible for these results. First, I discuss the role of contextual plausibility in §4.1, and then I turn to the effect of prosodic scope marking in §4.2. Finally, I discuss the large between-speaker difference in the acceptability of *whether*-island violations in §4.3.

4.1 Contextual plausibility

When considering the discrepancy between the acceptability judgments for matrix scope in the literature and the results of the present study, the importance of context becomes evident. In the current study, the matrix scope reading was made available by providing discourse contexts plausible for a matrix scope interpretation. This study clearly shows that pragmatics influences scope disambiguation across languages. This result corroborates the finding reported by Hirose and Kitagawa (2007), namely that speakers of TJ accept matrix scope readings if contexts favoring the scope are provided. Further, the results of the current experiment support the argument that the unacceptability judgment, in part, stems from the unusual context that is necessary for the accommodation of matrix scope interpretations.

Interrogatives are recognized to be sensitive to presupposition and discourse structure. It has been widely accepted that the non-questioned part of an interrogative clause is normally discourse-presupposed (Lambrecht 1994, Lahiri 2002, among others). This indicates that for a matrix interpretation, all other material in the phrase, particularly matrix verbs, should be presupposed. However, the contexts where a matrix verb is presupposed are not easy to come by compared to contexts where presupposition of the matrix verb is not required.

Crain and Steedman (1985) and Altmann and Steedman (1988) exploit the notion that a null context is not necessarily a neutral context, as a null context might favor one interpretation over another. This was originally argued for the garden-path effect, where the interpretation which carries fewer unsupported implicatures is favored. Based on this observation, the principle of parsimony (Crain

& Steedman 1985) and the principle of referential support (Altmann & Steedman 1988) were proposed.

A similar observation is made by Kuno (1987). Kuno argues that acceptability judgments are not made purely based on syntactic structure, as shown by the asymmetry in the examples below.

- (10) a. * Yesterday, I met the actress who I had bought Mary's portrait of.
 - b. Yesterday, I met the model who I just bought Avedon's portrait of.

Kuno (1987) correctly points out that (10b) is considerably better than (10a) if the hearer knows that Avedon is a famous photographer. (10a) requires a special context such as the following.

There is a portrait by Mary of the man under discussion, as well as of many other persons/objects...The sentence also presupposes that the preceding discourse has been about the fact that the speaker is accustomed to buying Mary's portraits (p. 18).

Note that the unacceptability of (10a) cannot be attributed to a syntactic constraint: (10a) is judged unacceptable because speakers are not immediately able to come up with the highly marked context the question requires.

It has been convincingly argued that the resolution of syntactic ambiguity integrates lexical, syntactic, semantic, discourse, and situational variables in real time (Spivy & Tanenhaus 1998). Multiple cues simultaneously contribute to the understanding of a sentence by combining information sources from phonology, semantics, syntax, pragmatics, and so on. Instrumental work that takes into consideration multiple cues is particularly useful when there is a lack of agreement on judgment. Thus, it is not surprising that disambiguation of the scope ambiguity in the structure of interest involves the integration of multiple cues, in particular, pragmatic contexts.

4.2 Role of prosody

Considering the apparent prosodic bias against matrix scope, Kitagawa (2005a) argues that the intonation pattern for the matrix scope reading is disfavored, as it violates the general principle 'avoid monotony' (Selkirk 1984, Kubozono 1988). Furthermore, it has been argued that a prosodic boundary tends to align with a syntactic boundary (Selkirk 2000). Note that there is a major syntactic boundary after embedded Comps, the boundary between matrix and embedded clauses. Thus, it is predicted that in a null context, a prosodic boundary tends to be inserted after a Comp, resulting in the prosodic pattern favoring embedded scope readings. The comprehension test of the present study provides answers to the question

of whether the dispreference for matrix scope can be ameliorated by an intonation pattern lacking a prosodic boundary after an embedded Comp.

Across the languages investigated in the present study, the resolution of *wh*scope ambiguity appears to be significantly driven by prosodic cues, showing the role of prosodic scope marking in overriding the *whether*-island effect. The crucial role of prosody in the disambiguation of syntactic ambiguities has been extensively documented for other languages as well (Lehiste 1973, Ladd 1980, Price et al. 1991, Wightman et al. 1992, Nagel et al. 1996, Schafer et al. 2000, Kraljic and Brennan 2005, among others). Regarding scope ambiguities in particular, Baltazani (2002) provides experimental results for a construction involving the interaction between negation and a quantifier in Greek. An example of the test material in verb-object order is given below. According to Baltazani (2002), the sentence in (11) is potentially ambiguous, but each of the two interpretations is realized with a distinct prosodic pattern.

- (11) den élisan pollá provlímata not solved-3PL many problems
 'They did not solve many problems'
 - a. 'The problems they solved are not many.' [NOT > MANY]
 - b. 'There are many problems they didn't solve.' [MANY > NOT]

In a production test with a disambiguating context for each reading, Baltazani found that speakers indeed consistently exhibited distinct prosody. For the case in which negation took scope over the quantifier (11a), prosodic prominence aligned with negation, and all the items following are de-accented, forming a low plateau. On the other hand, when the quantifier took scope over negation, a prosodic boundary appeared between the verb and the quantifier *many*, indicating that the negative particle and the quantifier occurred in a separate prosodic phrase. In addition, the quantifier — not the negative particle — was most prominent, exhibiting the nuclear pitch accent L+H*. The results of Baltazani's comprehension test also showed that the distinct prosodic pattern played an important role in the resolution of the scope ambiguity.

Returning to the results of the comprehension test in the present study, speakers of the languages investigated exhibited different behaviors regarding the acceptability of matrix scope interpretation. In TJ and FJ, the strength of the island effects and influence of the prosodic pattern vary considerably depending on the speaker: for speakers who exhibited rather weak *whether*-island effects, the prosodic scope marking ameliorated the effects but did not completely override them. In SKK, on the other hand, matrix readings in violation of the *whether*-island effect were readily available given the prosodic cues appropriate for that reading. In this variety of Korean, prosody appears to have priority over any pragmatic/

contextual bias against matrix scope interpretation. To what should the observed difference between Japanese and Korean be attributed?

One possibility is that the difference lies in part in the distinct surface patterns of the prosodic scope marking. This possibility receives experimental support from the results of response times in the present study; in comparing response times yielded by the two prosodic patterns of *wh*-intonation, the high plateau pattern appears to provide more certainty than the F0 compression pattern. It seems that, for the high plateau pattern, speakers can disambiguate and gain confidence about the appropriate *wh*-scope as soon as they encounter a discrete prosodic marker for an embedded Comp. Consider the schematic contours of distinct wh-scopes illustrated in (12). The solid and dotted lines represent embedded scope and matrix scope, respectively. Arrows indicate the moment that the contours of distinct wh-scope clearly diverge. In either case, the two scope readings demonstrate quite comparable pitch contours before the embedded Comp. While F0 compression exhibits a higher F0 peak on wh-phrases in matrix questions than in embedded questions, it is not a reliable cue for wh-scope assignment because wh-phrases are substantially raised in both interpretations, compared to their non-wh-counterparts. Thus, for the F0 compression pattern, it seems that speakers wait until they hear the F0 of matrix verbs, and disambiguate wh-scope based on the F0 peaks on matrix verbs or the F0 changes between wh-phrases and matrix verbs. On the other hand, for the high plateau pattern, a discrete acoustic difference between the two readings is observed at the Comp before the speaker encounters a matrix verb. The discrete fall on the embedded Comp implies that speakers disambiguate the wh-scope as soon as they encounter the presence or absence of the discrete falling tone of a Comp. From this standpoint, it is not surprising that speakers respond more quickly for the high plateau pattern than for the F0 compression pattern.

(12) Schematic pitch contours of prosodic scope marking

Also, the high plateau yields slightly higher percentages of correct responses than F0 compression, suggesting that the high plateau is a more reliable marker of *wh*-scope than F0 compression. Presumably, this is due to the fact that F0 compression can be interpreted as conveying discourse-givenness as well as *wh*-scope. Recall that the high plateau pattern exclusively marks *wh*-scope, whereas F0 compression signals not only *wh*-scope but also information structural status, specifically givenness. However, the slight degree of the effect makes it difficult to consider prosodic patterns as the primary factor behind the difference in acceptability of matrix scope between Japanese and SKK. Although FJ has the high plateau pattern, its status in FJ may be unstable (Smith 2010, 2013).

Alternatively, the distinct behavior between Japanese and SKK regarding the acceptability of matrix scope can be attributed to other cross-linguistics differences. While Japanese and Korean share a number of structural properties, the Korean Comp -*ci*, corresponding to *whether*, may establish a weaker island, which can be completely overridden by the prosodic marking of matrix scope. In order to test this possibility, however, it would be necessary to investigate other varieties of Korean, to determine whether or not the characteristics of -ci, with respect to island effects, are comparable across the Korean dialects. One instance of support for such a cross-linguistic difference comes from Hwang's (2007) study, which examined the role of prosody in *wh*-scope disambiguation in Seoul Korean and SKK.

Hwang (2007) tested six auditory stimuli for each scope reading in SKK and Seoul Korean. Following Jun and Oh (1996), Hwang assumed that the two scope interpretations exhibit different boundary tones: H% for the embedded reading vs. HL% for the matrix reading in Seoul Korean. For SKK, she argued that embedded scope readings exhibit H% or HL%, whereas matrix readings yield L%. It should be noted that Hwang did not note the exceptional prosodic scope marking in SKK, i.e. the high plateau, though it was evident in the pitch tracks she presented. Nevertheless, Hwang tested the role of prosody in wh-scope interpretation using natural utterances. Six speakers of each variety were asked to disambiguate whscope. The accuracy of scope interpretation when the intended prosodic patterns were given is presented below.

Table 4.	Average percentages of scope	interpretation in	i Seoul Korean	and SKK (Hwang
2007)					

	Intended Prosody		
	Embedded scope	Matrix scope	
Seoul Korean	100%	94.6%	
SKK	71%	100%	

Both in Seoul Korean and in SKK, the matrix scope reading was accepted to a high degree, given the prosodic pattern signaling matrix scope. However, the details of how the stimuli were created were left unreported, with Hwang (2007) noting only the following:

The stimuli were produced with variation in the positioning of 'wh-prosody' and 'yes-no prosody' — in certain questions *wh*-appropriate prosody was applied in CP2 (embedded clause) and 'yes-no prosody' in CP1 (matrix clause) and in other questions the opposite pattern was applied.

It is not clear whether Hwang provided contexts to disambiguate the scope at the time of creating the stimuli. Also, no detailed phonetic description was given regarding the difference between the prosodic patterns of distinct *wh*-scope. Thus, it is difficult to discern the characteristics of 'wh-prosody' and 'yes-no prosody'. Also, Hwang did not consider other prosodic cues such as the F0 of *wh*-phrases and the degree of F0 compression. Furthermore, for SKK, the scope-specific endings *-na/-no* were used. Recall that this is another scope marker independent of the prosodic cues. More importantly, the accuracy for the embedded readings in SKK was markedly low (71%), even though an embedded reading is the unmarked interpretation across languages. Moreover, in the stimuli, not only the prosodic cues, but also the morphological marker *-na* was given to signal embedded scope. Despite all of this, the surprisingly low accuracy for the embedded scope reading in SKK was left unexplained. Despite these major issues regarding methodology, the notably high rate of acceptability of matrix scope in Seoul Korean supports the possibility that Korean has a generally weaker *whether*-island effect than Japanese.

Another factor may be variation in the test sentences. As with the previous studies, only natural utterances obtained in the production test were used as the stimuli for the comprehension test. Consequently, the acoustic differences between the stimuli were not equally controlled for in the different languages. Recall that the prosodic differences between distinct scope readings were the most salient in SKK, particularly for the F0 compression pattern of the prosodic scope marking. On the other hand, some speakers of TJ and FJ exhibited no appreciable F0 difference in matrix verbs between distinct interpretations. It may be the case that listeners require a much larger difference in the absence of other cues, though some speakers do not produce substantial acoustic differences given a disambiguating context. Thus, it is quite probable that fine-grained acoustic characteristics in production influence the assignment of wh-scope in comprehension. Furthermore, FJ demonstrated signs of an ongoing change in production by showing the lack of an obligatory high plateau and the lack of accent loss in embedded verbs for embedded scope readings. The results of the comprehension test also demonstrated that FJ speakers accept the F0 compression cue as well as the high plateau cue in

comprehension, implying a reduced role played by the high plateau pattern as an exclusive marker of *wh*-scope. Thus, in order to confirm the role of prosodic scope marking or scross-linguistic difference with respect to the *whether*-island effect between Korean and Japanese, more carefully controlled experiments would be necessary, using synthesized stimuli involving the same acoustic differences between distinct scope readings across languages, and notably including other varieties of Japanese and Korean. In addition, there may well be other prosodic cues at work, such as the lengthening of a Comp or the presence of a pause or a discrete boundary tone, and further research into the possibility of other prosodic cues is also required.

In the final section below, I discuss the noticeable inter-speaker variability regarding the acceptability of matrix scope in TJ and FJ, an effect which cannot be attributed to pragmatic or prosodic factors.

4.3 Inter-speaker variability in Tokyo Japanese and Fukuoka Japanese

While all the participants in SKK exhibited a high level of acceptance for matrix scope readings given the relevant prosodic scope marking, the subjects in TJ and FJ showed large between-speaker differences in matrix scope acceptance, with the percentage of matrix scope readings ranging from 0% to 100% in TJ and 17.7% to 100% in FJ. Also, an interesting tendency was observed in the response times depending on the acceptability of matrix scope interpretations.

Let us first consider the distribution of participants according to the percentage of matrix acceptance in TJ and FJ. As illustrated in Figure 19, both TJ and FJ participants who gave the correct matrix response were dispersed over nearly the entire percentage range. The observed inter-speaker differences in accepting matrix scope suggest that the violability of the *whether*-island effect greatly varies among speakers. While both languages yielded distributions skewed toward greater acceptability of matrix scope, FJ exhibited a greater concentration in the region of higher %Mat, suggesting that more FJ speakers have a weaker *whether*-island effect. Given the considerably diffused distribution in TJ, it is not surprising that the acceptability judgments on *whether*-island effects have resulted in discrepancies in these varieties. This variability may be consistent with the hypothesis that *whether*-island effects are motivated by non-syntactic factors.

Figure 19. Distribution of speakers for acceptability of matrix scope in TJ and FJ

A number of interesting tendencies were observed with respect to the correlation between the percentage of matrix acceptance and response times. Response times were positively associated with matrix acceptability up until the percentage reached approximately 70%. However, they tended to decrease as the acceptability increased above 70%.

As indicated by the circles in Figure 20, the data of response times clustered into three groups: 0-20%, 21-85% and 86%-100%. The average response times among the groups were compared as shown in Table 5. Notice that the groups on either extreme — those who hardly accepted (below 20%) or strongly accepted (above 85%) matrix scope interpretations — responded relatively quickly to the questions of matrix scope. It seems that speakers who have strong island effects interpret *wh*-scope quickly as embedded, regardless of prosodic cues. Speakers who accepted matrix scope for 85% or above, thereby having markedly weak island effects, also seem to respond quickly using the prosodic cues marking matrix scope. On the other hand, in both TJ and FJ, the middle group exhibited a substantially longer response time than the other groups, implying that the subjects in this group were confused or not sure of their scope assignment. It may be the case that speakers who have somewhat weaker island effects yield longer response times due to the dispreference toward matrix scope. Or, they simply have more semantic alternatives to consider.

÷ 100		-	~
Matrix Acceptability (%)	TJ	FJ	
0-20	1056	698	
21-85	2685	2152	
86-100	1223	1116	

Table 5. Mean response times (ms) by percentage of correct matrix scope reading

Figure 20. Response time by acceptability of matrix scope in TJ and FJ

In sum, it appears that the acceptability of matrix scope is not categorical, but varies substantially among speakers of TJ and FJ. For some speakers, the violation of the whether-island effect is reconciled with the prosodic cues for matrix scope. It thus seems that sensitivity to whether-island effects and to prosodic scope marking varies substantially among speakers. Though not all speakers of TJ and FJ accept matrix scope, the appreciable variability in matrix acceptability calls into question the syntactic account for wh-island effects. Note that the judgments reported in the previous literature on wh-island effects were largely made using written examples lacking pragmatic contexts or prosody, and that the conclusion that violation of a wh-island effect is ungrammatical was based on impressionistic judgments depending entirely on syntactic structure. The results of the current study suggest that the structural account for wh-island effects needs to be reassessed, reinforcing more interactive perspectives on these phenomena. In fact, there is a line of research where island effects are accounted for by other linguistic components (Szabolsci & Zwarts 1993, Abrusan 2011) or by processing difficulty (Bard et al. 1996, Schütze 1996, Cowart 1997, Gibson 1998, Kluender 1998, Miyamoto & Takahashi 2002, Warren & Gibson 2002). The findings in the current study may support the non-syntactic accounts of *wh*-island effects.

5. Conclusions

The results of this study suggest that simply attributing acceptability/unacceptability to the syntax is not adequate, and that we should revisit the status of constraints that have been assumed to be principles of grammar of a language based on impressionistic judgments alone. The approach suggested by the current study treats acceptability judgments as involving not only syntactic structure, but also other linguistic factors, processing difficulty, memory limitation, biases, experience, knowledge of the world and so on.

Although the embedded scope interpretation is favored when no prior discourse context is given, the results of this study indicate that *wh*-intonation and the presentation of plausible contexts for a matrix reading facilitate the otherwise disfavored matrix scope interpretation. These results provide experimental support for the contention that the *whether*-island effect can be overridden by contextual plausibility and prosodic *wh*-scope marking, in the varieties of Korean and Japanese investigated.

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Appendix

Materials for the production test: For the formal style, the distinct parts from informal style are given in *italics*. For FJ, only distinct parts from TJ are given in parenthesis following the corresponding TJ items.

<TJ, FJ>

J-1. DATE set

- (a) embedded scope
 - A: mosimosi, Tomomi-chan? Raishuu, tomodati-o (-ba)

senpai-o (-ba) hello next.week friend-ACC syookaisite-kureru-tte (-totte)? Arigatoo! Demo, atode, introduce-for.me-QUOT thanks but later sono hito-o (-ba) kiniitta-kadooka-wa kikanaide (kikande). the person-ACC liked-whether.or.not-TOP ask.not Sono kawari-ni watasi-ga sonohito-o (-ba) kiniittara the.person-ACC liked.if that instead I-nom suki-ka]-o (-ba) tazune-te, sonohito-ni [ryoori-ga the.person-to [cooking-NOM like-Q]-ACC ask-and kiniiranakattara (kiniirankattara) nanimo tazunenai-kara (tazunenkara) not.like.if anything not.ask-because atode sono tomodati-ni kiite-mite. senpai later that friend-to ask-try

'Hello? Tomomi? Are you saying you'll introduce your friend/senpai to me? Thanks! But, later, don't ask me whether I liked him or not. Instead, if I like him, I'll ask him [do you like cooking?], and if I don't, I won't ask anything. So ask him later (whether I asked him something)."

(Deeto-no ato, syookaisita tomodati-ni atta Tomomi-chan) senpai date-GEN after, introduced friend-with met 'After the blind date, Tomomi met the friend/senpai she introduced' B: Yuu-chan, watasi-no tomodati-to atta-toki, kanozyo-wa Yuu-tyan-ga senpai senpai friend-with met-time, she-TOP I-GEN -NOM nani-ga (nan-ga) suki-ka tazuneta-no (tazuneta-to)? tazunemasita-ka (tazunetorimasita-ka) what-NOM like-comp asked-o 'Yuu-chan/senpai, when you met my friend, did she ask what you like?' (b) matrix scope A: mosimosi, Tomomi-chan? Raisyuu, tomodati-o (-ba) senpai-o (-ba) hello next.week friend-ACC syookaisite-kureru-tte (-totte)? Arigatoo! Demo, atode, introduce-for.me-QUOT thanks but later sono hito-o (-ba) kiniitta-kadooka-wa kikanaide (kikande). the person-ACC liked-whether.or.not-TOP ask.not. Sono kawari-ni watasi-ga sonohito-o (-ba) kiniittara

the.person-ACC liked.if. that instead I-nom sonohito-ni [ryoori-ga suki-ka]-o (-ba) tazune-te,

the.person.-to [cooking-NOM like-Q]-ACC ask-and

kiniiranakattara (kiniirankattara) [baree-ga suki-ka]-o (-ba)

not.like.if valleyball-NOM like-Q-ACC

tazuneru-kara atode sono tomodati-ni kiite-mite.

senpai

ask-because later that friend-to ask-try

'Instead, if I like him, I'll ask [do you like cooking?], and if I don't, I'll ask [do you like valley ball?]. So ask him later what it is that I asked him whether he likes)'.

(Deeto-no ato, syookaisita tomodati-ni atta Tomomi-tyan) senpai date-GEN after, introduced friend-with met 'After the blind date, Tomomi met the friend/senpai she introduced'

B: Yuu-tyan, watasi-no tomodati-to atta-toki, kanozyo-wa Yuu-chan-ga senpai senpai I-GEN friend-with met-time, she-TOP -NOM nani-ga (nan-ga) suki-ka tazuneta-no (tazuneta-to)? tazunemasita-ka (tazunetorimasita-ka) like-COMP asked-Q what-NOM

'Yuu-tyan/senpai, when you met my friend, what did she ask if you like?'

J-2. FORGERY set

- (a) embedded scope
 - A: konoaida, Andoo kaicyoo-ga gizoobunsyoo-o (-ba) kakusita-ka the.other.day chairman-NOM forged.document-ACC hided-COMP tyooshasitotta (tyooshasitotta)-desyoo? Konkai mata sono kaityoo-ga investigated-right this.time again that chairman-NOM nanika kakusita yoogi-ga aru(aruto)-kedo something hided suspicion-NOM be-though mada nani-o (nan-ba) kakusita-ka wakaranai (wakaran)-mitai vet what-ACC hided-comp not.know-quot

'You know that (the police) investigated whether Chairman Ando hided a forged document the other day, right? This time, again, he is suspected whether he hided something. But I heard that it has not become known what he hided yet.'

B: dakara (daken), keisatu-wa Andoo- kaityoo-ga so police-TOP chairman-NOM nani-o (nan-ba) kakusita-ka sirabeteru-no (sirabetoo-to)? *sirabete-masuka (sirabetooto-desuka)*? what-ACC hided-COMP be.investigating-Q 'So, are the police investigating what Andoo hid?'

(b) matrix scope

A: konoaida, Andoo kaityoo-ga gizoobunsyoo-o (-ba) kakusita-ka chairman-NOM forged.document-ACC hided-COMP the.other.day tyooshasitotta (tyooshasitotta)-desyoo? Konkai mata sono kaityoo-ga investigated-right this.time again that chairman-NOM nanika-o kakusita yoogi-ga a-tte hontooni something-ACC hided suspicion-NOM be-and really sore-o (nan-ba) kakusita-ka sirabeteru-tte kaityoo-ga chairman-NOM what-ACC hided-COMP be.investigating-QUOT

'You know that (the police) investigated whether Chairman Andoo hided a forged document the other day, right? This time, again, he is suspected whether he hided something. So I heard that the police are investigating if he really hided it.'

 B: konkai-wa nani-kasira? keisatu-wa Andoo- kaityoo-ga this.time what-could.be police-тор chairman-NOM nani-o (nan-ba) kakusita-ka sirabeteru-no (sirabetoo-to)? *sirabete-masuka (sirabetooto-desuka)?* what-ACC hided-COMP be.investigating-Q
 'What could it be, this time? What is it that the police are investigating if Chairman Ando hided?'

J-3. NURSE set

- (a) embedded scope
 - A: konoaida byooin-de okottajiken-de hankoo-ni the.other.day hospital-loc occurred.crime-about crime-for tukawareta kyooki-o (-ba) mituketa-kedo sore-wa hankoo-no was.used weapon-ACC found-though it-TOP crime-GEN

zenjitu-ni kawareta mono-rasii (-rasika)-yo the.day.before-on was.bought thing-QUOT-Assertive 'The weapon used for the crime occurred in the hospital the other day was found, and I heard it was bought on the day before.'

- B: soo? Sorede keisatu-wa dare-ga sore-o (-ba) katta-ka really then police-TOP who-NOM it-ACC bought-COMP sirabeteru-no (sirabetoo-to)? *sirabetemasu-ka (sirabetooto-desuka*)? be.investigating-Q 'Really? Then, are the police investigating who bought it?'
- (b) matrix scope
 - A: konoaida byooin-de okottajiken-de hankoo-ni the.other.day hospital-loc occurred.crime-about crime-for tukawareta kyooki-o (-ba) mituketa-kedo hushinna kangosi-ga was.used weapon-ACC found-though suspicious nurse-NOM hitori i-te, sono hito-ga sore-o (-ba) katta-ka one.person be-and the person-NOM it-ACC bought-COMP sirabeteru (sirabetoo)-tte.

be.investigating-QUOT

'The weapon used for the crime occurred in the hospital the other day was found, and there is a suspicious nurse. I heard that the police are investigating whether she bought it.'

B: Ah, watasi, sono byooin-no kangositati-o yoku sitteru (sittoo)!

I that hospital-GEN nurses-ACC well be.knowing Dare-kasira (-kaina), sono kangoshi... keisatu-wa dare-ga who-could.be that nurse police-TOP who-NOM sore-o (-ba) katta-ka sirabeteru-no (sirabetoo-to)? *sirabetemasu-ka (sirabetooto-desuka)*? it-ACC bought-COMP be.investigating-Q

'Ah, I know well the nurses in the hospital! Who could it be...? Who is it that the police investigating if she bought it?'

J-4. SUSPECT set

(a) embedded scope

A: Yumi-ga sensyuu-no doyoobi-ni korosareta-rasiiyo (-kena).

-NOM last-NOM Saturday-on was.killed-quoт

de, sonohi Yumi-wa dareka-ni atta (attotta)-mitai.

but that.day -тор someone-with met-seem

Keisatu-ga uchi-ni-mo kita (kitotta)-wa.

police-NOM me-to-too had.come-ending

'I heard that Yumi was killed last Saturday. It is said that Yumi met someone on that day. The police came to my place, too'

- B: soo? keisatu-wa Yumi-ga sonohi dare-ni atta-ka really police-TOP -NOM that.day who-ACC met-COMP tazuneta-no (-to)? *tazunemasita-ka (tazunetorimasita-ka)* asked-Q 'Really? Did the police ask who Yumi met on that day?'
- (b) matrix scope
 - sensyuu-no doyoobi-ni korosareta-rasiiyo (-kena). A: Yumi-ga -NOM last-NOM Saturday-on was.killed-QUOT tokorode, yoogisya-ga i-te sonohi Yumi-ga sono hito-ni but suspect-NOM be-and that.day -NOM that person-with atta (attotta)-ka sirabeteru (sirabetoo) mitai-desu. be.investigating met-COMP seem-ending Keisatu-ga uchi-ni-mo tazune-ni kitemasita. kitorimasi-ta. police-NOM me-to-too ask-for had.come

'I heard that Yumi was killed last Saturday. It seems that there is a suspect, and the police are investigating whether Yumi met him on that day. The police came to question me, too'

B: sono yoogisya-tte dare-kasira (-kaina)? keisatu-wa Yumi-ga the suspect-QUOT who-could.be police-TOP -NOM sonohi dare-ni atta-ka tazuneta-no (-to)? *tazunemasita (tazunetorimasita)-ka* that.day who-ACC met-COMP asked-Q?

'Who could the suspect be? Who is it that the police ask whether Yumi met on that day?'

<SKK>

K1. DATE set

- (a) embedded scope
 - A: yeposeyyo, Yumi? Taumcwuey senpay sokaysikhye-cunta-ko? hello Yumi next.week senior introduce-for.me-quot komapta! kuntey, nacungey, ku chinkwu-ga maumeytulessnun-ci later the friend-NOM liked-whether thanks but an tulessnun-ci-nun mwutcimala. taysiney ku salam-i not liked-whether-тор don't.ask instead the person-NOM maumeytul-myen ku salam-hanthey [yenghwa cohahanun-ci] liked-if the person-to movie like-if] mule-po-ko, maumeyantul-myen amwukesto an mwule-po-lkenikka ask-try-and like.not-if anything not ask-try-because nacungey ku chinkwu-hanthey mwule-pwala. later that friend-to ask-trv

'Hello? Yumi? Are you saying you'll introduce your senior student to me? Thanks! But, later, don't ask me whether I liked him or not. Instead, if I like him, I'll ask him [do you like a movie?], and if I don't, I won't ask anything. So ask him later (whether I asked him something).'

(sokayting hwu, sokayhaycun senpay-lul mannan Yumi) blind.date after introduced senior-ACC met 'After the blind date, Yumi met the senior student she introduced'

B: senpay, nay chinkwu mannassul-ttay, ku chinkwu-ka my friend met-time that friend-NOM senpay-ga me cohahanun-ci mwule-pwass-eyo? -pnika

-NOM what like-COMP ask-tried-Q 'Senpai, when you met my friend, what did she ask you like?'

- (b) matrix scope
 - A: yeposeyyo, Yumi? taumcwuey senpay sokaysikhye-cunta-ko? Yumi next.week senior introduce-for.me-quot hello komapta! kuntey, nacungey, ku chinkwu-ga maumeytulessnun-ci thanks but later the person-NOM liked-whether an tulessnun-ci-nun mwutcimala. taysiney ku salam-i not liked-whether-тор don't.ask instead the person-NOM maumeytul-myen ku salam-hantey [yenghwa cohahanun-ci] liked-if the person-to movie like-if] mule-po-ko, maumeyantul-myen [yori cohahanun-ci] ask-try-and like.not-if cooking like-if mwule-po-lkenikka nacungey ku chinkwu-hantey mwule-pwala. ask-try-because later that friend-to ask-trv

'Hello? Yumi? Are you saying you'll introduce your senior student to me? Thanks! But, later, don't ask me whether I liked him or not. Instead, if I like him, I'll ask him [do you like a movie?], and if I don't, I'll ask [do you like cooking?]. So ask him later what it is that I asked him whether he likes)'.

 B: senpay, nay chinkwu mannassul-ttay, ku chinkwu-ka my friend met-time that friend-NOM senpay-ga me cohahanun-ci mwule-pwass-eyo? *-pnika* -NOM what like-COMP ask-tried-Q
 'Senpay, when you met my friend, what did she ask you like?'

K2. FORGERY set

- (a) embedded scope
 - A: cinanpeney Yu-hoychang-i wicomwunse swumkyessnun-ci last.time Yu-chairman-NOM forged.document hided-if cosahayss-cyanayo ipeney ku hoicang-i tto mwel investigated-right this.time that chairman-NOM again something swumkyesstanun hyemui-ka issnun-de hided suspect-NOM be-but acik mwel swumkyessnun-ci-nun molun-tayyo. yet what hided-if-TOP not.know-QUOT

'You know that (the police) investigated whether Chairman Yu hided a forged document the other day, right? This time, again, he is suspected whether he hided something. But I heard that it has not become known what he hided yet.'

- B: kulayse, kyengchal-un Yu-hoycang-i me-l so police-тор Yu-chairman-NOM what swumkyessnun-ci cosahakoiss-eyo? *-pnika* hided-сомр be.investigating-ending? 'So, are the police investigating what Chairman Yu hided?'
- (b) matrix scope
 - A: cinanpeney Yu-hoychang-i wicomwunse swumkyessnun-ci last.time Yu-chairman-NOM forged.document hided-if cosahayss-cyanayo? ipeney ku hoicang-i tto mwel investigated-right this.time that chairman-NOM again something swumkyesstanun hyemui-ka issnun-de cengmallo hoychang-i really chairman-NOM hided suspect-NOM be-but kuku-l swumkyessnun-ci cosahakoiss-tayyo. that-ACC hided-if be.investigating-QUOT

'You know that (the police) investigated whether Chairman Yu hided a forged document the other day, right? This time, again, he is suspected whether he hided something. I heard that the police are investigating if he really hided that.'

B: kulayse, kyengchal-un Yu-hoycang-i me-l so police-TOP Yu-chairman-NOM what swumkyessnun-ci cosahakoiss-eyo?

-pnika

hided-COMP be.investigating-ending?

'What could it be, this time? What is it that the police are investigating if Chairman Yu hided?'

K3. NURSE set

- (a) embedded scope
 - A: cinanben, pyengwon-eyse nan ku saken, pemhayng-ey ssuin last.time hospital-LOC occurred the crime crime-for used hywungki-lul palkyenhass-tayyo. Pemhayng cennal phallin weapon-ACC found-QUOT crime the.day.before sold ke-lanuntey, acik nwu-ka sassnun-ci molu-ntayyo. thing-QUOT yet who-NOM bought-COMP not.know-QUOT

'The weapon used for the crime occurred in the hospital the other day was found, and I heard it was bought on the day before.'

B: kulayse, kyengchal-un nwu-ka kuke-l sassnun-ci so police-top who-nom that-ACC bought-COMP swusahakoiss-eyo?

-pnika?

be.investigating-Q?

'So, are the police investigating who bought it?'

(b) matrix scope

A: cinanben, pyengwon-eyse nan ku saken, pemhayng-ey ssuin last.time hospital-LOC occurred the crime crime-for used hywungki-lul palkyenhass-tayyo. Pemhayng cennal phallin weapon-ACC found-QUOT crime the.day.before sold ke-lanuntey, swusanghan kanhosa-ka han myeng iss-ese, thing-quot suspicious nurse-nom one Cl be-and ku salam-i kuke-l sassnun-ci swusahakoitta-neyyo. that person-NOM that-ACC bought-if be.investigating-QUOT

'The weapon used for the crime occurred in the hospital the other day was found, and there is a suspicious nurse. I heard that the police are investigating whether she bought it.'

B: nwukwul-kka, ku kanhosa...? na, ku pyengwon kanhosatul cal who-Q the nurse I the hospital nurses well anuntey... kyengchal-un nwu-ka kuke-l sassnun-ci know... police-тор who-NOM that-ACC bought-COMP swusahakoiss-eyo? Hoksi, a-sey-yo? *-pnika -si-pnika* be.investigatng-Q? perhaps know-Hon-ending 'Ab I know well the nurses in the bospital! Who could it be ? Who

'Ah, I know well the nurses in the hospital! Who could it be...? Who is it that the police are investigating if she bought it? Do you know, perhaps?'

K4. SUSPECT set: see (6)

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