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Scope assignment in quantifier-negation sentences in early Korean-Chinese bilinguals' grammars

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Abstract. Quantifier-Negation sentences allow an inverse scope reading in many languages, but this phenomenon is not observed in Chinese. Building on the work of Chen and Huan (2023), this study investigates whether early Korean-Chinese bilinguals can make a distinction between Korean and Chinese in terms of the inverse scope. Employing the sentence-picture matching truth value judgment experiment from Chen and Huan (2023), we recruited a group of 23 early Korean-Chinese bilinguals and 15 monolingual Korean speakers. The experimental results aligned with those of Chen and Huan (2023), which identified three distinct groups of bilinguals. The first group permits an inverse scope reading in both Korean and Chinese, the second group prohibits it in both languages, and the third group successfully distinguishes between Korean and Chinese regarding inverse scope. These findings suggest that early bilinguals may experience long-lasting crosslinguistic influence that extends into adulthood. They may adopt either of two opposite strategies when constructing sentences, both of which can potentially minimize syntactic differences between their two languages.

Keywords. Chinese; early bilingual; negation; Korean; scope

1. Introduction. We define quantifier-negation (Q-Neg) sentences as those involving a universal quantifier in the subject position and a negation word for the verb. Below is an example in English:

(1) All teachers did not use Sandy's car.
a. Surface-scope (all>not): for every teacher, he/she did not use Sandy's car.
b. Inverse-scope (not>all): It is not the case that all teachers used Sandy's car.

In (1), a universal quantifier all occurs as a noun modifier in the subject position. Meanwhile, the negation *not* is employed to negate the verb *use*. As demonstrated, this sentence has two possible interpretations: a surface scope (SS) reading and an inverse scope (IS) reading. The SS reading arises from the wide scope the universal quantifier. In contrast, the IS reading occurs when the negation *not* takes scope over the universal quantifier.[1] The scope ambiguity in English Q-Neg sentences has been tested and verified by numerous experimental studies, including Musolino and Lidz (2006) and Musolino, Crain and Thornton (2000). On the other hand, based on our consultation of several native Korean speakers, Q-Neg sentences in Korean also allow the IS reading. The equivalent Korean sentence of (1) is shown in (2):

(2) modeun seonsaengnim-i Saojeong-ui cha-leul sseu-jianh-ass-da. (Korean)
all teacher-NOM Sandy-GEN car-ACC use-NEG-PST-COP
'All teachers did not use Sandy's car.'

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[1] We term it 'inverse scope' because the semantic interpretation is the opposite of the c-commanding relation between *all* and *not* at surface structure.

a. Surface-scope (all>not): for every teacher, he/she did not use Sandy's car.
b. Inverse-scope (not>all): It is not the case that all teachers used Sandy's car.

However, Q-Neg sentences in Chinese do not permit the IS reading, which was confirmed by many experimental studies (e.g., Zhou & Crain 2009; Fan 2017; Chen & Huan 2023). The Chinese equivalent of (1) and (2) is in (3):

(3) suoyou laoshi meiyou yong Shaheshang de che. (Chinese)
all teacher not use Sandy GEN car
'All teachers did not use Sandy's car.'
a. Surface-scope (all>not): for every teacher, he/she did not use Sandy's car.
b. Inverse-scope (not>all): It is not the case that all teachers used Sandy's car.

To sum up, English and Korean Q-Neg sentences allow both SS and IS readings while Chinese Q-Neg sentences only allow the SS reading. Following Moscati's (2010) analysis, we assume that the negation in both English and Korean Q-Neg sentences can be raised to an adjunct position of IP/CP, which c-commands the subject at Logical Form (LF), thus generating the IS reading. In contrast, the negation in Chinese Q-Neg sentences cannot be raised, which can be attributed to the weak nature of Infl/T in Chinese. According to Aoun and Li (1993), the weak nature of Infl/T in Chinese is manifested by its lack of agreement features.

This study explores whether early Korean-Chinese bilinguals have the knowledge that Q-Neg sentences allow for the IS reading in Korean but not Chinese. Note that Chinese is more restrictive than Korean due to the absence of the IS reading, which is a poverty of the stimulus issue. In light of the observation that Tibetan Q-Neg sentences permit the IS reading, Chen and Huan's (2023) examined the same issue with Chinese-dominant Tibetan heritage speakers. Their investigation revealed three different groups of bilinguals: (i) those who accepted the IS reading in both languages; b. those who rejected the IS reading in both languages; c. those who accepted the IS reading in Tibetan but rejecting it in Chinese. We will see whether such findings can be replicated in the context of early Korean-Chinese bilinguals.

2. Early bilinguals of Korean and Chinese. The Korean ethnic group residing in northeastern China is commonly known as *Chaoxianzu*/*Joseonjok*. According to Choi (2001), the prevailing belief about the origin of these Koreans is that they were border-crossing migrants, relocating to China from the Korean peninsula in the late 19th century. The Seventh National Population Census of the People's Republic of China, conducted in 2020, revealed that the Korean population in China numbered 1,702,479. For this study, we recruited a total of 23 early Korean-Chinese bilinguals, who were born and raised in the northeastern region of China. These participants were undergraduate college students aged between 18 and 23 at the time of the experiment. In addition, they all attended *Chaoxianzu* schools from elementary to high school. *Chaoxianzu* schools were established to cater to ethnic Koreans who would like to seek education in Korean. Through consultations with several bilinguals, we learned that *Chaoxianzu* schools predominantly used Korean to teach courses in various subjects. However, the Chinese language classes were still important, as their number equaled that of Korean language classes. Furthermore, our early bilingual participants shared the following background profiles: a. They were born into families where at least one parent spoke Korean as their primary language; b. All but one started being exposed to Korean from age 0; c. They started being exposed to Chinese from age 0 to age 6; d. They stated that they had fully acquired both Korean and Chinese by the age of 11.

3. Chinese proficiency test. We used Wen's (2015) fill-in-the-blank quasi-C-test as a tool to assess our participants' Chinese proficiency. In this test, participants need to fill in each blank with one appropriate Chinese character. There were two texts in total, each containing 25 blanks. With each blank worth one point, the full score for the Chinese proficiency test was 50. Participants were given 10 minutes to finish the test. Table 1 shows the Chinese proficiency data of the 23 Korean-Chinese bilinguals. Also, the 31 L1 Chinese controls' data from Chen and Huan (2023) were also included.

	M	*SD*	Highest score	Lowest score
Chen & Huan's (2023) 31 L1 Chinese participants	47.27	2.55	49.5	36.5
23 Korean-Chinese bilinguals	47.63	1.55	50	45

Table 1. Chinese proficiency test results of L1 Chinese and Korean-Chinese participants

Wen (2015) used 22 as the cutoff point to select advanced L2 learners of Chinese. As shown in Table 1, the lowest scores for both groups were much higher than 22, and the average scores exceeded 47, which confirmed the validity of the proficiency test. A pairwise comparison reveals that there is no significant difference between the L1 Chinese speakers and the Korean-Chinese bilinguals regarding their Chinese proficiency scores ($t = 0.59$, $p = .56$), which indicates that the bilinguals' Chinese proficiency level is equivalent to L1 Chinese natives'.

4. Korean proficiency test. We developed a Korean proficiency test to measure our Korean-speaking participants' Korean proficiency. Given that Korean-Chinese bilinguals might not have strong reading or writing skills, the test was created in a listening format. There were 30 test items in total, each of which was presented to participants on a Microsoft PowerPoint slide. Each item had a sentence containing one missing particle, and participants were instructed to orally fill in the missing particle after hearing the sentence. They were allowed to listen to the sentence multiple times. An example is provided below:

(4) seonsaengnim, daehag-eseo mueos-eul galeuchi-sibnik-ka?
teacher university-at what-ACC teach-COP-Q
'Teacher, what do you teach at the university?'

For (4), the particle *-seo*, which is part of the locative case marker *-eseo* 'at', was removed. Therefore, our participants listened to (4) without *-seo*. A one-second pause was inserted to fill the gap left by the omitted word. In addition, participants were not able to see the sentence in its written form. Instead, they were presented with a string of 'X' characters along with a blank space, which represents the position of the omitted word. (5) is exactly what our participants saw when listening to the sentence in (4):

(5) XXX, XXX_XXX XXXXXX?

Participants earn one point for successfully producing *-seo*. All test sentences were developed based on example sentences from various Korean language textbooks and grammar books. For each test sentence, we removed only one particle, which is part of a functional word or content word. The full score of the test was 30. Table 2 shows the Korean proficiency data of the 23 Korean-Chinese bilinguals and the 15 L1 Korean controls.

	M	*SD*	Highest score	Lowest score
23 Korean-Chinese bilinguals	24.65	3.49	30	16
15 L1 Korean controls	26.53	1.73	29	23

Table 2. Korean proficiency test results of Korean-Chinese bilinguals and L1 Koreans

A pairwise comparison revealed no significant difference in Korean proficiency scores between the Korean-Chinese bilinguals and the L1 Korean controls (t = 1.94, p = .06). This implies that the 23 Korean-Chinese bilinguals have achieved a high level of proficiency in Korean.

5. Experimental design. The Chinese version of the sentence-picture matching TVJT in Chen and Huan's (2023) was adopted, based on which a Korean TVJT was further created. For each experimental trial, participants viewed a picture, listened to a sentence and then judged whether the picture matched the sentence in terms of the meaning. Each Chinese sentence from the Chinese TVJT was closely translated to Korean for the Korean TVJT. Native speakers pre-recorded all sentences with a natural tone, and these recordings, along with accompanying pictures, were presented to participants on Microsoft PowerPoint. The whole experiment was conducted on video conferencing programs such as VooV Meeting and Zoom, where we interacted with each participant on a one-to-one basis. The Korean-Chinese bilinguals were initially exposed to the Korean TVJT, followed by the Chinese TVJT. Then they completed the Korean and Chinese proficiency tests as well as a background information questionnaire. There was no time limit for the TVJTs, and participants were allowed to listen to each audio stimulus more than once.

Six characters from *Journey to the West*, a renowned Chinese novel published in the 16th century, were used in the TVJT. There were three students: *Monkey* (6a), *Pig* (6b), and *Sandy* (6c), along with three teachers: *Monk* (6d), *Sakyamuni* (6e) and *Goddess* (6f). There is also a dog (6g) who can speak languages.

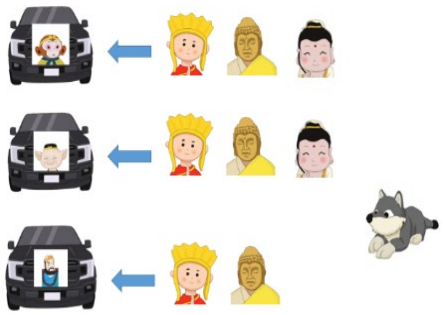
(6) a.  b.  c.  d.  e.  f.  g. 

Here is a sample trial: one day, the three students each bought their own car, as shown in (7):

(7)

Then the three teachers used Monkey's and Pig's cars. In addition, Monk and Sakyamuni used Sandy's car, as demonstrated in (8). The dog witnessed everything that had happened.

(8)



Afterwards, the dog says the Korean sentence in (2) or the Chinese sentence in (3). Participants then judge whether the sentence and the picture match by responding with 'yes' or 'no' in the

language being tested. Note that in Q-Neg sentences such as (2) and (3), the SS reading semantically entails the IS reading. That is, if none of the teachers used Sandy's car, it is also true that not all teachers used Sandy's car, but not the other way around. Thus, if our goal is to test the availability of the IS reading, we must create a context where the given Q-Neg sentence is correct under the IS reading but false under the SS reading. The story illustrated in (8) provided exactly such a context. Therefore, if both Korean and Chinese allow the IS reading in their Q-Neg sentences, we expect native speakers to accept (2) and (3) under the context of (8). However, if Korean permits the IS reading but Chinese does not, our prediction is that native Korean speakers will accept (2) while native Chinese will reject (3).

We used 16 sentences of different lexicalizations from Chen and Huan's (2023) experimental lists. Each sentence was combined with a picture requiring an IS reading. Then the 16 sentence-picture pairs were distributed to two lists so there were eight pairs in each list, constituting our critical trials. For each critical trial, there were two additional trials included as fillers, categorized as Type 1 filler and Type 2 filler. The Type 1 filler in Korean for the sample involving (2) and (8) is in (9) and the equivalent in Chinese is in (10):

(9) modeun seonsaengnim-i Wonsungi-ui cha-leul sse-oss-da. (Korean)
all teacher-NOM Monkey-GEN car-ACC use-PST-COP
'All teachers used Monkey's car.'

(10) suoyou laoshi yong-le Sunwukong de che. (Chinese)
all teacher use-PST Monkey GEN car
'All teachers used Monkey's car.'

The Type 1 fillers were used as baseline items to monitor whether our participants understood simple positive statements involving the universal quantifier *all* in Korean/Chinese. In each list, there were eight 'match' trials and eight 'mismatch' trials, accompanying the critical trials.

Meanwhile, the Type 2 fillers were used to assess whether our participants were able to interpret the negation word in simple negative sentences in Korean/Chinese. Below are examples:

(11) Yeolae-neun Dwaeji-ui cha-leul sseu-jianh-ass-da. (Korean)
Sakyamuni-TOP Pig-GEN car-ACC use-NEG-PST-COP
'Sakyamuni did not use Pig's car.'

(12) rulaifo meiyou yong Zhubajie de che. (Chinese)
Sakyamuni NEG use Pig GEN car
'Sakyamuni did not use Pig' car.'

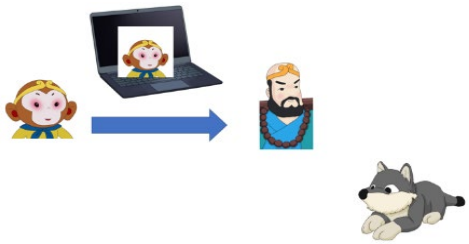
Like Type 1 fillers, there were eight 'match' trials and eight 'mismatch' trials for Type 2 fillers. In each experimental list, eight blocks were created. Each block started with a specific story, which included one critical trial, one Type 1 filler trial, and one Type 2 filler trial. The order of the eight blocks in each list was randomized. Moreover, the order of the three trials within each block were pseudorandomized and the very first trial in each list was a filler. The 'match' and 'mismatch' fillers were evenly distributed across trials. To ensure that our participants understand how to do the TVJT, we initially presented several sample trials before the actual trials. Two of the sample trials are shown below: one trial includes the Korean/Chinese sentence in (13) and the image in (14a); another trial includes the Korean/Chinese sentence in (13) and the image in (14b):

(13a) Wonsungi$_i$-ga Saojeong$_j$-e geu$_{i/j}$-ui Keompyuteo-leul bonae-ss-da. (Korean)
Monkey-NOM Sandy-DAT him-GEN computer-ACC send-PST-COP
'Monkey sent Sandy his computer.'

(13b) Sunwukong$_i$ jigei-le Shaheshang$_j$ ta$_{i/j}$ de diannao. (Chinese)
Monkey send-PST Sandy he GEN computer
'Monkey sent Sandy his computer.'

(14a)

(14b)



In both the Korean sentence (13a) and the Chinese sentence (13b), the pronouns *geu* and *ta* meaning 'him' can refer to either the subject *Wonsungi*/*Sunwukong* 'Monkey' or the indirect object *Saojeong*/*Shaheshang* 'Sandy.' Participants first view the image (14a) and then listen to the sentence (13a)/(13b). If they respond with 'no,' they would be asked to think about whether there is any possibility of saying the target sentence in the context of (14a). All participants who initially responded with 'no' successfully changed their response to 'yes' after reconsideration. Then the trial involving (13) and (14b) was presented and all participants responded with 'yes.' In addition, there was another set of sample trials, which involve the Korean/Chinese sentence in (15) and the images in (16a) and (16b):

(15a) Saojeong-eun Wonsungi-ga jasin-ui chiyag-eul sayonghae-ss-da-go malhae-ss-da.
Sandy-TOP Monkey-NOM self-GEN toothpaste-ACC use-PST-COP-COMP say-PST-COP
'Sandy said Monkey used his toothpaste.'

(15b) Shaheshang shuo Sunwukong yong-le ziji-de yagao.
Sandy say Monkey use-PST self-GEN toothpaste
'Sandy said Monkey used his toothpaste.'

(16a)

(16b)

In Korean sentence (15a) and Chinese sentence (15b), the morphologically simplex reflexive pronouns, *jasin* and *ziji*, meaning 'self,' can potentially refer to either the matrix subject *Sandy* or the embedded subject *Monkey*. Thus, participants were expected to say 'yes' to both the trial involving (15a)/(15b) and (16a) as well as the trial involving (15a)/(15b) and (16b). If they were unable to get the intended interpretation, the same procedure employed in presenting earlier sample trials was conducted. After that, a clear guideline was explicitly stated: if a sentence has two possible interpretations, as long as one of them corresponds to the given picture, the trial

should be accepted. The entire procedure, including the presentation of the two sets of trials, was adopted to address the preference issue in sentence-picture matching TVJ tasks, a concern previously discussed in White et al. (1997). That is, when faced with ambiguous sentences, participants may unintentionally overlook a less preferred reading that is in fact permitted in their grammar. Thus, our participants were instructed to explore possibilities and base their judgments on acceptability rather than preference. In addition, for the first block of trials in each list, which consists of an IS item and two fillers, participants were instructed to take time to think about whether there is any possibility of saying the target sentence in the given context for each trial.

6. Findings. We present three datasets: (i) L1 Korean data; (ii) L1 Chinese data from Chen and Huan's (2023) and (iii) Korean-Chinese bilinguals' data. Table 3 summarizes the three groups' mean proportions of 'yes' answers in the IS reading condition of the Korean and Chinese TVJTs:

Group	Language	Mean Proportion	Standard Deviation	Standard Error
L1 Korean	Korean	0.8	0.41	0.11
L1 Chinese	Chinese	0.08	0.25	0.04
Bilingual	Korean	0.65	0.44	0.09
Bilingual	Chinese	0.28	0.44	0.09

Table 3. Summary of the mean proportions of 'yes' answers in the TVJTs from all participants.

First, a total of 15 L1 Korean speakers (age range: 20-50) participated in the Korean TVJT. They were all born and raised in South Korea and identified Korean as their sole native language. Also, none of them had lived outside Korea before the age of 18. As shown in Table 3, the acceptance rate for the Korean IS trials within this group of participants was 0.8, which indicates that 80% of the answers were 'yes.' Since there were 8 IS trials in each experimental list, based on the binomial cumulative distribution, participants were considered to have made consistent judgments if they accepted or rejected 7 trials or more out of 8.[2] An examination of the individual data revealed that 12 (80%) out of the 15 L1 Korean participants accepted all 8 IS trials, which suggests that they fully allowed the IS reading in Korean Q-Neg sentences. However, the remaining 3 (20%) participants rejected all IS trials, indicating a complete disapproval of the IS reading. This result is unexpected under the assumption that the IS reading is available in Korean Q-Neg sentences. In order to gain a more accurate picture, we will continue collecting data from L1 Korean speakers.

Second, we use the L1 Chinese data collected in Chen and Huan (2023) for comparison. In Chen and Huan's experiment, 31 L1 Chinese speakers were recruited. They were all university students (age range: 18-24) in China and had never lived outside China by the time of the experiment. As shown in Table 3, the mean acceptance rate for the Chinese IS trials within the L1 Chinese group was only 0.08, which means 92% of their answers were 'no.' An analysis of individual data further demonstrated that 29 (93.55%) participants consistently rejected the IS trials, while only two (6.45%) participants consistently accepted them. Therefore, both the group and individual data strongly suggests that the IS reading is prohibited in Chinese Q-Neg sentences.

Now we examine the Korean-Chinese bilinguals' data. As indicated in Table 3, their group data in Korean and Chinese seems to differ from that of monolinguals: they were more likely to reject the IS reading in Korean but accept the IS reading in Chinese. We used R (R core team 2021) and *lm4* (Bates et al. 2015) to run a linear mixed-effects analysis (using *glmer*) on the bilingual participants' data. The dependent variable was participants' answers, with 'yes' coded as

[2] The cumulative probability of having 7 or more successes out of 8 independent trials is 0.04.

1 and ‘no’ coded as 0. The fixed factor was *Language* (Korean/Chinese). The Korean proficiency score and the Chinese proficiency score were included as covariates. Participants and items were treated as random intercepts. The results are shown in Table 4.

	Estimate	Standard Error	*z*-value	*p*-value
Intercept	-2.92	1.02	-2.86	0.004**
Language (KOR vs. CHN)	5.73	0.86	6.63	< 0.001***
KOR level	0.24	1.01	0.24	0.81
CHN level	-2.08	1.07	-1.94	0.05
Language * KOR level	1.37	0.74	1.86	0.06
Language * CHN level	1.98	0.83	2.38	0.02*
CHN level * KOR level	-0.06	1.14	-0.06	0.96
Language * KOR level * CHN level	-3.06	1.12	-2.73	0.006**

Model: Answer ~ Language + KOR level + CHN level + Language * KOR level +Language * CHN level + KOR level * CHN level + Language * KOR level * CHN level + (1|Participant) + (1|Item).

Table 4. Output of the binomial generalized linear mixed model fit by maximum likelihood

The results showed highly significant main effects for Language ($p < .001$) but no significant main effects for KOR level ($p = .81$) and Chinese level ($p = .05$). First, when we hold other variables constant, the estimate for Language was 5.73, which means the log odds of ‘yes’ answers will increase by 5.73 if we change Language from Chinese to Korean. Second, the Korean proficiency level did not have significant effects on the TVTJ answers ($p = .81$). However, the Chinese proficiency level seemed to have a marginally significant negative effect on the bilinguals’ TVTJ answers ($p = .05$). In other words, as the bilinguals’ Chinese proficiency level rises, they are more likely to say ‘no’ in the TVJTs. Moreover, we also found significant interaction effects between Language and Chinese level ($p = .02$). In particular, while holding other variables constant, if we change from Chinese to Korean, participants with higher Chinese proficiency are expected to have a greater increase in the log odds of providing 'yes' answers, compared to participants with lower Chinese proficiency. Thus, we can infer that bilinguals with higher Chinese proficiency are more likely to accept Korean trials.

We now analyze the individual data of the bilingual participants. Again, we use 7 as the cut-off point to see whether individuals made consistent judgments. An examination revealed three different groups of participants. First, there were 6 (26.09%) participants who consistently accepted the IS reading in both Korean and Chinese. Second, 9 (39.13%) participants consistently accepted the IS reading in Korean and consistently rejected the IS reading in Chinese. Third, 8 (34.78%) participants consistently rejected the IS reading in both Korean and Chinese. Table 5 summarizes the individual data.

Judgment on Q-Neg sentences	Number of Participants	Percentage
Accepting IS in Korean and Chinese	6	26.09%
Accepting IS in Korean but rejecting IS in Chinese	9	39.13%
Rejecting IS in Korean and Chinese	8	34.78%
Total	23	100%

Table 5. Summary of the 23 bilinguals’ judgment on the IS reading in Korean and Chinese

7. Discussion. First of all, the L1 Korean data revealed that 80% of the participants consistently accepted the IS reading in Korean Q-Neg sentences while the remaining 20% of them consistently rejected it. This finding aligns with our prediction: the IS reading is accepted in Korean Q-Neg sentences. However, this contrasts with the L1 Tibetan data in Chen and Huan (2023). As discussed, Tibetan is also a language allowing the IS reading in Q-Neg sentences. In Chen and Huan's study, out of 25 L1 Tibetan participants, 24 (96%) consistently accepted the IS reading in Tibetan Q-Neg sentences, while only one (4%) participant consistently rejected it. Thus, although both Korean and Tibetan allow the IS reading in their Q-Neg sentences, there seems to be a greater interspeaker variation among L1 Korean speakers. Additional data collection is needed to verify whether our existing L1 Korean data is indeed representative of the entire L1 Korean population. If so, future studies will examine what factors lead 20% of the population to prohibit the IS reading in Q-Neg sentences. What we can infer from the existing data is that Korean generally permits the IS reading in Q-Neg sentences, although there is still a notable portion of native speakers rejecting this interpretation.

Moreover, the data of the 23 early Korean-Chinese bilinguals in this study were in line with that of the Tibetan-Chinese bilinguals in Chen and Huan (2023). Three different groups were identified in this study: (a) Group One, consistently accepting the IS reading in both languages; (b) Group Two, consistently accepting the IS reading in Korean but consistently rejecting it in Chinese; (c) Group Three, consistently rejected the IS reading in both languages. We want to highlight that the early Korean-Chinese bilinguals' findings complement the experimental results of Chen and Huan (2023). Chen and Huan examined Chinese-dominant heritage speakers of Tibetan, who stopped consistent exposure to Tibetan after being immersed in a Mandarin-speaking environment around the age of 12-13. In contrast, the 23 Korean-Chinese bilinguals in the present study sustained exposure to Korean in their school settings until college, despite Chinese being the socially dominant language. Given that Group Two constituted approximately 40% of the samples, it can be inferred that early Korean-Chinese bilinguals are able to make a distinction between the two languages regarding the availability of the IS reading. Since the interpretation of Q-Neg sentences involve multiple modules such as syntax, semantics and pragmatics, this finding suggests that early bilinguals can navigate one-to-many mappings between form and meaning in one language while maintaining one-to-one mapping in another language.

In addition, the Group Three participants, who consistently rejected the IS reading in both languages, made up 34.78% of the bilingual samples. While we observe that 20% of the L1 Korean participants also reject the IS reading in Korean, the proportion of Group Three is higher, indicating a possible influence of Chinese.[3] Based on this finding, we can infer that early Korean-Chinese bilinguals may prohibit the IS reading in Q-Neg sentences in both languages. This complete prohibition may be attributed to cognitive economy because the target IS reading is derived by negation raising, which may require extra processing efforts (e.g., Chen & Huan 2023).

Regarding Group One, although their Chinese proficiency is native-equivalent, they still lack the knowledge of the constraint that Chinese Q-Neg sentences disallow the IS reading. A point-biserial correlation analysis was conducted between the 23 early bilinguals' *z*-scores on the Chinese proficiency test and their categorical judgment on the Chinese IS items. The results re-

[3] We conducted a chi-square test to examine the relationship between the language background (L1 Korean vs. Korean-Chinese bilinguals) and the acceptance of the IS reading. The chi-square test yielded a statistic of 0.96 with a *p*-value of .33. Thus, we cannot affirm that bilinguals are more likely to reject the IS reading in Korean. However, we acknowledge that our sample size is still limited, and further data collection is needed.

vealed no statistically significant correlation (r_{pb} (21) = 0.31, p = 0.15). Also, there was no significant correlation between their z-scores of the Korean proficiency test and their categorical judgment on the Chinese IS items: (r_{pb} (21) = 0.06, p = 0.8). This finding suggests that high Chinese/Korean proficiency may not guarantee the acquisition of the Chinese constraint, which further implies that early Korean-Chinese bilinguals may maintain scope ambiguity in both languages. As discussed in Chen and Huan (2023), the strategy of keeping scope ambiguity in both languages could be more cognitively efficient than imposing a constraint on just one language. Thus, the experimental results of Group One and Group Three suggest that early Korean-Chinese bilinguals may employ two opposite strategies when constructing Q-Neg sentences: either allowing or prohibiting the IS reading in both languages. Interestingly, both strategies seem to share a common goal: to minimize syntactic differences between their grammars. In line with Chen and Huan (2023), we argue that this tendency is not exclusive to heritage speakers but extends to early bilinguals as well. That is, early bilinguals may minimize structural differences across languages rather than simply seek ambiguity avoidance.

8. Conclusion. This study investigated whether early Korean-Chinese bilinguals have the knowledge that Q-Neg sentences allow the IS reading in Korean but not in Chinese. We used the sentence-picture matching TVJT from Chen and Huan (2023), along with Korean and Chinese proficiency tests. Similar to Chen and Huan's findings on Chinese-dominant heritage speakers of Tibetan, the experimental results of our study identified three distinct bilingual groups: (i) Group One, allowing the IS reading in both Korean and Chinese; (ii) Group Two, allowing the IS reading in Korean but prohibiting it in Chinese; (iii) Group Three, prohibiting the IS reading in both languages.

The findings have two significant implications for early Korean-Chinese bilinguals: (i) they are able to make a distinction between Korean and Chinese concerning the scope assignment difference in Q-Neg sentences; (ii) they may either permit or prohibit the IS reading in both languages. Despite these seemingly contrasting strategies, they share the same goal of minimizing syntactic differences between their grammars. We argue that this tendency is not exclusive to heritage speakers but also extends to early bilinguals.

References

Aoun, Joseph & Yen-Hui Audrey Li. 1993. *Syntax of scope*. Cambridge, MA: MIT Press.

Bates, Douglas, Martin Mächler, Ben Bolker & Steve Walker. 2015. Fitting linear mixed-effects models using lme4. *Journal of Statistical Software* 67(1). 1–48. https://doi.org/10.18637/jss.v067.i01.

Chen, Yunchuan & Tingting Huan. 2023. Scope assignment in quantifier-negation sentences in Tibetan as a heritage language in China. *Second Language Research*. Online First. https://doi.org/10.1177/02676583231161164.

Choi, Woo-Gil. 2001. The Korean minority in China: The change of its identity. *Development and Society* 30(1). 119–141.

Fan, Li. 2017. No "Chinese-speaking phase" in Chinese children's early grammar – A study of the scope between negation and universal quantification in Mandarin Chinese. *Lingua* 185. 42–66. https://doi.org/10.1016/j.lingua.2016.07.005.

Moscati, Vincenzo. 2010. *Negation raising: Logical Form and linguistic variation*. Newcastle Upon Tyne: Cambridge Scholars Publishing.

Musolino, Julien, Stephen Crain & Rosalind Thornton. 2000. Navigating negative quantificational space. *Linguistics* 38(1). 1–32. https://doi.org/10.1515/ling.38.1.1.

Musolino, Julien & Jeffrey Lidz. 2006. Why children aren't universally successful with quantification. *Linguistics* 44(4). 817–852. https://doi.org/10.1515/LING.2006.026.
R Core Team. 2021. R: A language and environment for statistical computing. Vienna, Austria: R Foundation for Statistical Computing. http://www.R-project.org/.
Wen, Zhijun. 2015. *Chinese sentence processing by first and second language speakers*. Honolulu, HI: University of Hawaii at Manoa dissertation.
White, Lydia, Joyce Bruhn-Garavito, Takako Kawasaki, Joe Pater & Phillippe Prévost. 1997. The researcher gave the subject a test about himself: Problems of ambiguity and preference in the investigation of reflexive binding. *Language Learning* 47. 145–172. https://doi.org/10.1111/0023-8333.41997004.
Zhou, Peng & Stephen Crain. 2009. Scope assignment in child language: Evidence from the acquisition of Chinese. *Lingua* 119(7). 973–988. https://doi.org/10.1016/j.lingua.2009.01.001.