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# COMPARING CONSTRAINTS ON ADVERBS OF QUANTIFICATION

## 1 INTRODUCTION

Since Kratzer (1995), it has been pointed out that the distribution of adverbs of quantification (henceforth, Q-adverbs) depends on the types of predicates and DPs with which they are used. In order to explain this fact, various constraints have been proposed in the literature: Prohibition against Vacuous Quantification (Kratzer (1995)), Plurality Condition on Quantification (de Swart (1993,1996)), and Pragmatic Constraint on Adverbial Quantifiers (Percus (2007)). However, there has been no consensus as to which constraint has the widest empirical coverage. To fill in this gap, this short paper attempts to compare these three constraints, and to show that the third constraint, Pragmatic Constraint on Adverbial quantifier, is empirically more adequate than the other two constraints.

The structure of this paper is as follows. Section 2 will introduce the aforementioned constraints. Section 3 will compare these constraints with each other in the light of all the existing data, and will argue that Percus' (2007) constraint has the widest empirical coverage. Section 4 concludes this paper and makes a brief remark on the consequences.

## 2 PREVIOUS STUDIES

### 2.1 Kratzer (1995): *Prohibition against Vacuous Quantification*

Kratzer (1995) points out that Q-adverbs are sensitive to the distinction of the predicates with which they are used. The relevant distinction is between stage-level and individual-level predicates (henceforth, SLPs and ILPs, respectively). According to Milsark (1977) and Carlson (1980), the former denote temporal or accidental properties, while the latter denote parament or essential properties. As shown below,

Q-adverbs can be used with SLPs but not with ILPs<sup>1</sup>:

(1) a. When Mary speaks French, she speaks it well.  
     b. \*When Mary knows French, she knows it well.  
     c. \*When Mary knows French, she speaks it well.  
     d. \*When Mary speaks French, she knows it well. (Kratzer 1995:129)

In the above examples, the predicates *speak* and *know* are regarded as an SLP and an ILP, respectively, and the difference in acceptability indicates that ILPs are difficult to use with Q-adverbs.

Kratzer (1995) also points out that in certain cases, ILPs can be used with Q-adverbs:

(2) When Mary knows a foreign language, she knows it well. (ibid.)

The crucial element here is the existence of indefinite DPs and the co-indexed pronouns. The above example shows that ILPs, when they are used with indefinites, are compatible with Q-adverbs.

In order to explain this fact, Kratzer (1995) adopts several assumptions from Dynamic Semantics, which are summarized below (cf. Heim (1982)):

(3) a. Quantificational determiners and quantificational adverbs *Q* create a tripartite structure,  $Q[A][B]$ , where *A* is a restrictive clause and *B* is a nuclear scope.  
     b. These quantificational expressions *Q* are unselective in the sense that they can bind all free variables in their restrictive clauses.  
     c. Indefinite DPs, which are traditionally analyzed as existential quantifiers, have no quantificational force by themselves and supply free individual variables.

In addition, she makes her own two assumptions about Q-adverbs and SLPs/ILPs

(4) a. Q-adverbs can bind not only event variables but also individual variables.  
     b. SLPs and ILPs have different argument structures: only the former have event arguments that can be bound by Q-adverbs.

Given these assumptions, the LFs of the examples in (1) are represented as follows:

(5) a. Always/[speaks(French, Mary, *l*)][speaks-well(French, Mary, *l*)]

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<sup>1</sup> Note that in the examples, the implicit Q-adverb *always* is assumed to be present.

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- b. Always[knows(Mary, French)][speaks-well(Mary, French, *l*)]
- c. Always[knows(Mary, French)][speaks-well(Mary, French, *l*)]
- d. Always[speaks(Mary, French, *l*)][knows-well(French, Mary)]
- e. Always<sub>x</sub>[foreign-language(*x*) & knows(Mary, *x*)][knows-well(Mary, *x*)]

(Kratzer 1995:130)

To rule out the LFs of the unacceptable examples (namely, (5b) - (5e)), she proposes the following constraint on LF:

(6) Prohibition against Vacuous Quantification (Kratzer 1995:131)  
 For every quantifier *Q*, there must be a variable *x* such that *Q* binds an occurrence of *x* both in its restrictive clause and its nuclear scope.

Given this constraint, the above examples are explained as follows. In the case of (5a), there are two event variables in both of the clauses, since the SLP *speak*, which has a bindable variable, is used there. In the cases of (5b) - (5d), on the other hand, the constraint cannot be satisfied, since the ILP *know*, which does not include a bindable variable, is used either in the restrictor or in the nuclear scope, and the vacuous quantification arises. In the case of (5e), though the predicates are an ILP, there are indefinites that can supply an individual variable. Hence, the Q-adverb *always* can bind this variable in the two clauses, and the constraint can be satisfied.

As we have seen above, Kratzer's (1995) analysis can handle the fact that Q-adverbs are sensitive to the predicates and the DP with which they are used. Since its publication, her analysis, especially the famous claim in (4b), has been influential and various analyses continue to be based on this. There are, however, at least two analyses that argue against Kratzer's claim, and we will discuss these in the next two subsections.

### 2.2 de Swart (1993, 1996): Plurality Condition on Quantification

In order to maintain a Neo-Davidsonian approach to verbal predicates and argue against Kratzer's (1995) famous claim about SLPs and ILPs, de Swart (1993,1996) proposes a constraint on adverbial quantifiers, wherein the restrictor of the quantifiers should denote a plural event.

The major motivation of this constraint comes from the similarity between ILPs and what de Swart (1993,1996) calls once-only predicates, examples of which are given below:

(7) a. John died this morning.  
 b. Marc Chapman killed John Lennon in front of Dakota Apartments.  
 c. John built this house many years ago.

According to de Swart (1993,1996), once-only predicates denote an event that cannot be repeated by the same individual. Consider, for example, the predicate *die*. Given our world knowledge, the same person cannot die several times. Therefore, this predicate qualifies as a once-only predicate, and the same consideration applies to the predicates *kill* and *build* in the above examples.

Note that in (7), the once-only predicates are used with locational or temporal adverbials and that only SLPs can be compatible with these adverbials:

(8) a. John speaks French in this room every day. (SLP)  
 b. \*John knows French in this room every day. (ILP)

Given this fact, once-only predicates are regarded as a special kind of stage-level predicates, whose characteristics are summarized as in (9):

(9) Once-only Predicates

A once-only predicate is a special kind of stage-level predicates that apply only once to the same individual. In other words, they denote events that cannot be repeated by the same individuals.

At this point, recall that Kratzer's (1995) analysis depends on the presence or absence of bindable variables, which leads to the following prediction:

(10) Prediction of Kratzer's (1995) Analysis

Once-only predicates can be used with Q-adverbs without indefinites, since they are stage-level predicates and have bindable event variables.

As de Swart (1993,1996) points out, however, this prediction is incorrect, and once-only predicates cannot be used with Q-adverbs without indefinites:

(11) a. \* When Anil died, his wife usually killed herself.  
 b. When an Italian died, his wife usually killed herself.  
 c. \* When Mary built Jim's house, she always built it well.  
 d. When Mary built a house, she always built it well.

(de Swart 1996:178-179)

Consider, for example, (11a) and (11c). According to Kratzer's (1995) analysis, these examples should be acceptable, since the once-only predicates *die*, *kill* and *build* are stage-level predicates with bindable variables. Next, consider (11b) and (11d). These examples contain indefinite DPs, and unlike the previous two examples, they are acceptable. This indicates that if once-only predicates are used with indefinites, they become compatible with Q-adverbs. These observations are summarized as below;

## (12) Observation

Contrary to Kratzer's (1995) prediction, once-only predicates and ILPs show the same behavior with respect to Q-adverbs.

As defined above, once-only predicates are a special kind of SLPs. Given this fact, the unacceptability of the above examples indicates that the presence or absence of event variables does not determine the distribution of Q-adverbs. If that is the case, how can we distinguish the predicates that can be used with Q-adverbs from those that cannot?

To answer this question, de Swart (1993,1996) first claims that, unlike Kratzer (1995), SLPs and ILPs both have Davidsonian event arguments. She also highlights the similarity between ILPs and once-only predicates: they are similar in that their application to a particular individual is permitted only once. This similarity is formulated as follows:

## (13) Uniqueness Presupposition on the Davidsonian Argument

The set of spatio-temporal locations that is associated with an individual-level or a 'once-only' predicate is a singleton set for all models and each assignment of individuals to the arguments of the predicate.

(de Swart 1993:65)

In addition to this, she proposes the following constraint on quantification in general:

## (14) Plurality Condition on Quantification

A Q-adverb does not quantify over a set of cases if it is known that this set has a cardinality of less than two.

A set of cases is known to be a singleton set if:

- i) the predicate contained in the sentence satisfies the uniqueness presupposition on the Davidsonian argument, and
- ii) there is no (in)definite NP present in the sentence which introduces a variable available for binding.

(de Swart 1993:67)

According to this constraint, quantification over a singleton set (i.e., the set that has only one member) is impossible, and this situation occurs if ILPs or once-only predicates are used without indefinites.

With these in mind, let us consider the examples below:

- (15) a. \*When Mary knows French, she knows it well.
- b. \*When Anil died, his wife usually killed herself.

Since the ILP *know* and the once-only predicates *die* and *kill* are used without indefinites, and the Q-adverbs quantify over singleton sets. Hence, these examples violate the plurality condition, and the unacceptability is predicted as desired.

Next, let us see the examples in (16):

(16) a. When Mary knows a foreign language, she knows it well.  
 b. When an Italian died, his wife usually killed herself.

Unlike the above two examples, the restrictors in these examples do not denote singleton sets of events, since there are as many events of knowing or dying as there are individuals denoted by the indefinites. Hence, these examples satisfy the condition above, and they are correctly predicted to be acceptable.

In the literature, this analysis has provided a major alternative to Kratzer's (1995) famous analysis of SLPs and ILPs. I agree with de Swart (1993,1996) in that SLPs and ILPs have the same argument structure, but in the next section, we will point out that her analysis also faces at least two problems.

### *2.3 Percus (2007): Pragmatic Constraint on Adverbial Quantifier*

Just like de Swart (1993,1996), Percus (2007) argues against Kratzer's (1995) analysis. For this purpose, he points out the following contrast:

(17) a. Context 1: We were both present at series of exams, which took place from Monday through Saturday. We both saw that each time a different person finished first.  
 b. The student who finished first was always Swedish.

(Percus 2007:179)

(18) a. Context 2: Just as before, we were both present at the exams, but this time the pattern is different. The same person finished first each time.  
 b. \*The student who finished first was always Swedish. (ibid.)

Note that the predicate *be Swedish* is an ILP, since in normal cases, our nationality does not change day by day. The difference between the acceptability of these two cases is problematic for Kratzer's (1995) analysis. In order to explain this difference, she must stipulate two types of the predicate. In one type, the predicate has a bindable event variable, and in the other, it does not. This is not explanatory at all, and Percus (2007) claims that the presence or absence of bindable variables is not relevant to the distribution of Q-adverbs.

In order to explain the above data, Percus (2007) proposes an alternative constraint to Kratzer (1995), which is given below:

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## (19) Pragmatic Constraint on Adverbial Quantifiers

- a. Let  $Q$  be the relevant kind of generalized quantifier and  $A, B$  two sets. Then the statement  $QAB$  is pragmatically deviant in a common ground  $CG$  if there is a proper subset  $A'$  of  $A$  such that  $CG \models Q(A)(B) \Leftrightarrow Q(A')(B)$ . (Percus 2007:210)
- b. Only use  $[\text{QUANT}_i]$  (to express  $[\text{QUANT}_i]^g$ ) holds of the actual world) if the contextually salient set of time intervals contains more than three members. (Percus 2007:192)

According to (19a), the use of  $Q$ -adverbs is impossible if the quantification over the subset  $A'$  of the original domain  $A$  ensures the truth of the whole sentence. In addition, following de Swart (1993), he adds condition (19b), which requires that the domain  $A$  contain more than three members. This condition is roughly equivalent to de Swart's (1993,1996) plurality condition.

To see how this constraint works to explain the above contrast, let us first consider Figure 1 from Percus (2007:190), which depicts Context 2:

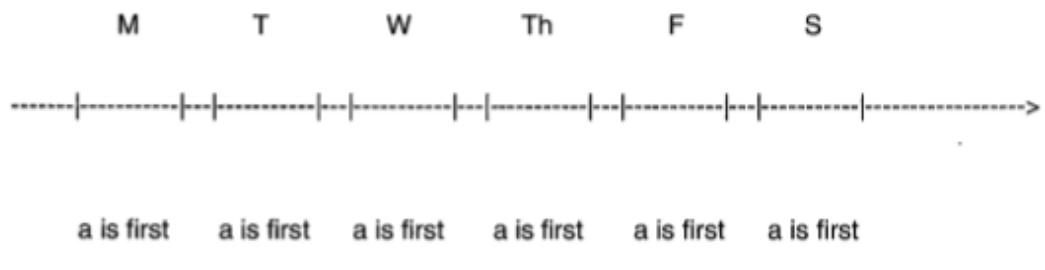


Figure 1: Percus (2007:190)

Recall that in Context 2, the same person,  $a$ , finished first each test. In addition, the domain of quantification  $A$  consists of five days, namely,  $A = \{ \text{Monday, Tuesday, Wednesday, Thursday, Friday, Saturday} \}$ . Suppose that the proper subset  $A'$  of  $A$  consists of Monday, namely,  $A' = \{ \text{Monday} \}$  and that  $QAB$  is true, namely, the person  $a$  finished the test first and he or she is Swedish. From this fact, it follows that  $QAB$  is true. The reason is that the same person  $a$  finished the tests each day and the property denoted by the predicate *be Swedish* denotes a permanent property. Hence, this example violates the pragmatic constraint, and the unacceptability is correctly predicted.

Now, let us turn to Context 1, where different people finished the tests first. Again, the domain of quantification  $A$  consists of five days, namely,  $A = \{ \text{Monday, Tuesday, Wednesday, Thursday, Friday, Saturday} \}$ . Suppose that the proper subset  $A'$  of  $A$  consists of Monday (i.e.  $A' = \{ \text{Monday} \}$ ) and that  $QAB$  is true. Unlike the previous context, it does not follow that  $QAB$  is true in this case: different people finished first, and if the person who finished first on Monday is Swedish, it is possible that other

people different from the person *a* have another nationality. This example, therefore, does not violate the pragmatic constraint, and it is correctly predicted to be acceptable.

As shown above, Percus' (2007) constraint, unlike Kratzer's (1995) one, does not rely on the presence or absence of bindable variables, and can capture the contrast between (17) and (18). His analysis, however, focuses on monoclausal cases, and it is unclear whether it can be extended to the data in Kratzer (1995) and de Swart (1993, 1996).

### 3 COMPARING THE PREVIOUS CONSTRAINTS

In this section, we will compare the three constraints on Q-adverbs introduced above, and explains why the third one, the pragmatic constraint proposed by Percus (2007), has the widest empirical coverage. Before entering the discussion, we first label each data taken up in the previous studies for the expository purpose. In the following examples, the descriptions in parenthesis represent the labels for each data.

(20) Kratzer's Data

- a. When Mary speaks French, she speaks it well. (SLP→SLP)
- b. \*When Mary knows French, she knows it well. (ILP→ILP)
- c. \*When Mary knows French, she speaks it well. (ILP→SLP)
- d. \*When Mary speaks French, she knows it well. (SLP→ILP)
- e. When Mary knows a foreign language, she knows it well. (ILP/+Indefinites)

(21) de Swart's (1993,1996) Data

- a. \*When Anil died, his wife usually killed herself. (Once-only)
- b. When an Italian died, his wife usually killed herself. (Once-only/+Indefinite)

(22) Percus's (2007) Data

- (\*) The student who finished first was always Swedish. (Swedish Case)

It has been already demonstrated that Kratzer's analysis cannot account for the examples in the latter two analyses, since they were developed to argue against her analysis. Therefore, the data involving once-only predicates and the Swedish example are problematic for her analysis. The result is summarized as in Table 1:

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	SLP→ILP	ILP→ILP	ILP→SLP	SLP→ILP	ILP/+indefinites	once-only	once-only/+indefinites	Swedish Case
Kratzer(1995)	✓	✓	✓	✓	✓	✗	✓	✗

Table 1: Kratzer's (1995) Analysis

The next question is whether the latter two constraints can account for all the existing data sets, to which we will turn now.

### 3.1 Evaluation of de Swart's (1993,1996) Analysis

First, let us consider de Swart's (1993,1996) analysis. The example in which an SLP is used in the restrictor and an ILP in the nuclear scopes is problematic for her analysis:

(23) \*When Mary speaks French, she knows it well. (SLP→ILP)

In this example, the SLP *speak* is used in the restrictor, and this means that since the predicate does not have the uniqueness presupposition on its event argument, the restrictor denotes a nonsingleton set of events. Hence, this example does not violate the plurality condition, and it is wrongly predicted to be acceptable.

By contrast, this constraint can deal with cases where ILPs are used in restrictive clauses without indefinites:

(24) a. \*When Mary knows French, she knows it well. (ILP→ILP)  
b. \*When Mary knows French, she speaks it well. (ILP→SLP)

In these examples, the restrictors denotes singleton sets of events, since the ILP *know*, which has the uniqueness presupposition on its event argument, is used there without indefinites. This example, therefore, is correctly ruled out by the plurality condition.

The last data set that de Swart (1993) does not address is the Swedish case, the relevant example of which is repeated below:

(25) (\*) The student who finished first was always Swedish. (Swedish Case)

Recall that this example is uttered in the context where several tests are conducted for six days. This means that the Q-adverb *always* quantifies over a non-singleton sets consisting of six events, which leads to the wrong predication that this example is always acceptable regardless of the utterance contexts. de Swart's (1993,1996) analysis, therefore, cannot capture the fact that the acceptability of this example varies depending on the contexts.

The discussions so far are summarized as in the following table.

	SLP→ILP	ILP→ILP	ILP→SLP	SLP→ILP	ILP/+indefinites	once-only	once-only/+indefinites	Swedish Case
de Swart (1993,1996)	✓	✓	✓	✗	✓	✓	✓	✗

Table 2: de Swart's (1993, 1996) Analysis

### 3.2 Evaluation of Percus's (2007) Analysis

Next, let us turn to the pragmatic constrain proposed by Percus (2007). In his paper, he primarily focuses on monoclausal cases, and does not address most of Kratzer's (1995) data. To begin with, let us consider the example where ILPs are used in both clauses:

(26) \* When Mary knows French, she knows it well. (ILP→ILP)

Assume that the domain of quantification  $A$  and its proper subset  $A'$  are as follows:

(27) a.  $A = \{t_1, t_2, t_3\}$   
b.  $A' = \{t_1\}$

Suppose that  $QA'B$  is true. In this case, it follows that  $QAB$  is true, since the predicate *knows French* denotes a permanent property. Hence, this example violates the constraint above, which results in its unacceptability. This is a correct result.

The next example is a case in which ILPs are used with indefinites:

(28) When Mary knows a foreign language, she knows it well. (ILP/+indefinite)

Unlike the previous case, this example does not violate the pragmatic constraint, and indefinites play a crucial role here. Suppose that  $QA'B$  is true. But it does not ensure that  $QAB$  is true, because the indefinite *a foreign language* can denote different languages such as French, German and Japanese and it is possible that Mary knows French well but does not know German or Japanese at all.

Let us move on to the next case where SLPs are used in the restrictor and ILPs in the nuclear scope:

(29) \*When Mary speaks French, she knows it well.

Again, the pragmatic constraint correctly rules out this example. Once we know that  $QAB$  is true, it follows that  $QAB$  is true as well, since the predicate *know* denotes a permanent property.

The last data set from Kratzer (1995) that Percus (2007) does not address is a case where ILPs are used in the restrictor and SLPs in the nuclear scope:

(30) \*When Mary knows French, she speaks it well.

In this case, Percus' (2007) first condition can be satisfied. Suppose that  $QA'B$  is true. From this, it does not follow that  $QAB$  is true, because in the nuclear scope the SLP *speak* is used, and it is possible that in one case Mary knows French and speaks it well but in other cases she doesn't speak it well. Hence, this example satisfies the first constraint, which means that this condition alone wrongly predicts that this example is acceptable.

At this point, recall that Percus's (2007) second condition in (19b), which is roughly identical to de Swart's (1993, 1996) plurality condition. In the example above, the ILP *know* is used without indefinites. This means that the restrictor denotes a singleton set, and the plurality condition is not satisfied. Hence, this example violates his second condition, and is correctly predicted to be unacceptable.

The last scenario is a case involving once-only predicates.

(31) a. \*When Anli died, his wife usually killed herself. (Once-only)  
b. When an Italian died, his wife usually killed herself. (Once-only/+Indefinite)

Since his second condition is roughly identical to the plurality condition, these examples can be explained in the same way as de Swart's (1993, 1996) analysis. Hence, Percus's (2007) analysis can successfully cope with these data sets.

The discussions so far are summarized as in Table 2:

Table 2: Percus' (2007) Analysis

### 3.3 Interim Summary

Thus far, we have compared the three previous constraints on Q-adverbs, and the overall results are subsumed in the following table:

	SLP→ILP	ILP→ILP	ILP→SLP	SLP→ILP	ILP/+indefinites	once-only	once-only/+indefinites	Swedish Case
Kratzer(1995)	✓	✓	✓	✓	✓	✗	✓	✗
de Swart (1993,1996)	✓	✓	✓	✗	✓	✓	✓	✗
Percus (2007)	✓	✓	✓	✓	✓	✓	✓	✓

Table 4: The Results of Comparison

As is clear from the able table, there are two cases that are problematic for Kratzer's (1995) and de Swart's (1993,1996) analyses. Percus' (2007) analysis, on the other hand, can account for all the data sets. This, the last constraint, Pragmatic Constraint on Adverbial Quantifiers, has the widest empirical coverage.

#### 4 CONCLUSION

In this short paper, I compared the three constraints on Q-adverbs proposed in the previous studies and demonstrated that Percus' (2007) pragmatic constraint is empirically more adequate than the other two constraints. This result has an important consequence for the analysis of SLPs and ILPs. One of the major motivations for Kratzer's (1995) analysis of these predicates was their (in)compatibility with Q-adverbs. As de Swart (1993, 1996) and Percus (2007) emphasize, however, the distribution of Q-adverbs is not determined by the presence of bindable variables. This means that the major motivation for Kratzer's (1995) analysis is incorrect, and that the analysis of these predicates based on the argument structure difference should be reconsidered.

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