Relevance and Other Constraints on the Quantification Domain of *only*

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1 Introduction

According to the standard view, the lexical semantics of the particle *only* provides that sentences of the form $only(\phi)$ entail that all propositions other than $\|\phi\|$ are false. Of course, what is meant is not all propositions that can be constructed on the basis of a given model, but all propositions in some distinguished *domain of quantification*. Rooth's semantic rule for *only* (1) makes reference to a domain variable D which should be instantiated by an appropriate set of propositions which, in turn, should be given by the context.

(1) $only(\phi)$ iff $\|\phi\| \wedge \forall p \in D : p \Rightarrow \|\phi\| = p$

The crucial problem is what sort of propositions make up that set. Three kinds of restrictions have been discussed in the literature.

The *Focus-determined constraint* (2) proposed by Rooth (1985, 1992) requires that the quantification domain of *only* be included in ϕ's focus semantic value $\|\phi\|_F$ which is a maximal set of propositions that differ from $\|\phi\|$ only in the interpretation of the focused constituent.

(2) *The Focus-determined constraint* (Rooth, 1992):
$D \subseteq \|\phi\|_F$

Rooth's theory makes reasonable predictions as long as the focused constituent is of type e, since in this case the propositions in D can be assumed to be logically independent, but the theory runs into serious problems leading to contradictory sentences with *only* as soon as foci of higher types are considered. These shortcomings should be overcome by adding the *Relevance constraint* which requires that the domain of quantification only contain propositions that are *relevant* to the current *question under discussion*, or salient within the current discourse topic. It has often been suggested (von Fintel, 1995) that Relevance should ultimately make the Focus-determined constraint obsolete and become *the* principle that governs the composition of quantification domains. However, the proponents of this hypothesis apparently do not consider making use of a third type of constraints, which I will call 'logical'.

Logical constraints are meant to include prohibitions of certain logical relations between elements of a quantification domain, for instance, the requirement that a quantification domain, whether it consists of propositions, properties or other entities, should not contain two entities that bear a part-whole relation (Kratzer, 1989; Schwarzschild, 1997). Another example of a logical constraint is Schwarzschild's (1997) requirement that a quantification domain be consistent.

In this paper, I address the question whether logical constraints are necessary or whether they can (and should) be covered by Relevance. First, I will give a brief overview of a number of problems that arise if the propositions in the quantification domain are not logically independent, and recapitulate the relevant discussion in the literature (section 2). In section 3, I will show that Relevance based on Groenendijk and Stokhof's (1984) notion of answerhood does not account for two of the three problematic cases. Section 4 explores the possibility of introducing a logical constraint which explicitly requires independence of the propositions in D. The proposed theory will be able to avoid all types of contradictory entailments mentioned in this paper, but it also has two serious problems. First, the proposed Independence constraint is too strong since it makes quantity scales like *some* > *all* ill-formed quantification domains. Section 5 discusses a possible technical solution to the problem, although a real solution will remain outside the scope of the current paper. The second difficulty of the proposed approach, discussed in section 6, has to do with the non-functional character of logical constraints, i.e. that one and the same discourse situation (information state) can be associated with different quantification domains. Here van Rooy's (2002) proposal treating Relevance as a gradual parameter might help us to establish a preference for one quantificaton domain over the other.

2 What *only* should not exclude

To begin with, already Rooth (1985) pointed out that his analysis of *only*'s semantics leads to contradictions if one of the alternatives is a necessarily true proposition like (3b), which is a possible alternative to 'John swam' if the whole VP is in focus. In this case (3a) is necessarily false since it entails $John \neq John$. It is usually suggested that such trivial statements should be excluded from the quantification domain as irrelevant, on a par with propositions like (3c) which just have nothing to do with the topic of discussion.

(3) a. John only swam.
b. John = John.
c. John has a brother.

The second class of contradictory sentences with *only* has to do with the relation of entailment between the propositions in the quantification domain. This type of contradictions has received a lot of attention in connection with focused quantifiers (von Stechow, 1991; Bonomi and Casalegno, 1993) but the problem is in fact much more general. In brief, to avoid contradiction, *only* should not exclude alternatives that follow from the selected proposition, i.e. (4a) should not exclude (4b). This has been remedied mainly by adjusting the semantic rule for *only*; one of the simplest and most general ways to do that is to introduce an explicit restriction that entailments are not excluded (Schwarzschild, 1997), cf. (5).

(4) a. Eleanor only has a son.
b. Eleanor has a child.
c. Eleanor only has a child.
d. Eleanor has a son.
e. Eleanor has a daughter.

(5) $only(\phi)$ iff $\|\phi\| \wedge \forall p \in D : p \Leftrightarrow \|\phi\| \rightarrow p$

However, apparently it is also a problem if entailment holds the other way round, i.e. the selected alternative is entailed by some propostion in D. If this is allowed, (4c) should exclude (4d) which is not necessarily contradictory, but certainly not what (4c) is intended to mean. But if the excluded alternatives happen to exhaust the space of the selected one, i.e. if the latter entails a disjunction of the former, (4b) $\subseteq$ (4d) $\cup$ (4e), then the contradiction is back again: e.g. (4c) entails that Eleanor neither has a son nor a daughter.

The third problematic case, which has received much less attention, is quantification domains that include propositions whose complementary propositions are inconsistent. This is the case, for instance, with (6b) and (6d): $\neg$(6b) entails $\neg\neg$(6d). If both (6b) and (6d) belong to the alternatives then a sentence like 'Henry only disinherited Richard' would entail that Henry neither disinherited John nor failed to do so, which is necessarily false.

(6) a. Henry disinherited Richard.
 b. Henry disinherited John.
 c. Henry did not disinherit Richard.
 d. Henry did not disinherit John.

Rooth's Focus-determined constraint (2) is of no help here. Constituents like $[VP]$ and [not VP] are presumably of the same semantic type. Thus a sentence of the form $[NP\ [VP']_F]$ would have both $\|NP\ [VP]\|$ and $\|NP$ [not $VP]\|$ in its focus semantic value. And even if some syntactic mechanism had been introduced to prevent the contribution of negated sentences to the focus semantic value, the problem would still remain unsolved for alternatives based on lexical antonyms such as *leave something to John* and *disinherit John* which can be taken to be roughly complementary.

Unlike the entailment problem, the problem of inconsistent complements cannot be repaired in any obvious way by adjusting the semantic rule for *only*. In order to know which proposition in D can be excluded one has to know what other propositions have been excluded which makes the interpretation of *only* non-functional. It is possible, however, to impose restrictions on the antecedent for the domain variable D that *only*'s lexical semantics depends on. This is the option that will be pursued in this paper as it makes it possible to treat all three cases discussed above in a uniform fashion. I will simply adopt the standard semantics for *only* (5) and address the issue of domain restriction at the level of pragmatics.

3 Relevance and Independence

3.1 A theory of Relevance

It is standardly assumed that information exchange between individuals is governed by the Gricean Cooperation Principle. In a cooperative setting, relevance of some information can be naturally understood as relatedness to a question mutually addressed by the participants of communication, or helpfulness in solving a common problem. This view is taken, for instance, by Jäger (1996), Roberts (1996) and Groenendijk (1999). The underlying assumptions are that a proposition is a set of possible worlds and a question is a partition of some proposition. Then, according to Groenendijk (1999), a proposition is relevant if it fulfills the following requirements.

First, it should *answer* the question under discussion, i.e. eliminate at least one but not all cells in the question's partition (Groenendijk and Stokhof, 1984). Second, it must address that question *entirely*, i.e. once it eliminates some world in a cell it should eliminate the whole cell (Lewis (1988), cf. Groenendijk's (1999) notion of *licensing*). Note that within this approach, relevance is a Boolean property, i.e. a proposition is either relevant or irrelevant, without any intermediate degrees.

(7) Answerhood:
p *answers* Q iff $\exists q, r \in Q : p \cap q = \emptyset$ and $p \cap r \neq \emptyset$

(8) Entire Aboutness:
p is *entirely about* Q iff $\forall q \in Q : q \subseteq p$ or $q \subseteq \bar{p}$

In order to relate this to the phenomenon of quantification by *only*, let's assume that each sentence is uttered in some information state $I = \langle C, Q, D \rangle$ where C is a proposition that reflects the common knowledge of the interlocutors, Q is a partition of C representing the current question under discussion (cf. Roberts, 1996; Groenendijk, 1999), and D is a set of propositions (distinct from Q) which will directly instantiate the quantification domain variable in the semantics of *only*.

In addition to the Focus-determined constraint (2), the domain of quantification D must satisfy Relevance, i.e. each proposition in D must be relevant to the question under discussion Q (9).

(9) *The Relevance constraint:*
$\forall p \in D : p$ is relevant to Q

It is quite obvious that the definition of Relevance and the corresponding constraint prevent tautologies like $John = John$ (3b) from appearing in the quantification domain. On the assumption that question partitions do not contain empty cells, a proposition that is necessarily true never answers any question, so it is never relevant. Relevance will also exclude propositions like (3c) from D as long as the question addressed by the interlocutors concerns, for instance, John's activities on the weekend, cf. (3a), and not his family relations. Other problematic cases discussed in section 2 and their relation to the theory of relevance presented above are taken under closer observation in the next sections.

3.2 Entailment

As noted in section 2, *only* should not exclude propositions that entail or are entailed by the selected alternative. The second prohibition is obvious: without it the semantics of *only* leads directly to a contradiction. This problem has been handled by a number of authors by adjusting the rule for *only*, cf. section 2. The first case, exemplified by (4c-e) repeated below, has received less attention generally and remains problematic for theories that pursue the semantic strategy. This section is concerned with the question whether a pragmatic theory based on the notion of relevance in terms of Groenendijk (1999) brings us any further.

(4) c. Eleanor only has a child.
d. Eleanor has a son.
e. Eleanor has a daughter.

It has already been noted (e.g. by Kadmon, 2001) that there is no intuitive reason why having a son should be irrelevant while having a child is under discussion.

Moreover, in a certain sense two properties related to the same domain of world knowledge, e.g. family relations, are likely to be relevant at the same time. If our formal theory reflects such understanding of relevance, then (4c) should be able to exclude (4d) at least in some contexts, which is not the case. In other words, this kind of relevance is not restrictive enough to eliminate all propositions from D that should be eliminated.

The Groenendijk-style formal notion of relevance is compatible with this understanding. That is, it is possible to construct a sound question which makes both 'Eleanor has a child' and 'Eleanor has a son' relevant. For instance, if 'daughter', 'son' and 'husband' are the only family relations that count, a question like 'What kind of family does Eleanor have?' would contain the cells listed in (10), where d, s and h are the propositions that Eleanor has a daughter, a son, and a husband, respectively, and C is the common ground.

(10) a. $C \cap d \cap s \cap h$
b. $C \cap d \cap s \cap \bar{h}$
c. $C \cap d \cap \bar{s} \cap h$
d. $C \cap d \cap \bar{s} \cap \bar{h}$
e. $C \cap \bar{d} \cap s \cap h$
f. $C \cap \bar{d} \cap s \cap \bar{h}$
g. $C \cap \bar{d} \cap \bar{s} \cap h$
h. $C \cap \bar{d} \cap \bar{s} \cap \bar{h}$

Obviously, the proposition that Eleanor has a son is relevant to this question. But assuming that every child is either a son or a daughter the proposition 'Eleanor has a child' is relevant, too: it excludes some cells in the partition such as (10g), but not all, e.g. (10a), so it answers the question; and either it or its complement is entailed by every cell, so it is entirely about (10). Note that since both d and s are relevant, (4c) entails that Eleanor neither has a son nor a daughter, although she has a child, which is a contradiction.

Thus the notion of relevance based on answerhood and entire aboutness with respect to a question as partition leaves space for hyponymous propositions in the domain of quantification. What was intuitively attributed to domain restrictions other than relevance is indeed not covered by Groenendijk's definition, given in (7) and (8). So if we adopt this definition, additional constraints on D should be imposed.

3.3 Complement-consistency

Another source for contradictory sentences with *only* discussed in section 2 is quantification domains that contain propositions with inconsistent complements.

(11) Complement-consistency:

$$P = \{p_1, ..., p_n\} \text{ is } \textit{complement-consistent} \text{ iff } \bigcap_{i=1}^{n} \bar{p}_i \neq \emptyset$$

This case is even more problematic for relevance in terms of Groenendijk (1999). The most basic example for complement-inconsistent propositions are the complementary propositions p and $\bar{p}$.[1] One of the consequences of Groenendijk's theory is

[1] Complementary propositions are both inconsistent and complement-inconsistent, but the two properties are generally independent. For instance, $p \cap q$ and $\bar{q}$ are inconsistent but complement-consistent, whereas $p \cup q$ and $\bar{q}$ are consistent but complement-inconsistent.

fact (12), referred to as presuppostion test in Groenendijk (1999), which says that whenever a proposition is relevant its complement is relevant, too.

(12) If p is relevant to Q then $\bar{p}$ is also a relevant to Q.

For instance, if (6a) and (6b) are relevant to some question Q, so are (6c) and (6d): A sentence like 'Henry only disinherited Richard' would still imply that he neither disinherited John nor failed to do so. Note that this problem arises not just with some but with all possible questions under discussion that have more than two cells. Thus a constraint based on Groenendijk's relevance systematically allows for quantification domains that lead to absurd *only*-sentences.

3.4 Solution strategies

As has been shown, neither Relevance nor Focus-determined congruence are restrictive enough to exclude quantification domains that lead to contradictions. In principle, there are two possible ways to approach this problem at the level of pragmatics. One way is to look for a different notion of relevance which should be able to distinguish between 'positive' and 'negative' propositions or a proposition and its consequences and make them differently relevant depending on the context. Another option is to introduce additional constraints on D that prevent undesirable logical relations between its elements. Kratzer (1989) pointed out one consideration in favour of the latter option.

Consider the following example: suppose one evening Paula painted a still life with apples and bananas. She spent most of the evening painting and stopped only to make herself a cup of tea and, say, eat a piece of bread. Sentence (13) can, of course, give rise to objections because obviously painting that still life was not the only action performed by Paula that evening.

(13) Paula only painted a still life.

Kratzer suggests that one should distinguish between two crucially different kinds of objections, illustrated in (14): a pedant would insist that Paula, in fact, also made herself a cup of tea and ate a piece of bread. If one wanted to defend the point in (13) one could say that the speaker did not consider 'making a cup of tea' and 'eating a piece of bread' as relevant alternatives to 'painting a still life', therefore (13) is true enough. The lunatic's case is different: Paula did not paint apples and bananas *apart from* painting that still life. It's not that these actions are less important than 'painting a still life', they are just not distinct from it.

(14) Pedant: This is not true. She also made herself a cup of tea and ate a piece of bread.
Lunatic: This is not true. She also painted apples and she also painted bananas.

Although the relation between the propositions in Kratzer's example is not one this paper is concerned with, the same kind of argumentation can be applied to our case. Suppose the jury is trying to figure out the essence of Eleanor's offence with respect to Rosamund and one of the sides is claiming (15). In the given situation the sentence would probably mean that she did not rob or kidnap her.

(15) Eleanor only killed Rosamund.

If someone tries to object saying that Eleanor also initiated a civil war, Eleanor's attorney can protest on the basis that this has nothing to do with the subject of litigation, i.e. the relevance constraint is violated. However, I doubt that the law of procedure contains any appropriate regulations for the case of objections like (16) or (17).[2] The common sense will not recognize them as an attempt to contradict (15).

(16) This is not true. She also poisoned her.

(17) This is not true. She also did not rob her.

These examples illustrate the intuition that we are dealing with two different kinds of communication failure and that one of them, the lunatic case, is much worse than the other. The pragmatic theory should reflect this distinction and one step in that direction is to model it as violations of different principles. In the next section I explore this theoretical option.

4 Logical constraints

Some previous treatments of quantification by *only* have already considered domain restrictions based on logical relations between the possible alternatives. For instance, Schwarzschild (1997) suggests basically that *only*'s quantification domain should be (a) consistent, cf. (18), and (b) its elements should not entail one another, cf. (19).[3] His argument for consistency is that alternatives that *only* chooses from should all be accepted in the common ground, and since the common ground is consistent, the alternatives are, too. The prohibition of entailement is justified by referring to Kratzer's (1989) argumentation recapitulated in the previous section.[4] These assumptions play an important role in Schwarzschild's reasoning, leading to the conclusion that Rooth's Focus-determined constraint is not necessary as such and can be derived from a number of independent principles—in general, a very appealing theoretical point.

(18) Consistency:

$P = \{p_1, ..., p_n\}$ is *consistent* iff $\bigcap_{i=1}^{n} p_i \neq \emptyset$

[2]Example (16) is parallel to (4), in that the excluded alternative 'Eleanor poisoned Rosamund' entails the selected one 'Eleanor killed Rosamund'. Example (17) is analogous to (6).

[3]Two remarks are due here. First, Schwarzschild makes *only* quantify over properties, rather than propositions, so the actual constraint reads: the quantification domain does not contain two properties such that one of them is a subproperty of the other, e.g. 'invite Andre for dinner' and 'invite Andre for a meal'. However, his definition of subproperty is based on entailment, so the notion can be directly extrapolated to propositions. Second, the definition given in (19) is stronger than Schwarzschild's subproperty prohibition. It says that not only individual alternatives are not allowed to entail one another, but also a conjunction of some alternatives may not entail a disjunction of some other alternatives. The counterexample may sound somewhat far-fetched, but if this were not required, then $D = \{$'Geoffrey has a brother', 'Geoffrey has a sister', 'Eleanor is Geoffrey's mother', 'Eleanor has three children'$\}$ would be a well-formed quantification domain, in which case the sentence *only*([Eleanor is Geoffrey's mother] and [Eleanor has three children]) would entail both that Geoffrey has siblings and that Geoffrey has neither a sister nor a brother.

[4]Kratzer (1989) discusses the relation of subfact, which she calls 'lumping' insisting that 'lumps' should not be excluded by *only*. In fact, she emphasizes that lumping and entailment should not be confused, but the definition of 'lumping' she ultimately proposes is based on a subset relation on sets of situations, cf. entailment is inclusion on sets of worlds. In other words, Kratzer's lumping and entailment are very similar and lead to the same theoretical problems, to be discussed in section 5. This allows us to ignore this distinction in the current context.

(19) Prohibition of entailment:
$P = \{p_1, ..., p_n\}$ is *entailment-prohibited* iff
$\forall p_1, ..., p_l \in P \forall q_1, ..., q_m \in P : (\{p_1, ..., p_l\} \cap \{q_1, ..., q_m\} = \emptyset) \rightarrow$
$\neg \left(\bigcap_{i=1}^{l} p_i \subseteq \bigcup_{i=1}^{m} q_i \right)$

Let's accept Schwarzschild's assumptions without argument for the time being and add the requirement that the quantification domain D be complement-consistent. Thus D must satisfy three logical constraints: it should be consistent (18), complement-consistent (11), and entailment-prohibited (19). These are necessary conditions for a set of proposions to be logically independent. If logical independence of some set of propositions P is understood as consistency of all possible combinations (*solutions*, cf. (20)) of positive and negative "evaluations" of the propositions in P (21) then it can be shown that the three requirements listed above are also sufficient, cf. fact (22).

(20) Solution of a set of propositions $P = \{p_1, ..., p_n\}$ is a proposition
$\bigcap_{i=1}^{n} q_i$ where $q_i = p_i$ or $q_i = \bar{p}_i$.

(21) Logical Independence:
$P = \{p_1, ..., p_n\}$ is *independent* iff it has no empty solutions.

(22) P is independent iff
a. P is consistent, and
b. P is complement-consistent, and
c. P is entailment-prohibited

This means that instead of imposing three logical constraints it is enough to impose one, that of logical independence. Thus we end up with a list of three constraints on D: the Focus-determined constraint (2), the Relevance (9) and the Independence constraint (23).

(23) *The Independence constraint:*
D is logically independent.

Given these constraints and the assumption that the selected alternative is part of domain D, the contradictions that the semantics of *only* gave rise to are eliminated. For instance, since (24b) entails (24a), if (24a) is in the quantification domain, then (24b) is not. Thus the sentence 'Eleanor only has a child' correctly fails to entail that she has no son. Similarly, (25a) and (25b) cannot both be part of the same quantification domain as complement-inconsistent, thus if the sentence 'Henry only disinherited Richard' excludes that he disinherited John it will not exclude that he did not disinherit John at the same time.

(24) a. Eleanor has a child.
b. Eleanor has a son.

(25) a. Henry disinherited John.
b. Henry did not disinherit John.

In short, the problems caused by logical dependencies between propositions that *only* quantifies over can be simply remedied by explicitly requiring their mutual independence. In the next two sections I discuss some shortcomings of this approach.

5 An empirical problem: Quantity scales

One serious problem that the analysis presented above runs into has to do with quantity scales. Scales like *some* < *all* or the natural numbers are one of the most basic kinds of quantification domains for exhaustifying operators. A sentence like (26a) should be able to entail (26b) which would be the case if both 'Eleanor has three sons' and 'Eleanor has four sons' belonged to *only*'s domain of quantification. However, it cannot be since this pair of propositions violates the prohibition of entailment.

(26) a. Eleanor only has three sons.
  b. Eleanor does not have four sons.

Since elements of a scale are, by definition, ordered according to their informativity, and relative informativity of two propositions typically reduces to entailment, scales represent a huge class of data with respect to which a theory based on logical independence makes false predictions. Note that the same problem arises for Kratzer (1989) and Schwarzschild (1997) whose notions of subfact/subproperty are based on entailment.

Thus what is needed is some way to distinguish between "subfacts" like 'Eleanor has a child' vs. 'Eleanor has a son' on the one hand and "pure entailments" like (26) on the other. From a purely technical point of view, this is possible: entailment imposes a total linear order on sets of propositions built up on the basis of lexical scales, like ... ⇒ 'Eleanor has four sons' ⇒ 'Eleanor has three sons' ⇒ 'Eleanor has two sons' ⇒ ... By contrast, a hyperonym usually has more than one "direct" hyponym, e.g. *child* vs. *son* and *daughter*, therefore entailment is a partial order on the corresponding sets of propositions. Now if a linear scale is defined as the set of propositions totally ordered by entailment, one can weaken the Independence constraint (23) to (27) so as to allow for linear scales. In this way, we can keep the proposition 'Eleanor has four children' as a possible alternative to 'Eleanor has three children', so the ability of sentences like (26a) to entail (26b) is recovered.

(27) *The weak Independence constraint:*
  D is independent or a linear scale.

Of course, even if this solution gets most of the facts right it lacks any explanation, and it is doubtful that a reasonable justification can be found for making linearity of entailment such an important criterion determining the geometry of possible quantification domains. The real solution should probably be based on Kratzer's (1989) suggestion that the "forbidden" logical relation between alternatives be distinct from entailment.[5] However, the formal implementation of this idea is a highly non-trivial task. The first place to look for an appropriate mechanism may be the realm of part-whole relations on abstract entities such as events or

[5] It is necessary to note though that once Schwarzschild's subproperties are made distinct from entailments, certain parts of his derivation become invalid.

situations (Kratzer, 1989; Eckardt, 1998). This is a challenging enterprise and its realization is outside the scope of the current paper.

6 A conceptual problem: Alternative quantification domains

Another problem of an approach based on logical constraints has to do with the non-functional character of these constraints.

The Relevance constraint, for instance, can be considered functional in the sense that given a particular question under discussion Q, it is possible to define a *function* that maps any set of propositions P to its *single* biggest subset of relevant propositions P_r so that any other relevant subset of P would be included in P_r. For relational constraints such as Independence (23) in general there is no such function. A set of propositions P can have multiple subsets that satisfy Independence but do not include one another. This is the case because one and the same proposition in P may or may not pass the Independence filter depending on what other propositions pass it. For instance, if the set of propositions in (6) is further restricted by Independence, both (28) and (29) are valid outcomes.

(28) a. Henry disinherited Richard.
b. Henry disinherited John.

(29) a. Henry disinherited Richard.
b. Henry did not disinherit John.

Unfortunately, the information state as it has been defined so far does not offer any obvious method to compare (28) and (29). The question partitions established by these two domains are identical. In other words, we got rid of contradictions but increased the ambiguity of *only*-sentences. That is, a sentence like 'Henry only disinherited Richard' no longer entails both that Henry did and did not disinherit John, but it may entail one or the other depending on the information state. The difficulty is that the current definition of Relevance always assigns the same relevance values to a proposition and its complement. However, if there were some criterion that would allow us to say that p is more (or less) relevant than $\bar{p}$ in a certain context then one of the quantification domains (28) or (29) could be picked as the preferred one.

A notion of relevance with the desired properties has in fact been proposed by van Rooy (2002). In his theory, relevance is a gradual parameter whose value depends on the current *decision situation* of an agent. A decision situation is characterized by a number of alternative actions considered by the agent, each of which is assigned a *conditional utility* value in each world or class of worlds weighted in terms of their probability. The *expected utility* of an action is determined by the sum of its conditional utilities multiplied by the probabilities of corresponding worlds. Then the relevance value of a proposition p is measured by the difference in the expected utility of the most useful action before and after learning p. In a certain sense, relevance of information p is the extent to which it helps the agent to make the best decision. This notion of Relevance is generally able to distinguish between a proposition and its complement, but it depends crucially on the function assigning conditional utilities to the alternative actions. The choice of this function, unspecified so far, will determine the predictive power of the overall theory.

7 Conclusions and Perspectives

In this paper I have considered some undesirable, and often absurd, consequences that sentences with *only* can have if the propositions in the quantification domain are not logically independent. A number of problematic cases which had previously been discussed in an unrelated way were treated here as a single cluster. It has been shown that Rooth's Focus-determined constraint and the Relevance constraint based on Groenendijk's (1999) notion of answerhood still allow for unwanted logical relations between the elements of the quantification domain, i.e. fail to prevent contradictions.

With Kratzer (1989) I argued that additional domain restrictions should be introduced (restrictions violated by the Lunatic), rather than looking for a stronger notion of relevance. These constraints should guarantee at least that the quantification domain of *only* is complement-consistent and does not contain hyponymous propositions or subfacts. To achieve this goal, I explored the theoretical option of introducing an explicit requirement of logical independence of the domain.

The proposed Independence constraint indeed precludes the considered types of contradictions, but it provides incorrect results with respect to an important class of quantification domains—quantity scales. This problem was partly handled by a technical trick based on the observation that quantifier scales are linear, whereas the hyperonym-hyponym relation is usually branching. However, the real solution should probably be based on an appropriate notion of a part-whole relation, distinct from entailment, defined on abstract entities—events or facts. Another problem of the proposed analysis is the non-functional character of the Independence constraint. One and the same Question under Discussion can make different quantification domains relevant. This problem can possibly be approached along the lines proposed in van Rooy (2002) which considers relevance as a gradual property making it possible to distinguish between and compare the alternative quantification domains.

References

Andrea Bonomi and Paolo Casalegno. *Only*: Association with focus in event semantics. *Natural Language Semantics*, 2:1–45, 1993.

Regine Eckardt. *Adverbs, Events and Other Things*. Niemeyer, Tübingen, 1998.

Jeroen Groenendijk. The logic of interrogation. In T. Matthews and D. L. Strolowitch, editors, *Proceedings of SALT 9*, Stanford, 1999. CLC Publications.

Jeroen Groenendijk and Martin Stokhof. *Studies in the Semantics of Questions and the Pragmatics of Answers*. PhD thesis, University of Amsterdam, 1984.

Gerhard Jäger. Only updates: On the dynamics of the focus particle *only*. In *Proceedings of the Tenth Amsterdam Colloquium*. University of Amsterdam, 1996.

Nirit Kadmon. *Formal Pragmatics*. Blackwell Publishers, 2001.

Angelika Kratzer. An investigation of the lumps of thought. *Linguistics and Philosophy*, 12(5):607–653, 1989.

David Lewis. Relevant implication. *Theoria*, 54:161–174, 1988.

Craige Roberts. Information structure in discourse: Towards an integrated formal theory of pragmatics. *OSU Working Papers in Linguistics*, 49:91–136, 1996.

Mats Edward Rooth. *Association with Focus.* PhD thesis, University of Massachusets, Amherst, 1985.

Mats Edward Rooth. A theory of focus interpretation. *Natural Language Semantics*, 1:75–116, 1992.

Roger Schwarzschild. Why some foci must associate. Rutgers University, 1997.

Robert van Rooy. Relevance only. In Bos, Foster, and Matheson, editors, *Proceedings of the Sixth Workshop on the Semantics and Pragmatics of Dialogue (EDILOG 2002)*, pages 155–160, Edinburgh, UK, September 4-6 2002.

Kai von Fintel. A minimal theory of adverbial quantification. In Barbara Partee and Hans Kamp, editors, *Context Dependence in the Analysis of Linguistic Meaning: Proceedings of the Workshops in Prague, February 1995, Bad Teinach, May 1995*, IMS Stuttgart Working Papers, pages 153–193, 1995.

Arnim von Stechow. Focusing and backgrounding operators. In Werner Abraham, editor, *Discourse Particles*, pages 37–84. John Benjamins, 1991.