Remarks on Defining Korean NPIs in terms of Negation Strength

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Keun Young Shin and Daeho Chung. 2009. Remarks on Defining Korean NPIs in terms of Negation Strength. *Language and Information 13.2*, 47–57. It has been observed that not all negative polarity items (NPIs) are licensed in the same negative contexts, and different NPIs may be licensed by different negative expressions. This shows that Ladusaw's (1979) downward entailment is not precise enough to account for the distributional patterns of NPIs (van der Wouden, 1997; van der Wouden and Zwarts, 1993; Zwarts, 1986, among others). One well-known attempt to deal with this issue is to divide negative expressions into several subtypes. Using boolean semantics, Zwarts (1986; 1998) distinguishes three kinds of downward entailing licensors and accounts for heterogeneous NPI-licensing conditions by means of the semantic strength of negative expressions. This approach has been adopted to define Korean negation (Nam, 1994; Chung, 1993; Chung, 1997; Hwang, 2009). In this paper, however, we argue that the boolean semantic approach for negation is not adequate in characterizing the properties of Korean negative expressions and explaining the contexts of licensing Korean NPIs. (**Hanyang University**)

Key words: negation, negative polarity item (NPI), Boolean semantics, negation strength, scope ambiguity, categorial grammar

1. Zwarts's (1986; 1998) Boolean Approach for Negation

In German, Dutch and English, Zwarts (1986; 1998) discovers that the logical behaviors of negative expressions are not governed by the laws of De Morgan in a uniform way: they differ in how many of the four De Morgan's relations used by Zwarts are valid with them. Based on boolean properties of negation, Zwarts proposes that there are three types of negation: anti-morphic (e.g., sentential negation *not*), anti-additive (e.g., *no man*), and monotonic-decreasing (e.g., *few men*) expressions, as sketched in (1).

(1) A hierarchy of negative expressions:
Let B and B^* be two Boolean algebras, and f a function from B to B^*

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	Monotone-decreasing	Anti-additive	Anti-morphic
(i) $f(X \cup Y) \subseteq f(X) \cap f(Y)$	valid	valid	valid
(ii) $f(X) \cap f(Y) \subseteq f(X \cup Y)$	invalid	valid	valid
(iii) $f(X \cap Y) \subseteq f(X) \cup f(Y)$	invalid	invalid	valid
(iv) $f(X) \cup f(Y) \subseteq f(X \cap Y)$	valid	valid	valid

These negative expressions are ordered hierarchically. The stronger a given expression is, the more conditions it satisfies. For example, the negative NP *few* N is the weakest negation that denotes a monotone-decreasing function. The following examples illustrate that *few* N validates only (1-i) and (1-iv).

(2) a. Few trees will blossom or will die. $\rightarrow$ Few trees will blossom and few trees will die.

b. Few trees will blossom and few trees will die. $\nrightarrow$ Few trees will blossom or will die.

c. Few trees will blossom and will die. $\nrightarrow$ Few trees will blossom or few trees will die.

d. Few trees will blossom or few trees will die. $\rightarrow$ Few trees will blossom and will die. (Zwarts, 1998, 181)

On the other hand, *no* N, which is stronger than *few* N, satisfies (1-ii) as well as (1-i) and (1-iv).

(3) a. No man escaped or got killed. $\rightarrow$ No man escaped and no man got killed.

b. No man escaped and no man got killed. $\rightarrow$ No man escaped or got killed.

c. No man escaped and got killed. $\nrightarrow$ No man escaped or no man got killed.

d. No man escaped or no man got killed. $\rightarrow$ No man escaped and got killed. (Zwarts, 1998, 182)

According to Zwarts, this hierarchical approach for negation provides a principled account for heterogeneous NPI-licensing environments across different languages. That is, the strength difference between negative expressions is reflected in their abilities to license NPIs. As shown in (4), Zwarts distinguishes three classes of NPIs depending on the negative strength of their licensors: superstrong NPIs, strong NPIs, and weak NPIs.

(4) Laws of negative polarity

a. Only sentences in which a monotone decreasing expression (e.g., *few* N) occurs can contain a negative polarity item of the weak type.

b. Only sentences in which an anti-additive expression (e.g., *No N*) occurs can contain a negative polarity item of the strong type.

c. Only sentences in which an anti-morphic expression (e.g., *not*) occurs can contain a negative polarity time of the superstrong type.

(Zwarts, 1998, 233)

He also shows that there exist both weak and strong NPIs in Dutch and German. While Dutch *hoeven* 'need' and German *brauchen* 'need' are weak NPIs that can occur in all negative contexts, Dutch *ook maar iets* and German *auch nur irgendwas* 'anything (at all)' are strong NPIs that are licensed only in anti-additive and anti-morphic environments.

2. Nam's (1994) Analysis of Korean NPI *amwuto*

In addition to strong and weak NPIs, Nam (1994) argues that there is a super-strong NPI (what he calls "strongest" NPI) in Korean, which would provide further empirical support for Zwarts's hierarchical approach for NPIs. He claims that Korean NPI *amwuto* is licensed only by an anti-morphic function.

In Korean, there are scope ambiguities which arise through interactions between negation and quantified NPs. In (5), negation is interpreted as not only VP negation but also sentence negation.

(5) motun haksayng-tul-i ttena-ci ahn-ass-ta
all student–Pl-Nom leave-Comp Neg-Pst-Dec
(i) 'No student left'
(ii) 'Not all the students left' (Nam, 1994, 19)

Nam proposes that the ambiguity in (5) is obtained by invoking two different compositions for the sentence. He analyzes the anti-morphic *ahn* as combining with a verb in two different ways, i.e., either by function application or by function composition. If the verb combines with negation via function application, we can get a narrow-scope reading for negation, and the whole negated predicate denotes a homo-morphic function by the following definitions:

(6) Let f be an anti-morphic function and g a homomorphism, then
a. the composition of f and g, $f \cdot g$ is anti-morphic, and
b. the application of f to g, $f(g)$ is homo-morphic. (Nam, 1994, 9)

On the other hand, if the verb undergoes type-raising and then combines with negation via function composition, negation has a wide scope reading. In this case, the whole negated predicate denotes an anti-morphic function by definition (6a).

Unlike *motun haksayng* 'all the students,' the NPI *amwuto* 'anyone' does not interact with negation and give rise to scope ambiguity. Sentence (7) has only one reading.

(7) amwuto o-ci ahn-ass-ta.
anyone come-Comp Neg-Pst-Dec
'None came.'

Assuming that negation always takes wide scope over an NPI, Nam claims that the NPI *amwuto* is only licensed by an anti-morphic function since a wide-scope reading of negation is derived by combining the type-raised verb with negation via function composition as represented in (8).

(8)

amwuto	o-	ci ahn-
Pn/Pn+1: ANYONE	P1: COME	Pn\Pn: NOT
	——T	
	P0\(P0/P1): COME*	
	——B	
	P0\(P0/P1): NOT·COME*	
——A		
P0: NOT·COME*(ANYONE)		
· = NOT(ANYONE(COME))		(Nam, 1994, 12)

However, this compositional analysis faces both empirical and theoretical problems. It has been suggested that the NPI *amwuto* is not licensed in the scope of negation, in contrast to Nam's assumption (Kim, 1999; Lee, 2001; Sells, 2006; Kim and Sells, 2007). To be more precise, negation is under the immediate scope of the Korean NPI that should be analyzed as a universal quantified NP. One piece of evidence comes from the fact that *amwuto* in the subject position can be licensed by lexical negation that cannot scope over the subject as in (9).

(9) motun haksayng-i Cheli-lul molu-n-ta
all students-Acc Cheli-Acc not;know-Pres-Dec
'All the students did not know Cheli.' (ALL > NOT, *NOT> ALL)

(10) amwuto Cheli-lul molu-n-ta
anyone Cheli-Acc not;know-Pre-Dec
'No one knew it.'

Moreover, *amwuto* can be modified by *keuy* 'almost' unlike the English NPI *any* (Kim, 1999, 408).

(11) *John did not meet almost anyone.

(12) Cheli-nun keuy amwuto manna-ci ahn-ass-ta.
Cheli-Top almost anyone meet-Comp Neg-Pst-Dec
'Cheli did not meet almost all people.'

According to Carlson (1981), the modification of *almost* shows whether a given quantified expression is existential or universal: *almost* can modify the universal *any*, whereas it cannot modify the existential or NPI *any*. The grammaticality of (12) suggests that *amwuto* is not an existential quantified expression.

In (7), therefore, the NPI takes wide scope over negation, not vice versa. Following Nam's approach, the negated VP 'not come' cannot take the NPI as its argument in (7), but it becomes an argument of the NPI as illustrated in (13).

(13)

amwuto	o-	ci ahn-ass-ta.
Pn/Pn+1: ANYONE	P1: COME	Pn\Pn: NOT
	T	
	P0\(P0/P1): COME*	
	A	
	P1: NOT(COME)	
A		
P0: ANYONE (NOT(COME))		

Note that in (13) negation combines with the VP by function application, yielding the negated VP that denotes a homo-morphic function. However, this conflicts with Nam's own claim that the NPI *amwuto* is licensed by an anti-morphic function.

Another problem has to do with the use of type-raising and function composition in order to derive an anti-morphic negated VP. It is well-known that type-raising rules along with function composition give rise to overgeneration problems because of their recursive nature. A number of ways have been proposed to avoid spurious ambiguity in the analysis of linguistic data — for example, applying the type-raising rules only "on demand" (Partee and Rooth, 1983; Wood, 1993; Steedman, 2000, among many others). There is general agreement that function composition and type-raising are allowed only when they offer the only possible way to form a derivation or have some semantic effects. Nam applies type-raising and function composition in combining a verb and negation in order to obtain a wide scope reading for negation. However, we can easily get this wide-scope reading of negation by combining the type-raised verb with the subject instead of combining the verb with negation through function composition as shown in (14).

(14)

amwuto	o-	ci ahn-ass-ta.
Pn/Pn+1: ANYONE	P1: COME	Pn\Pn: NOT
	T	
	P0\(P0/P1): COME*	
A		
P0: ANYONE(COME)		
A		
P0: NOT(ANYONE(COME))		

It should be also stressed that unlike the derivation in (8), the derivation in (14) clearly shows why the verb undergoes type-raising. In (14), type-raising allows negation to take a sentence as its argument. As a result, negation is interpreted as sentence negation that takes wide scope over the NPI. Therefore, there is no independent motivation for using function composition in (8).

Nam's explanation for the NPI licensing condition depends on using diverse semantic mechanisms to interpret scope ambiguities between negation and a quantified NP. Put another way, it is based on the assumption that negation can be interpreted either as VP negation or as sentence negation, but this assumption is problematic. Not all NPs exhibit this scope ambiguity with negation even though

they are not NPIs that Nam claims require sentence negation. For example, sentence (15) is unambiguous.

(15) ceketo twu-myeng-i kukek-ul mek-ci ahn-ass-ta.
at least two-CL-Nom that thing-Acc eat-Comp Neg-Pst-Dec
'At least two persons did not eat it.' (AT LEAST TWO > NOT)

If a type-raised verb can combine with negation in a brute force way as in (8), we would expect that negation can take wide scope over the subject NP in (15). Given that negation only has narrow scope in (15), we need to stipulate another ad-hoc rule to prevent the composition of a verb and negation via function composition in some cases. Note that the NP 'at least two students' is not an NPI that appears only in negative contexts, and it can occur with a homo-morphic, affirmative, predicate as shown in (16).

(16) ceketo twu-myeng-i ttena-ss-ta
at least two-CL-Nom leave-Pst-Dec
'At least two persons left.'

Thus, the example in (15) also poses another problem in Nam's proposal to invoke the two different compositions in order to capture scope ambiguities between a quantified NP and negation.

3. Other Attempts to Define Korean Negation in terms of Negative Strength

Despite such shortcomings, Nam's semantic approach for negation has been extended to define other Korean negative expressions such as short-form negation *an* and lexically negated verbs (Chung, 1993; Chung, 1997; Hwang, 2009).

Chung (1993; 1997) observes that the NPI *amwuto* can be licensed not only by long-form negation *ahn* but also by lexically negated verbs like *moluta* 'not know' and *epsta* 'not exist' as exemplified earlier in (10). He proposes that *amwuto* is not a superstrong NPI by arguing that a lexically negated verb displays the characteristic features of an anti-additive function. The following examples are taken as evidence to show that a lexically negated verb is anti-additive. According to Chung (1993; 1997) and Lee (2004), the invalidity of (17c) indicates that the lexically negated verb *moluta* is not anti-morphic but anti-additive.

(17) a. Cheli-nun [Sue-na Yengi]-lul **molu**-n-ta →
Cheli-Top [Sue-or Yengi]-Acc not;know-Pres-Dec
'Cheli does not know Sue or Yengi.'

Cheli-nun Sue-lul **molu**-ko Cheli-nun Yengi-lul
Cheli-Top Sue-Acc not;know-and Cheli-Top Yengi-Acc
molu-n-ta
not;know-Pres-Dec
'Cheli does not know Sue, and Cheli does not know Yengi.'

b. Cheli-nun Sue-lul **molu**-ko Cheli-nun Yengi-lul **molu**-n-ta. → Cheli-nun [Sue-na Yengi]-lul **molu**-n-ta.

c. Cheli-nun [Sue-wa Yengi]-lul **molu**-n-ta. ↛
Chel-Top [Sue-and Yengi]-Acc not;know-Pres-Dec
'Cheli does not know Sue and Mary.'

Cheli-nun Sue-lul **molu**-kena Cheli-nun Yengi-lul
Cheli-Top Sue-Acc not;know-or Cheli-Top Yengi-Acc
molu-n-ta.
not;know-Pres-Dec
'Cheli does not know Sue, or Cheli does not know Yengi.'

d. Cheli-nun Sue-lul **molu**-kena Cheli-nun Yengi-lul **molu**-n-ta. → Cheli-nun [Sue-wa Yengi]-lul **molu**-n-ta.

If a lexically negated verb obligatorily undergoes type-raising and takes the subject as its argument, we can use the coordination tests in (17) to characterize the property of the lexically negated verb. This type-raising approach, however, faces the same problem as Nam's analysis because it is also based on the wrong assumption that negation always takes wide scope over an NP in the subject position. As pointed out by Chung and Park (1998) and Kim (1999), lexical negation has only a narrow-scope reading because the scope of negation is restricted to a verb: it is only construed as being under the scope of the NPI as shown in (9). Just like long-form negation, a lexically negated verb cannot be analyzed as a functor taking the NPI as its argument.

Furthermore, the conditional in (17a) is not valid. The truth of the antecedent is not a sufficient condition for the truth of the consequent. Imagine a situation in which Cheli knows Sue, but he does not know Yengi. In this case, the antecedent is true, but the consequent is false. Recently, Hwang (2009) argues that the invalidity of (17a) is due to the fact that lexical negation always has narrow scope. That is, lexical negation takes narrow scope with respect to any quantified NP, and it is interpreted to be distributed over each conjunct as exemplified in (18) and (19). Hwang accepts the following biconditionals as valid.

(18) Cheli-nun [Sue-na Yengi]-lul molu-n-ta. ↔
Cheli-Top [Sue-or Yengi]-Acc not;know-Pres-Dec
'Cheli does not know Sue or Yengi.'

Cheli-nun Sue-lul molu-kena Cheli-nun Yengi-lul molu-n-ta.
Cheli-Top Sue-Acc not;know-or Cheli-Top Yengi-Acc not;know-Pres-Dec
'Cheli does not know Sue, or Cheli does not know Yengi.'

(19) Cheli-nun [Sue-wa Yengi]-lul molu-n-ta. ↔
Cheli-Top [Sue-and Yengi]-Acc not;know-Pres-Dec
'Cheli does not know Sue and Mary.'

Cheli-nun Sue-lul molu-ko Cheli-nun Yengi-lul molu-n-ta
Cheli-Top Sue-Acc not;know-and Cheli-Top Yengi-Acc not;know-Pres-Dec
'Cheli does not know Sue, and Cheli does not know Yengi.'

Recall that in Nam's analysis a negated predicate denotes an anti-morphic function only when negation takes wide scope over an NP. If Hwang's claim is on the right track, lexical negation that only has narrow scope cannot be considered an anti-morphic function taking an NPI as its argument.

Nevertheless, Hwang claims that all forms of negated predicates including short-form negation *an* are anti-morphic in Korean, supporting Nam (1994)'s claim that the NPI *amwuto* is a super-strong NPI. Korean short-form negation *an* behaves like lexical negation by directly attaching to a verb, and *amwuto* can occur with this negation as in (20).

(20) amwuto Cheli-lul an man-ass-ta
anyone Cheli-Acc Neg meet-Pst-Dec
'No one meets Cheli.'

Assuming that lexical or short-form negation is always distributed over each conjunct, Hwang presents the following derivations to conclude that lexical negation and short-form negation are anti-morphic.[1]

(21) (A and B) lexical/short negation = Neg A and Neg B
$= f(\alpha) \wedge f(\beta)$
$= f(\alpha \vee \beta)$
[by the def. of anti-additive]

(22) (A or B) lexical/short negation = Neg A or Neg B
$= f(\alpha) \vee f(\beta)$
$= f(\alpha \wedge \beta)$
[by the def. of anti-multiplicative]

However, this claim is based on circular reasoning, which cannot be defined linguistically or formally. For example, $f(\alpha) \wedge f(\beta) = f(\alpha \vee \beta)$ in (21) is derived by the definition of an anti-additive function. She assumes that lexical negation denotes an anti-additive function in order to apply the definition of the anti-additive function to obtain $f(\alpha) \wedge f(\beta) = f(\alpha \vee \beta)$. In addition, she makes two claims that are in conflict with each other. She observes Neg (A and B) = Neg (A) and Neg (B) and Neg (A or B) = Neg (A) or Neg (B) as in (21) and (22). If an NP is an argument of a negated verb, it indicates that lexical negation is homo-morphic (i.e., multiplicative and additive function that preserves meets and joins), but this conflicts with her own proposal that lexical negation is anti-morphic.

[1] Hwang (2009) uses the following definitions provided by Nam (1994, 3):

Let $< A, \leq >$ and $< B, \leq >$ be two Boolean algebras.

(a) $f \in [A \rightarrow B]$ is *monotone decreasing* iff for all $\alpha, \beta \in A$, if $\alpha \leq \beta$, then $f(\beta) \leq f(\alpha)$.

(b) $f \in [A \rightarrow B]$ is *anti-additive* iff for all $\alpha, \beta \in A, f(\alpha \vee \beta) = f(\alpha) \wedge f(\beta)$.

(c) $f \in [A \rightarrow B]$ is *anti-multiplicative* iff for all $\alpha, \beta \in A, f(\alpha \wedge \beta) = f(\alpha) \vee f(\beta)$.

(d) $f \in [A \rightarrow B]$ is *anti-morphism* iff f is anti-additive and anti-mulitplicative.

4. An Attempt to Explain Korean Negation in Zwart's Analysis

Although Nam (1994) and Zwarts (1986; 1998) share the idea that VP negation has to do with an anti-morphic function, their approaches for negation are very different. Recall that Nam explains the scope ambiguity of negation and a quantified NP under the assumption that a negated VP can denote two different functions. As we discussed earlier, this approach has difficulty in explaining the fact that negation and an NP do not always give rise to scope ambiguity. For example, the quantified NP 'all the students' in the subject position interacts with negation in (2), whereas such a scope ambiguity is absent in (15) when the subject is 'at least two persons.' Zwarts proposes that the scope ambiguity between negation and an NP is closely related with the nature of the NP, i.e., whether a given NP is *consistent* which is defined in (23) with the corollary in (24).

(23) Let B be a Boolean algebra. A quantifier Q on B is said to be consistent iff each element X of the algebra B: If $-X \in Q$, then $X \notin Q$

(Zwarts, 1998, 204)

(24) An NP is consistent iff the following schema is logically valid:
NP (NEG VP) → NEG (NP VP) (Zwarts, 1998, 204)

This approach can capture the contrast between (2) and (15): the scope ambiguity in (2) is attributed to the fact that the subject NP 'all the students' is consistent. With a consistent NP, VP negation can be interpreted as sentence negation. Given that 'at least two persons' is not consistent, it is also predicted that negation cannot function as sentence negation, and hence it cannot take scope over the subject in (15).

This may raise the question of how to define Korean negative expressions in terms of Zwarts's negative strength. In Zwarts's analysis, negation 'not' takes a verb as its argument. With the aid of the VP coordination test, we can easily see that Korean long-form negation *ahn* 'not' denotes an anti-morphic function (cf. Lee (2004)).

(25) ku-nun kekise mek-kena ca-ci ahn-nun-ta ↔
he-Top there eat-or sleep-Comp Neg-Pres-De
'He does not eat or sleep there'

ku-nun kekise mek-ci ahn-ko, ku-nun kekise ca-ci ahn-nun-ta
he-Top there eat-Comp Neg-and he-Top there sleep-Comp Neg-Pres-Dec
'He does not eat there, and he does not sleep there.'

(26) ku-nun kekise mek-ko ca-ci ahn-nun-ta ↔
he-Top there eat-and sleep-Comp Neg-Pres-Dec
'He eats and sleeps there'

ku-nun kekise mek-ci ahn-kena, ku-nun kekise ca-ci
he-Top there eat-Comp Neg-or he-Top there sleep-Comp
ahn-nun-ta
Neg-Pres-Dec
'He does not eat there, or he does not sleep there.'

Unfortunately, such a coordination test cannot be used to characterize short-form or lexical negation. A lexically negated verb is formed as one word in the lexicon, and hence the scope of negation is restricted to one verb. Short-form negation *an* that is analyzed as a prefix attaching to a verb (Kim, 2000, cf. Sells, 2001) also negates only one verb to which it is adjacent as exemplified in (27).

(27) Cheli-ka sakwa-lul an ssis-ko mek-ess-ta
Cheli-Nom apple-Acc Neg wash-and eat-Pst-Dec
'Cheli did not wash and ate the apple.'
(# 'Cheli did not [wash and eat the apple].')

Furthermore, since Korean NPIs are not in the scope of negation, it is not adequate to deal with their licensing conditions in Zwarts's analysis where NPIs are licensed in the scope of their triggers.

5. Conclusion

Zwarts's semantic approach for negation has been designed to provide a typology of NPIs by classifying them into three types across languages according to their different licensing contexts. In fact, there have been several attempts to define Korean negation and explain NPI licensing conditions by adopting this approach. However, they have not recognized an important typological difference between Korean and English/German/Dutch. That is, Korean NPIs are not licensed in the scope of negation, and hence they cannot be treated as arguments of negated predicates. Mainly due to this idiosyncratic property of Korean NPIs, it is difficult to define the contexts of licensing Korean NPIs in terms of three different levels of negation.

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