Pragmatic Scale and the Properties of Scalar Quantificational Determiners*

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A notion of linguistic scale is examined in connection with some scalar quantificational determiners such as *all, most, many,* and *some* in English and their correspondents in Korean. The widely-used definition of scale which is based on the identity of syntactic category and the linear ordering by the degree of semantic strength among the scalar predicates is not adequate enough to explain some set of facts about implicature and entailment that involve quantificational determiners. Attention is paid to *many* and *most* (in English and in Korean) that require a context parameter to get properly interpreted. They should be represented not as occupying a point on a scale but as occupying some interval. I also suggest that the properties of a scalar quantificational determiner including monotonicity and class-inclusiveness play an important role in scalar entailment and implicature, and therefore have to be considered in forming a linguistic scale.

1. Introduction

Semantic and pragmatic studies on scalar implicature and entailment have relied heavily on the notion of scale. However, the definition of scale is all too often taken for granted. Most studies adopt, explicitly or implicitly, a definition of scale which is more or less a variant of the one given by Levinson (1983: 133):

(1) A linguistic scale consists of a set of linguistic alternates, or contrastive expressions of the same grammatical category, which can be arranged in a linear order by degree of informativeness or semantic strength.

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The purpose of this paper is to show that the definition in (1) is not sufficient at least to deal with entailment and implicature involving scalar quantificational determiners such as *most, many* and *half*.

2. Horn's Scale

According to Horn (1989: 237), quantificational determiners like *all, most, many,* and *some* on the one hand, and *no, hardly any, few* and *not all* on the other, form a scale. The scale can be represented schematically as in (2):

(2)

1 all	−1 no hardly any
most/a majority	very few few
.5 half	−.5 not half
very many	
many quite a few several some	
0	0 not all

One thing to note here is that the determiners on the scale show a characteristic behavior with respect to coordination when they appear in an NP. For example, Horn (1989) notices that *many* p and *many* ¬p can be conjoined without being logically inconsistent, while *most* p and *most* ¬p cannot:

(3) a. Many Americans smoke and many don't.
b. #Most Americans smoke and most don't.

Thus, if we adopt the terminology of Lobner (1985), *many* is a tolerant determiner and *most* is an intolerant determiner. Generalizing this property into all the scalar expressions in (2), Horn (1989: 237-8) argues that low-point operators situated at or below the midpoint (.5) of a scale, (e.g., *many, half, some* in (4)) are 'tolerant operators', while those situated above

the midpoint (e.g., *all, a majority, almost all* in (5)) are 'intolerant operators':

(4) Many of my friends are linguists and many of them aren't.
Half half
Some some

(5) # All of my friends are linguists and all of them aren't.
A majority a majority
Almost all almost all

We will turn to the validity of the claim that *many* is a uniform tolerant operator in section 4, but let us restrict our attention for the moment to the scale in (2) on the whole. One might arrange the elements on the positive side of the diagram linearly as in (6), starting from the strongest expression *all* and ending with the weakest one *some*:

(6) <all, most, half, very many, many, quite a few, several, some>

Let us call this putative scale a scale of positive quantificational determiners. As a number of scholars including Fauconnier (1975), Gazdar (1979), Levinson (1983), and Horn (1989) note, there is a systematic meaning relation holding between the elements on a scale, which is summarized in (7):

(7) Scalar Entailment and Implicature:
Given any scale of the form $<e_1, e_2, e_3, \cdots e_n>$, and a sentential frame A,
i) $A(e_{n-1})$ entails $A(e_n)$, and
ii) if a speaker asserts $A(e_n)$ ··· then she implicates $\neg(A(e_{n-1}))$, $\neg(A(e_{n-2}))$ and so on, up to $\neg(A(e_1))$.

A question that arises is: Does every expression on the putative scale of positive quantificational determiners follow the general patterns of entailment and implicature outlined in (7)? This is what we turn to in section 3.

3. Nonmonotone *half*

Let us first concentrate on the element at the midpoint of the scale in (2), i.e., *half*. First, unlike the other elements on the same scale, *half* can-

not occur in the position marked by D in the following construction:

(8) If D CN is both Adj_1 and Adj_2, then D CN is Adj_1 and D CN is Adj_2.

For instance,

(9) a. If all students are both clever and humble, all students are clever and all students are humble.
b. If most students are both clever and humble, most students are clever and most students are humble.
c. If some students are both clever and humble, some students are clever and some students are humble.

However, the same entailment relation '[D CN is both Adj_1 and Adj_2] $\longrightarrow$ [D CN is Adj_1 and D CN is Adj_2]' does not hold for *half,* as in (10):

(10) Half of the students are both clever and humble $\not\longrightarrow$ Half of the students are clever and half of the students are humble.

The quantifiers that can occur in the D position in (8) are called 'M-class quantifiers' by Horn (1969).[1] The set of M-class quantifiers includes all the positive elements on the scale in (2) (such as *some, many, all*) except *half.* Moreover, *half* is not a member of what Horn calls L-class quantifiers since it cannot occur in the position marked by D in (11):

(11) If D CN is Adj_1 and D CN is Adj_2, then D CN is both Adj_1 and Adj_2.

This is also true of *celpan,* the Korean equivalent of *half,* as illustrated in (12):

(12) #Celpan-uy haksayng-i ttokttokha-ko celpan-uy
half student-NOM clever-and half
haksayng-i kyemsonha-myen, celpan-uy haksayng-i
student-NOM humble-if half student-NOM
tokttokha-myenseto kyemsonha-ta.
clever-both-and humble-DEC
'If half students are clever and half students are humble, then half students are both clever and humble'

[1] The notion of M-class quantifiers and their opposite L-class quantifiers prefigures the notion of monotonicity proposed by Barwise and Cooper (1981). Thus, an M-class quantifier is essentially monotone increasing and an L-class quantifier is monotone decreasing.

Therefore, *half* (or *celpan*) is neither in the set of M-class quantifiers, nor in the set of L-class quantifiers.

The entailment property of the quantificational determiners that we have seen in (8) to (12) is closely related to the notion of monotonicity originally proposed by Barwise and Cooper (1981):

(13) a. Let VP_1 and VP_2 be two verb phrases such that the denotation of VP_1 is a subset of the denotation of VP_2. Then $_{NP}$[D CN] is monotone increasing if (i) holds, and monotone decreasing if (ii) holds:
(i) If $_{NP}$[D CN] VP_1, then $_{NP}$[D CN] VP_2.
(ii) If $_{NP}$[D CN] VP_2, then $_{NP}$[D CN] VP_1.
If neither (i) nor (ii) holds, $_{NP}$[D CN] is nonmonotone.

b. A determiner D is monotone increasing (decreasing) if it always gives rise to monotone increasing (decreasing) NPs.

c. A determiner D is nonmonotone if it always gives rise to nonmonotone NPs.

Applying the monotonicity test to positive scalar quantificational determiners, we see that *half* is neither monotone increasing as in (14a) nor monotone-decreasing as in (14b):

(14) a. If all of the boys went home early, then all of the boys went home
most — most
some — some
#half — half

b. If #all of the boys went home, then all of the boys went home early
#most — most
#some — some
#half — half

As a result, only *half* is nonmonotone while the other positive scalar operators are monotone-increasing. As Partee, ter Meulen, and Wall (1990: 382) point out, the monotonicity properties of determiners affect inferential patterns. Unlike monotone increasing operators such as *all, most, many* and *some, half* is nonmonotone, and cannot be a scalar operator. Just as a nonmonotone operator *exactly n* cannot form a scale with other monotone operators like *all, most, many* and *some*, so *half* cannot be a part of the scale

in (6).

To sum, *half* differs in the semantic property of monotonicity from the others (or it does not belong to the set of M-class determiners) and thus cannot be dealt with in the same way as the other scalar quantificational determiners in (6), despite the fact that they belong to the same syntactic category and can be linearly arranged by degree of semantic strength. It is not just the entailment relation where we can see the peculiarity of *half*, but also the implicature relation testifies that the midpoint determiner cannot be treated uniformly with the other elements in the diagram (2). We now turn to the implicature relation in the following section.

4. Is *many* a Low-Point Determiner?

In section 2 we saw that Horn (1989) treats *many* as a tolerant determiner standing somewhere between *half* and *some*. To see if the treatment is tenable, let us now examine the entailment and implicature relations that involve the quantificational determiners.

The quantificational determiners on the scale are expected to follow the general property of scalar entailment given in (7). It turns out most of them do, as we can see in the examples in (15):

(15) a. All the students smiled ⟶ Most/Many/Some of the students smiled [2]

b. Most of the students were from China ⟶ Many/Some of the students were from China

c. Many of the students left early ⟶ Some of the/Several students left early

In contrast, the determiner *half*, which outranks *many* in the diagram in (2), fails to entail *many*, contrary to the prediction that obtains from (7) applied to the diagram:

[2] There seems to be an exception to this rule. For example,

(1) All men are created equal
(2) Most/Many/Some men are created equal

sentence (1) does not entail (2).

(16) a. Half of the students were from China $\not\rightarrow$
Many of the students were from China
b. Half of the students were from China $\not\rightarrow$
Some of the/Several students were from China

From (15c), (16a) and (16b) one may conclude that *half* outranks *several* or *some* as *many* does, but that *many* outranks *half* instead. However, the examples in (17) show that it is not the case, either.

(17) a. Many of the students were from China $\not\rightarrow$
Half of the students were from China
b. Many of the students were from China $\not\rightarrow$
Most of the students were from China

Similarly in Korean, *celpan* 'half' and *manhun* 'many' seem to be unordered. For example, neither (18a) nor (18b) entails each other:

(18) a. Celpan-uy kyengchal-i ssekess-ta.
half policeman-NOM corrupt-DEC
'Half of the policemen are corrupt'
b. Manhun kyengchal-i ssekess-ta.
many policeman-NOM corrupt-DEC
'Many of the policemen are corrupt'

In any case, it is safe to say that *manhun* 'many' in Korean is not necessarily a tolerant operator, since [*manhun* p and *manhun* ¬p] can be logically inconsistent. The example in (19) illustrates the point:

(19) #Manhun kukhoyuywen-tul-i ku pepan-ey
many congressman-PL-NOM the bill-to
chansengha-ess-ko, manhun kukhoyuywen-tul-i ku
voted for-PST-and many congressman-PL-NOM the
pepan-ey chansengha-ci anh-ess-ta
bill-to voted for-NEG-PST-DEC
'Many congressmen voted for the bill and many congressmen didn't vote for it'

If we compare the semantically awkward English gloss in (19) with Horn's example in (3a) in section 2, we can see that *many* CN is not always posi-

tive strong (i.e., stronger than the midpoint element).

Lee (1992: 402-3) notes that there is a systematic relation between "quantificational force" of a quantifier (i.e., semantic strength of a scalar expression) and the possibility of its being a topic in a donkey sentence. He argues that the more quantificational force an expression has, the closer the expression is to a generic interpretation. Quantifiers with little force such as *ilpuw* 'some' have no chance of being interpreted as generic, and thus fail to occur in the topic position. Consider the example from Lee (1992: 402):

(20) Tangnakwuy-lul kaci-n motun/taypwupwun-uy/manhun/?celpan -uy/#ilpwu-uy
donkey-ACC have-REL all/most/many/?half/#some
nongpwu-nun kukes-ul ttaylin-ta.
farmer-TOP it-ACC beat-DEC
'As for all/most/many/?half/#some farmers who own a donkey beat it'

The sentence in (20) shows that the quantificational force of *manhun* 'many' is greater than that of *celpan* 'half'.

As a number of studies show, quantifiers like *many* need reference to contextually determined proportions to get properly interpreted.[3] Following Cann (1993), we assume that *many* is a functor category of type <<e, t>, <<e, t>, t>> that applies to its argument noun of type <e, t>. Then, the noun phrase *many politicians* in (21a) is assigned to the interpretation in (21b):

(21) a. Many politicians are corrupt.
b. $[\text{many}'(\text{politician}')]^{M,g} = \{X \subseteq A \mid \mid X \cap [\text{politician}']^{M,g} \mid > c\ x \mid [\text{politician}']^{M,g} \mid \}$

The relevant proportion represented by c in (21b) for determining the truth of (21a) is not fixed even in the same model M of universe, but dependent on the speaker's (and/or the hearer's) judgment. The Korean examples in (22) show that in the case of quantificational adverb *manhi* 'many/a lot' the proportion is also determined by the context:

[3] Cann (1993: 191) says "Although it seems to be the case that the relevant proportion··· should be greater than fifty percent, this is not always the case."

(22) a. Na-nun 25 mwunce cwung 3 mwunce-man
I-TOP 25 question among 3 question-only
puwless-nuntey, manhi pwun seymita
solved-and many answered it-can-be said
(Lit.) 'I could only answer 3 questions out of 25, and I was one of those who answered many'

b. Na-nun 75% cengto pwuless-nuntey, manhi pwun
I-TOP 75% about solved-and many solved
seym-ita
it-can-be-said
(Lit.) 'I could answer about 75%, and I answered many'

Now we have two sets of scalar quantificational determiners: i) those that require a context parameter to get properly interpreted (e.g., *many, very many, most*) and ii) those that do not require such a contextual element (e.g., *all, half, a majority*). The determiners belonging to first set need to be represented to have a certain interval on the scale, rather than just a point. For example, *many* should be represented as an interval ranging from somewhere over *quite a few* to somewhere below *most*. Furthermore, *most*, cannot be represented as occupying the same point on the scale as *a majority*, since the former represents a wider range of value than the latter.

5. Implicature of *manhun* 'many'

We have seen earlier that *manhun* 'many' in Korean is a positive strong, i.e., intolerant determiner unlike the English determiner *many* in (3a). However, there is also a positive weak (tolerant) usage of *manhun* 'many'. Besides the well-known fact in English that *many* CN can occur in an existential *there*-construction whereas *most* CN cannot, Korean quantifier NPs provide an interesting case. First, consider (23):

(23) Taypwupwun-uy hoysa-eyse-nun thoyoil-ey ilha-nta
most company-in-TOP Sat.-on work-DEC
'They work on Saturday in most companies'

According to the principle of scalar implicature outlined in (7), the sentence in (23) should scalar implicate the sentence in (24):

(24) Motun hoysa-eyse thoyoil-ey ilha-nun kes-un-ani-ta
all company-in Sat.-on work-COMP-TOP-NEG-DEC
'It is not the case that they work on Saturday in all companies'

In (24) the negation marker *-ani* has scope over the universal quantifier *motun*, yielding an outer-negation reading. Given the well-known law of quantificational logic in (25),

(25) $\neg \forall x P(x) \Leftrightarrow \exists x \neg P(x)$

the sentence in (24) is truth-conditionally equivalent to the sentence in (26): [4]

(26) Ilpwu hoysa-eyse-nun thoyoil-ey ilha-ci anh-nta
some company-in-TOP Sat.-on work-NEG-DEC
'They don't work on Saturday in some companies'

As a result, the sentence in (27), which is the conjunction of (23) and (26), poses no problem:

(27) Taypwupwun-uy hoysa-eyse-nun thoyoil-ey-to ilha-nuntey
most company-in-TOP Sat.-on-too work-and
ilpwu hoysa-eyse-nun thoyoil-ey ilha-ci anh-nta
some company-in-TOP Sat.-on work-NEG-DEC
'They work on Saturday in most companies, and/but they don't in some companies'

What is important here is that (28) is possible as well:

(28) Taypwupwun-uy hoysa-eyse-nun thoyoil-ey-to ilha-nuntey
most company-in-TOP Sat.-on-too work-and
manhun hoysa-eyse-nun thoyoil-ey ilha-ci anh-nta.
many company-in-TOP Sat.-on work-NEG-DEC
'They work on Saturday in most companies, and/but they don't in many companies'

If we adopt the weaker version of the two possible interpretations of *most* given by Partee, ter Meulen, and Wall (1990: 397):

[4] Let us disregard the role of topic marker *-nun* and complementizer *-nun kes* in this example, which is not relevant to the theme of the present paper.

(29) most AB=most A(A∩B) where | (A∩B) | > | (A−B) |[5]

then the quantifier *manhun* 'many' in (28) has to be regarded as a positive weak quantifier.

The tolerant usage of *manhun* 'many' is contrasted with the intolerant usage in (30):

(30) #Taypwupwun-uy kukhoyuywen-tul-i ku pepan-ey
most congressman-PL-NOM the bill-to
chansengha-ess-nuntey, manhun kukhoyuywen-tul-i ku
voted for-PST-and many congressman-PL-NOM the
pepan-ey chansengha-ci anh-ess-ta
bill-to voted for-NEG-PST-DEC
'#Most congressmen voted for the bill and/but many congressmen didn't vote for it'

Then, what determines the tolerance of *manhun* 'many'? We will return to this in section 7, but let us first examine more properties of *manhun* 'many'.

6. Class-inclusiveness of *many*

Kim (1984: 29-30) makes a distinction between 'class-inclusive quantifiers' and 'class-non-inclusive quantifiers'. Class-inclusive quantifiers include the quantificational determiners *ilpwu-uy* 'some' in (31a) and *taypwupwun-uy* 'most' in (31b):

(31) a. Ilpwu-uy cwumin-i tongli-lul cikhi-ko iss-ess-ta
some-of residents-NOM village-ACC keep-PROG-PST-DEC
'Some of the residents were keeping the village'

[5] Cann (1993) points out a problem with this kind of denotation of an NP consisting of most followed by an N. The problem is that it turns out to be truth-conditionally equivalent to the interpretation that might be given to the NP more than half the books. Thus he suggests to interpret most N with respect to some pragmatically determined numerical proportion of the number of entities in the extension of the N that is greater than 0.5. Thus, we can assign to the same NP the following interpretation where c is a context parameter:

$[\text{taypwupwun-uy}'(\text{cangse}')]^{M,g} = \{X \subseteq A \mid |X \cap [\text{cangse}']^{M,g}| > c \times |[\text{cangse}']^{M,g}|\}$

where c is greater than .5

b. Taypwupwun-uy cangse-ka tosekwan-ey
most -of book-NOM library-to
kicung-toy-ess-ta
donate-PASS-PST-DEC
'Most of the books were donated to the library'

They are class-inclusive, since we assign to the subject NPs in (31) the interpretations in (32):

(32) a. $[\text{ilpwu-uy'(cwumin')}]^{M,g}=\{X\subseteq A \mid X\cap[\text{cwumin'}]^{M,g}\neq 0\}$
b. $[\text{taypwupwun-uy'(cangse')}]^{M,g}=\{X\subseteq A \mid\mid X\cap[\text{cangse'}]^{M,g} \mid > \mid [\text{cangse'}]^{M,g}\cap(A-X) \mid\}$

The set-theoretic definition of the NP *ilpwu-uy cwumin* 'some residents' is the set of all subsets of the set of entities that have a non-null intersection with the set denoted by *cwumin'*. Likewise, the set-theoretic definition of the NP *taypwupwun-uy cangse* 'most books' is the set of all subsets of the set of entities such that the number of books which were donated to the library is greater than the number of books which were not.

By contrast, each quantified subject NP in (33) contains a class-non-inclusive determiner (i.e., *han* 'one' in (33a) and *manhun* 'many' in (33b)):

(33) a. Han cwumin-i tongli-lul cikhi-ko iss-ess-ta
one resident-NOM village-ACC keep-PROG-PST-DEC
'One resident was keeping the village'
b. Manhun swu-uy cangse-ka tosekwan-ey
many number-of book-NOM library-to
kicung-toy-ess-ta
donate-PASS-PST-DEC
'A number of books were donated to the library'[6]

We cannot, for instance, assign to the NP *manhun swu-uy cangse* 'a number of books' in (33b) the interpretation in (34) in a similar way as we did in (32b):

[6] On this class non-inclusive reading, the quantified NP is often preceded by a specifier *ku* to further emphasize the non-inclusiveness.

(34) $[\text{manhun swu-uy'(cangse')}]^{M,g}=\{X\subseteq A \mid\mid X\cap[\text{cangse'}]^{M,g} \mid > c\ x \mid [\text{cangse'}]^{M,g} \mid \}$
where c is a context parameter

The reason that (34) cannot be the correct interpretation of the subject NP in (33b) is that the determiner *manhun swu-uy* 'a number of' does not require context to get interpreted. It is semantically just like a non-quantificational adjective in this respect.

What is important here is that only those inclusive readings of quantifiers follow the pattern of scalar entailment or implicature. Thus (32a) and (32b) scalar-implicate (35a) and (35b), respectively.

(35) a. Taypwupwun-uy cwumin-i tongli-lul
most of residents-NOM village-ACC
cikhi-ko iss-cin anh-ass-ta
keep-PROG-NEG-PST-DEC
'It is not the case that most residents were keeping the village'
b. Motun cangse-ka tosekwan-ey kicung-toy-cin anh-ess-ta
all book-NOM library-to donate-PASS-NEG-PST-DEC
'It is not the case that all the books were donated to the library'

On the other hand, those non-inclusive quantifiers do not show the scalar entailment or implicature relation. If *many* in (36a) is interpreted as class-non-inclusive, then (36b) does not follow from (36a):

(36) a. It's hard to feed many children.
b. It's not the case that it is hard to feed all children.

Thus, the determiner *manhun* 'many' on the quantificational determiner scale gives rise to ambiguity between a class-inclusive reading (as in (37b)) and class-non-inclusive reading (as in (37c)):

(37) a. Manhun sikku-ka kulmcwuli-ko iss-ta
many family-NOM starve-PROG-DEC
b. Many of the family members are starving
c. The entire large family are starving

It is from the inclusive reading (37a) that we can have a scalar implicature (38):

(38) Motun sikku-ka kulmcwuli-cinun anhnun-ta
all family-NOM starve-NEG-DEC
'Not all the family members are starving'

To sum, we need a constraint on the scalar implicature such that only the class-non-inclusive *many* can give rise to scalar entailment and implicature in conjunction with other scalar quantificational determiners.

7. Interpretations of *many*

In section 3 we saw that we need to refer to contextually determined proportions to get a proper interpretation of some quantifiers such as *many* and *most*. But how do we apply the context parameter?

According to Partee, ter Meulen, and Wall (1990: 398), there are four types of *many*, which is summarized in the table (39):

(39) Properties of *many*

	$many_1$	$many_2$	$many_3$	$many_4$
symmetric	+	−	+	−
conservative	+	+	−	−
extensional	−	+	−	+
quantitative	+	+	+	+
right-increasing	+	+	−	−
left-increasing	+	−	−	+

Since we are concerned here with the [+extensional] *many*, only $many_2$ and $many_4$ will be examined.[7] They share some properties like (a)symmetry and quantity, but they differ in conservativity and monotonicity.[8]

[7] If a determiner D satisfies the condition in (1), then it is called extensional

(1) If $A, B \subseteq E \subseteq E'$ then $D_E AB \leftrightarrow D_{E'} AB$

where E is the domain of entities. See Partee, ter Meulen, and Wall (1992: 377-8) for more details.

[8] In fact, there is a controversy over whether natural language quantifiers can be [-conservative]. Cann (1993: 192) argues that every natural language quantifier is conservative. Furthermore, van Benthem reserves the term quantifier for those NP-interpretations that are extensional and quantitative, as well as conservative. On the other hand, Partee, ter Meulen and Wall (1990) regard any NP-interpretation a (generalized) quantifier.

To see the different interpretations of *many*, take Westerstahl's example (1985) in (40) which is slightly adapted here:

(40) Many Americans have won the Nobel prize in economics

As is pointed out in Partee et al. (1990), the sentence in (40) is ambiguous between (41a) and (41b):

(41) a. Many winners of the Nobel prize in economics are Americans ($many_2$)
b. Many Americans are Nobel prize winners in economics ($many_4$)

The ambiguity of (40) arises from the different interpretations of *many*. On one hand, we can compare the cardinality of those Americans who are the winners of the Nobel prize in economics to some contextually fixed ratio of those who are the winners of the Nobel prize in economics by checking the distribution of nationality of the Nobel prize winners, etc. This is the reading given in (41a). To get this reading, *many* is interpreted as in (42):

(42) $many_E AB = many_E A(A \cap B)$ where $|(A \cap B)| > c \times |A|$
(where A and B are subsets of the domain of entities)

This interpretation of *many* is $many_2$ in table (39).[9]

On the other hand, (40) can mean that we find the number of the Nobel prize winners among all Americans exceeds some portion of the population that can be said 'many'. This is the reading of (41b). Clearly this situation is far less plausible than the one described by (41a). The interpretation of *many* for the reading in (41b) is given in (43):

(43) $many_E AB = many_E A(A \cap B)$ where $|(A \cap B)| > c \times |B|$
(where A and B are subsets of the domain of entities)

This interpretation of many is $many_4$ in table (39).

Given the interpretations of *many*, let us go back to the Korean examples in (28) and (30), reproduced here:

[9] When the implicature that arises from (40) is cancelled as in (1), the preferred reading has $many_2$ rather than $many_4$. This seems to be related to the fact that $many_2$ and most share the same properties. Both of them are [-symmetric, +conservative, +extensional, +quantitative, +right-increasing, -left-increasing].

(1) Many Americans have won the Nobel prize in economics, if not most.

(28) Taypwupwun-uy hoysa-eyse-nun thoyoil-ey-to ilha-nuntey
most company-in-TOP Sat.-on-too work-and
manhun hoysa-eyse-nun thoyoil-ey ilha-ci anh-nta.
many company-in-TOP Sat.-on work-NEG-DEC
'They work on Saturday in most companies, and/but they don't in many companies'

(30) #Taypwupwun-uy kukhoyuywen-tul-i ku pepan-ey
most congressman-PL-NOM the bill-to
chansengha-ess-nuntey, manhun kukhoyuywen-tul-i ku
voted for-PST-and many congressman-PL-NOM the
pepan-ey chansengha-ci anh-ess-ta
bill-to voted for-NEG-PST-DEC
'#Most congressmen voted for the bill and/but many congressmen didn't vote for it'

The puzzle that we had about the examples in (28) and (30) was that how [*most* p and *many* -p] is possible in one case (i.e. (28)) and the same construction is impossible in another (i.e. (30)). The difference rests on the difference in the interpretation of *manhun* 'many' in each sentence. In (30) external parameters need not be considered; just the cardinality of the congressmen who voted against the bill is compared to the number of all congressmen. The use of *taypwupwun-uy* 'most' in the first conjunct in (30) preempts the possibility of the ratio being greater than 50%, although the contextual parameter should be greater than in this case. For this sentence the interpretation of $many_2$ seems appropriate.

On the other hand in (28), we do not compare the cardinality of the companies that work on Saturday to those that don't. For the interpretation of (28), an external parameter such as the general knowledge or a person's belief about the working conditions need to be considered. Suppose the speaker of (28) believes that the hearer thinks that there are only a few companies that do not work on Saturday. The speaker utters the sentence to convey her feeling that contrary to the hearer's belief, the number of the companies that work on Saturday is surprisingly great. In this case what counts as many depends not just on the number of the companies that work on Saturday but on various contextual facts in the domain of entities, E. Therefore, we should depend on the frequency of the companies that do not

work on Saturday in the domain E.[10] The contextual facts to be considered in the interpretation may vary from case to case. They include the world knowledge or belief systems. Thus, as Partee et al. (1990) point out, "five A grades in a class of twenty might be considered many", but "if five out of twenty people are right handed, this is not considered to be many".

8. Concluding Remarks

The notion of scale is crucial for the interpretation of quantificational implicatures. However, as Gazdar (1979: 58) concedes, it has been generally assumed that a scale is "in some sense, given to us". Gazdar (1979) goes on to point out that the items in the scale must be "qualitatively similar", and yet he just fails to give a specific qualitative criterion, saying that "no obvious or available similarity criterion exists". This paper is an effort to go one step closer to a more constrained theory of scale in the case of positive quantificational determiners.

We have seen various aspects of scalar quantificational determiners in English and Korean. Some factors that affect the membership of a scale have been examined and some constraints on the representation of a scale have been suggested. A pragmatic scale cannot be thought of simply as consisting of a set of substitutable expressions of the same grammatical category (cf. Caton (1966), Horn (1972) and Levinson (1983), to name just a few). Instead, we observe that the properties of quantificational expressions such as class-inclusiveness and monotonicity must be taken into account in forming a scale, since they play an important role in the interpretation of scalar implicatures.

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[10] In this respect the interpretation of *many* in (28) seems closer to what Partee et al. (1990) calls $many_3$ rather than $many_4$. The interpretation of $many_3$ is:

$$many_E AB = many_E A(A \cap B) \text{ where } |(A \cap B)| > \frac{|B|}{|E|} \cdot |A|$$

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