Comparing to What is Possible

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Abstract

A novel pragmatic account of Heim (2001) and Rullmann (1995) ambiguities in comparatives with possibility modals is proposed and compared to a structural approach. The new analysis builds on a proposal in Fox and Hackl (2006) to treat strong readings of possibility statements with 'before' clauses as a result of strengthening their literary meanings by a free choice implicature.

1 Introduction

This paper is concerned with ambiguous comparative sentences featuring possibility modals. There are three types of such comparatives whose interpretation calls for an explanation. The first type is a 'less' comparative with a modal in the main clause. Consider the following example from Heim (2001).

(1)   (The draft is ten pages.) The paper is allowed to be less long than that.

One reading of (1) says that the paper is not allowed to be as long as the draft. The other reading says that it is possible for the paper to be shorter than the draft, leaving it open whether it is allowed to be as long as the draft.

The second kind of ambiguity, also pointed out in Heim (2001), is observed in differential comparative like (2) below. (2) normally receives a rather weak interpretation conveying that it is allowed for the paper to be 15 pages long. However, it may additionally imply that the paper is not allowed to be longer than 15 pages. In the following I shall refer to the ambiguities in (1) and (2) as Heim ambiguities.

(2)   (The draft is ten pages long.) The paper is allowed to be exactly five pages longer than that.

The third phenomenon to be considered is known as Rullmann ambiguity. The following sentence from Rullmann (1995) is a paradigmatic example. It can either be understood conveying that the altitude of the helicopter was below the maximal altitude

of a plane or that it was below the minimal one. Rullmann ambiguity arguably surfaces only in negative polar comparatives.

(3)   The helicopter was flying less high than a plane can fly.

I shall defend the view that the weaker readings of the first two constructions are the basic ones and the stronger readings result from a pragmatic enrichment known as a free choice implicature. The same kind of enrichment is at work in Rullmann ambiguity examples. I call the pragmatically enriched meanings 'extreme' readings (ExR). In (1) and (2) the extreme is the maximally allowed length of the paper. In (3) the extreme is set either to the maximal or the minimal altitude of a plane.

The paper is structured as follows. In section 2 I shall summarise the arguments against treating the three kinds of ambiguities as structural ones and motivate a new non-structural approach. In section 3 I shall implement a pragmatic approach to the ambiguities along the lines suggested by Fox and Hackl (2006). In the remaining part I shall address two problems that such an approach faces. The first problem is the apparent dependence of Rullmann ambiguity on negative polarity. The second concern is the difference in the strength of ExR of Heim's 'less' comparatives as predicted by a structural approach versus by a pragmatic approach.

2   Against Structural Ambiguity

The mainstream approaches to the ambiguities under discussion are structural, cf. Heim (2001), Büring (2007), Heim (2007), Oda (2008). Their central claim is that each of the three kinds of comparatives mentioned above can be assigned two LFs differing in the position of the comparative morpheme relative some other element in the structure. For the sake of concreteness, let me present the gist of Heim's (2007) theory which, unlike other analyses, has a virtue of being general enough to account for all cases of ambiguity. In the second part of this subsection I shall list the main challenges to a structural ambiguity approach.

2.1   Heim (2007)

In Heim's approach the ambiguity in sentences with 'less' results from the mobility of 'less' and the availability of two landing sites for it in the presence of intensional predicates. 'Less' spells out the comparative morpheme and the negative element 'little'. Being a degree negation, cf. the lexical entry in (4), 'little' scopally interacts with possibility modals.

(4) $[\![\text{little}]\!] = \lambda d \lambda P \ \neg P(d)$

For example, sentence (1) is assigned two LFs corresponding to a wide and a narrow scope of 'little' relative to 'be allowed', given in (5-a) and (5-b), respectively.

(5)   a.   [-er than 10pp] [$\lambda 2$ [little 2] [$\lambda 1$ allowed [the paper 1 long]]]
        b.   [-er than 10pp] [$\lambda 2$ [allowed [little 2] [$\lambda 1$ [the paper 1 long]]]

Two remarks on the underlying assumptions are in order before we consider the re-
sulting interpretations. First, the comparative is treated here as a degree quantifier
restricted by the comparative complement, cf. (6-a). It QRs from its base position in
the 'little' phrase to the edge of the clause. Second, gradable adjectives are analyzed
as relations between degrees and individuals, monotone in their degree arguments, cf.
(6-b).

(6)   a. $[\![\text{-er}]\!] = \lambda P \lambda Q \ P \subset Q$
        b. $[\![\text{long}]\!] = \lambda w \lambda d \lambda x \ \text{LENGTH}_w(x) \geq d$

If the modal is in the scope of negation, as in (5-a), the scope of '-er' is a set of lengths
greater or equal to the maximally allowed length of the paper, see (7-a). After the
application of '-er', set (7-a) is said to include the set of lengths greater than or equal
to ten pages, which amounts to the claim that the length of the draft exceeds the
maximally allowed length of the paper. If negation operates below the modal, as in
(5-b), '-er' compares the set left-bounded by the length of the draft to the set in (7-b).
The latter defines a set of degrees that are greater than the minimally allowed length
of the paper. The LF in (5-b) therefore corresponds to the claim that a length under
ten pages is permitted.

(7)   a. $\lambda d \forall w' \in Acc_w : \text{LENGTH}_{w'}(paper) < d$
        b. $\lambda d \exists w' \in Acc_w : \text{LENGTH}_{w'}(paper) < d$

Rullmann ambiguity in (3) is tackled analogously. The only difference is that in (3)
QR of the reconstructed 'little' phrase inside the comparative complement is responsible
for two readings. The option with a long movement leads to a comparison with the
maximal altitude of a plane, while a short movement results in a comparison with the
minimal altitude of a plane.

If there is no degree negation, as in comparatives with 'exactly' differentials, struc-
tural ambiguity is derived by assigning '-er' wide or narrow scope relative to the modal.
This is a prediction that Heim (2007) inherits from Heim (2001). For example, the two
readings of (2) are represented as a wide scope and a narrow scope of the comparative,
given (8-a) and (8-b), respectively.

(8)   a. $max(\lambda d \exists w' \in Acc_w : \text{LENGTH}_{w'}(paper) \geq d) = 15pp$
              'The maximally allowed length of the paper is 15 pages.'
        b. $\exists w' \in Acc_w : max(\lambda d \text{LENGTH}_{w'}(paper) \geq d) = 15pp$
              'It is possible for the paper to be 15 pages long.'

Heim's approach is thus capable of accounting for all three cases of ambiguity. An-
other advantage is that it uncovers the apparent link between negative polarity and the

availability of two readings in Rullmann ambiguity examples. Indeed, the variant of (3) with a positive polar 'higher' in place of 'less high', given in (9), is judged unambiguous. It can only compare the altitude of the helicopter with the maximal altitude of a plane.

(9)   The helicopter was flying higher than a plane can fly.

2.2 Challenges to a Scope Approach

A scope analysis, like Heim's, faces a number of challenges. I shall list five of them here. First, it appears that Heim ambiguity obtains outside comparatives as well. Depending on what kind of information is relevant to the addressee each of the following sentences has two different interpretations.

(10)   a.   You are allowed to arrive at 10 p.m.
        b.   You are allowed to arrive earlier than 10 p.m.
        c.   You are allowed to arrive before 10 p.m.

When answering the question "When are we allowed to arrive?" the sentences in (10) report on the latest permissible time of arrival: it is 10 p.m. in (10-a) and a time before 10 p.m. in (10-b) and (10-c). In a context of an alternative question they make a weaker claim. In the latter case (10-a) means that 10 p.m. is a permissible time of arrival leaving it open whether arriving before or after 10 p.m. would violate the regulations. By analogy, sentences (10-b) and (10-c) simply communicate that arriving before 10 p.m. is compliant with the regulations. While the two readings of (10-b) receive a straightforward account in Heim (2007), neither (10-a) nor (10-b) can be handled as proposed by Heim, despite the obvious relatedness of the available interpretations. Neither of them contains a comparative whose scope can be manipulated.

Rullmann ambiguity is not restricted to comparatives either. For example, the comparative clause of (11-a), when occurring unembedded as in (11-b), has two readings. 60 km/h may refer to the maximal speed limit as well as to the minimal one. These readings pattern with a less-than-maximum and a less-than-minimum reading of (11-a).

(11)   a.   Michael is driving less fast than allowed on this race track.
        b.   It is allowed to drive 60 km/h on this race track.

The common feature of examples (10) – (11) is the presence of a degree-denoting expression under a certain type of possibility modals. Notably, not any possibility modal gives rise to an ambiguity. This raises a second problem for a scope analysis, already touched upon in Heim (2001) and Heim (2007). The variants of (10) with the epistemic 'might' in place of the deontic 'be allowed', given below, are not ambiguous.

(12)   a.   You might arrive at 10 p.m.
        b.   You might arrive earlier than 10 p.m.
        c.   You might arrive before 10 p.m.

Neither of the examples in (12) can convey the latest time at which the addressee will possibly arrive in view of the information available to the speaker. Accounting for the discrepancy between (10) and (12) within a scope approach would most likely amount to formulating a restriction on the narrow scope of 'might' with respect to '-er', as Heim suggests. 'Might' is notorious for its pervasive high scope behaviour. This would leave us with a set of readings which correspond to the wide scope of 'might' relative to the comparative, i.e. the weaker readings. However, where exactly such a restriction stems from remains an open issue so far.

The third challenge to a scope analysis is the fact that ExRs in Heim ambiguity examples are unanimously judged less natural than weak readings. Uttered in a context favouring ExR, e.g. preceded by a wh-question, (13-a) is judged degraded by most speakers. It is, however, reported to improve if the modal is preceded by 'only' as in (13-b). The role of 'only' remains a mystery under a scope approach, and so does the strong preference for the weak interpretation when (13-a) is uttered out of the blue.

(13)   a.   You are allowed to arrive earlier than 10 p.m.
        b.   You are only allowed to arrive earlier than 10 p.m.

The fourth challenge faced by a scope approach is ambiguity in comparatives with true negative adjectives, like (14). Similar to (3), sentence (14) has a less-than-minimum and a less-than-maximum reading. Since the locus of ambiguity in a scope approach is the position of 'little' in the embedded clause, its proponents are forced to extract a component with the meaning of 'little' from 'lower', see Heim (2007), Heim (2008), Büring (2007). The discussion of a decompositional treatment of negative antonyms in Heim (2008) makes it clear that this creates as many puzzles as it solves problems.

(14)   The helicopter was flying lower than a plane can fly.

The fifth challenge, which is related to the treatment of Rullmann ambiguity, is the availability of empirical evidence showing that this kind of ambiguity does not depend on negative polarity. The assumption that Rullmann ambiguity is restricted to comparatives with negative polar predicates is questioned in Meier (2002). While Meier's examples contain deontic modals, comparatives with counterfactual possibility modals present somewhat more convincing evidence for the availability of ambiguity with positive polar adjectives. For example, (15) is undoubtably ambiguous. The context in (15-a) highlights a more-than-minimum interpretation, while (15-b) suggests a more-than-maximum reading.

(15)   Mary made more mistakes than Bill could have.
        a.   ... if he had done his best.
        b.   ... if he had made no effort at all.

To sum up, a scope approach to Heim and Rullmann ambiguities fails to explain why this kind of ambiguity is possible outside of comparatives and only with a certain

class of modals. It has nothing to say on the preference for the weaker reading and the role of 'only' in promoting ExR, i.e. the stronger reading. It commits its proponents to a decompositional analysis of negative polar adjectives. Finally, its prediction that the ambiguity is polarity sensitive is questionable.

3 Fox and Hackl's Solution

One alternative to a structural analysis in the spirit of Heim is informally discussed in Fox and Hackl (2006). Fox and Hackl consider (16) as addressed to a person who is staying at a Youth Hostel that is locked up over night. In the given context (16) is a way to convey the time at which the doors are locked. So one can use this sentence to communicate that the latest time at which one can enter the building precedes 10 p.m. This reading corresponds to the wide scope reading of 'less' comparatives with 'be allowed', viz. (1).

(16)   You are allowed to arrive before 10 p.m.

Fox and Hackl suggest that there are two pragmatic mechanisms responsible for the strong reading of (16). The first one produces the so called free choice implicature, which turns the plain assertion that you can arrive at a time t before 10 p.m. to the stronger statement that you can arrive at any time t before 10 p.m. The second pragmatic enrichment component is a strengthening by a scalar implicature which is possible due to the existence of the free choice interpretation. The fact that you are allowed to arrive any time before 10 p.m. is inferred to be the most informative true possibility among alternative assertions of the kind 'you are allowed to arrive any time before t'. If the plain meaning of (16) is strengthened by these implicatures the addressee gets informed about the latest time before which she is allowed to arrive.

In the following I shall follow in the footsteps of Fox and Hackl and show that their approach generalizes to all cases of ambiguity discussed here.

3.1 Implementing Fox and Hackl (2006)

In this subsection I shall apply Fox and Hackl's analysis to Heim 'less' comparatives. The task is to explain why (1), repeated in (17) for convenience, can implicate that the paper is not allowed to be ten pages or longer. For this purpose, I shall make use of the procedure for deriving scalar implicatures developed in Fox (2007).

(17)   (The draft is ten pages.) The paper is allowed to be less long than that.

Under a widely accepted assumption that 'be allowed' existentially quantifies over worlds compliant with whatever laws are in force in the actual world, we derive the following truth condition for (17).

(18) $\exists w' \in Acc_w : \text{LENGTH}_{w'}(paper) < 10pp$

(18) corresponds to the weaker reading of (17): it is met iff there is an admissible state of affairs in which the length of the paper is less than ten pages. Following the line of reasoning in Fox (2007), (18) may generate the ignorance inference that the speaker does not know what length under ten pages the paper is allowed to have. If this appears implausible to the addressee, they may choose to strengthen the original meaning. Fox suggests that in that case the hearer opts for an alternative structure by embedding the original one under the covert exhaustivity operator *exh* with the semantics similar to 'only'. *exh* can be applied recursively as long as it contributes to the meaning in a nontrivial way, that is, as long as it removes undesirable ignorance inferences. *exh* is essentially an exclusive operator restricted by a set of propositional alternatives to its prejacent. It projects the truth of the prejacent and attempts to exclude as many alternatives from its restriction set as possible with the aim of returning a consistent statement. Fox calls alternatives that can be excluded in that way innocently excludable. The set of innocently excludable alternatives (I-E) is formed by intersecting all maximal sets of propositions in the alternatives set (A) such that their exclusion is consistent with the prejacent. This is reflected in the following definition of *exh*.

(19) $[\![exh]\!](A)(p) = \lambda w \ p(w) \wedge \forall q \in I\text{-}E(p,A): \neg q(w),$
          where $I\text{-}E(p,A) = \bigcap\{A' \subseteq A | A'$ is a maximal set in A, s.t.
          $\{\neg r : r \in A'\} \cup \{p\}$ is consistent$\}$

Assume that to get rid of the undesirable inference that the speaker does not know the acceptable length of the paper the addressee of (17) chooses the following parse for that sentence.

(20) $[\![exh]\!](A)(\exists w' \in Acc_w : \text{LENGTH}_{w'}(paper) < 10pp)$

The prejacent of *exh* in (20) can be represented as a disjunction of alternative lengths under possibility, as shown in (21-a). Following the common practice, the alternative set is formed by replacing disjunction with each separate disjunct, see (21-b).

(21)   a. $\exists w' \in Acc_w : \text{LENGTH}_{w'}(paper) = 1p \vee ... \vee \text{LENGTH}_{w'}(paper) = 9pp$
          b. $A = \{\lambda w \exists w' \in Acc_w : \text{LENGTH}_{w'}(paper) = 1p, ...$
                $\lambda w \exists w' \in Acc_w : \text{LENGTH}_{w'}(paper) = 1p \vee ... \vee \text{LENGTH}_{w'}(paper) = 9pp\}$

The reader can verify that none of the alternatives in A different from the prejacent can be excluded innocently. However, the presence of the ignorance inference licenses another level of exhaustification. The parse in (22) is another attempt by the addressee to make most out of the literal meaning.

(22) $[\![exh]\!](A')([\![exh]\!](A)(\exists w' \in Acc_w : \text{LENGTH}_{w'}(paper) < 10pp))$

This time the alternatives A' are formed by applying *exh* to the elements of A, see (23-a). The prejacent remains unchanged, each other alternative q can be strengthened by excluding all alternatives different from q and the prejacent, as exemplified in (23-b).

(23)   a. $A' = \{exh(A)(p) : p \in A\}$
         b. $\lambda w \exists w' \in Acc_w : \text{LENGTH}_{w'}(paper) = 1p, \ldots$
               $\neg \exists w' \in Acc_w : \text{LENGTH}_{w'}(paper) = 9pp$

Each of the strengthened alternatives in the resulting A' can be innocently excluded. The reader may verify that this turns the possibility of a disjunction of lengths expressed by the prejacent into the conjunction of the possibilities of separate disjuncts, as shown in (24). (24) denotes a set of worlds in which the paper is allowed to have any length under ten pages. This is the so called free choice interpretation of (17).

(24) $\lambda w \exists w' \in Acc_w : \text{LENGTH}_{w'}(paper) = 1p \wedge \ldots \wedge$
         $\exists w' \in Acc_w : \text{LENGTH}_{w'}(paper) = 9pp$
         $= \forall d < 10pp \exists w' \in Acc_w : \text{LENGTH}_{w'}(paper) = d$

Evidently, the free choice interpretation is still not maximally exhaustive. From it the addressee may infer by means of a scalar implicature that ten pages is the maximal length the paper is allowed to be under, resulting in the ExR in (25).

(25) $\forall d < 10pp \exists w' \in Acc_w : \text{LENGTH}_{w'}(paper) = d$
         $\forall d \geq 10pp \neg \exists w' \in Acc_w : \text{LENGTH}_{w'}(paper) = d$

Treating ExR as a result of a free choice effect has a welcome prediction for sentences with epistemic modals like (12-b). The use of 'might' indicates the speaker's uncertainty about the truth of the embedded proposition. The speaker obviously lacks the relevant evidence. In such a situation an inference about the ignorance of the speaker cannot appear plausible to the hearer and lead to a strengthening of the meaning. On the contrary, such an inference is a natural result of the use of 'might'. This explains the lack of Heim ambiguity in epistemic possibility statements.

3.2   Numerals under Possibility

It is widely accepted in the literature on the interpretation of numerals that the 'exactly' interpretation of a numeral can sometimes give way to the 'at least' or 'at most' reading in an appropriate context. We need not delve into the ongoing debate about the source of 'exactly','at least' and 'at most' readings. Suppose we are free to select any option if it results in the strengthening of the overall meaning.

(26)   Mary could have spent €100.
         a.   ... She did away with a rather modest sum.
         b.   ... She didn't have to be that extravagant.

Depending on the context, €100 in (26) can refer to the minimum or to the maximum Mary could have spent. Suppose (26) is uttered in a situation in which Mary was to organise a party and she was saving up money to buy a new laptop. Mary's primary goal was to avoid spending too much for the party. Mary had €100 at her disposal. In that case, the maximum interpretaiton is prominent, as facilitated by the continuation in (26-a). On the other hand, (26) could have been uttered in a context in which Mary's goal was to prepare a fabulous meal for her family whatever it might cost her. With the continuation in (26-b), the sentence receives the minimum interpetation.

How do these reading come about? I propose that the crucial step towards them is a shift from the basic 'exactly' reading of the numeral in (27-a) to the 'at most' or 'at least' reading in (27-b) and (27-c), respectively. Once we have made this step we can follow Fox and Hackl's line of reasoning elucidated in the previous sections to derive a minimum or a maximum ExR of a possibility statement.

(27)   a. $\lambda w \exists w' \in Acc_w : \text{EXPENSE}_{w'}(Mary) = €100$
       b. $\lambda w \exists w' \in Acc_w : \text{EXPENSE}_{w'}(Mary) \leq €100$
       c. $\lambda w \exists w' \in Acc_w : \text{EXPENSE}_{w'}(Mary) \geq €100$

Two questions arise at this point. The first one is how the shift from 'exactly' to 'at least' and 'at most' can be implemented. It presents a broad and rather controversial issue which is outside the scope of this paper. To answer it one has decide on which interpretation is the basic one. A neo-Gricean approach along the lines of Fox (2007) would derive the 'exactly' reading of a numeral from the 'at least' reading by means of exhaustification. The 'at most' reading can be also obtained by excluding stronger propositional alternatives to the plain meaning, for a spelled-out analysis of overt 'at most' along these lines see Krifka (1999). An alternative, increasingly polular option is to treat the 'exactly' reading as the basic one and the 'at least' reading as a result of evaluating a sentence in a non-minimal situation, cf. Kratzer (2009). Whatever side one takes, the derivation of ExR pursued here does not hinge on the choice.

The second issue to be addressed is when which interpretation obtains. The move from (27-a) to (27-b) in the 'party' scenario mentioned above is possible because it supports the inference from "Mary spends d much" to "Mary spends d-n much". If one saves up money by spending €100, it holds that one saves up money by spending less than €100, cf. (28-a). Crucially, the direction of the inference is inferred from the context and therefore the scale associated with the open proposition 'Mary spends d much' is pragmatic. In the 'fabulous meal' scenario the direction of the inference is reversed. If Mary's primary wish is to cook a fabulous meal then spending €100 is higher on a pragmatic scale than spending more than €100, cf. (28-b). This allows a shift from (27-a) to (27-c).

(28)   a.   Mary spends €100 and saves up money.
            → Mary spends €90 and saves up money.
            ↛ Mary spends €200 and saves up money.
       b.   Mary spends €100 and cooks a fabulous meal.

$\rightarrow$ Mary spends €200 and cooks a fabulous meal.

$\nrightarrow$ Mary spends €90 and cooks a fabulous meal.

Rullmann (1995) contains an illuminating discussion on how pragmatics determines the direction of an inference in such cases. He compares the pair of sentences in (29). Given our world knowledge, the numeral in (29-a) receives an 'at least' reading, while that in (29-b) receives an 'at most' reading.

(29)   a.   A professor can live on €3000.

        b.   A professor can spend €3000.

Given that we are technically equipped to derive this or that reading of a numeral, from the 'at most' reading in (27-b) and the 'at least' reading in (27-c) we can arrive at the free choice reading of (26). By successive double application of *exh*, the statement 'there is an accessible world in which Mary spends €100 or less' is strengthened to the statement 'for any sum d equal to or less than €100 there is an accessible world in which Mary spends d much.' Finally, the resulting free choice interpretation is strengthened by the scalar implicature which excludes the possibility of Mary spending more than €100. The result is given in (30).

(30)   For any sum d s.t. $d \leq$ €100 there is a possible state of affairs in which Mary spends d much and for no d' such that $d' >$ €100 there is a possible state of affairs in which Mary spends d' much. [=(26-a)]

This interpretation entails the weak meaning we set out with, viz. (27-a). The choice of the 'at most' interpretation of the numeral in the given context is justified by the fact that it leads to a more informative assertion. Similarly, we can derive the minimum ExR of (26) from the 'at least' sense of the numeral.

(31)   For any sum d s.t. $d \geq$ €100 there is a possible state of affairs in which Mary spends d much and for no d' such that $d' <$ €100 there is a possible state of affairs in which Mary spends d' much. [=(26-b)]

If we adopt a localist approach for computing pragmatic implicatures advocated in (Fox, Chierchia and Spector, to appear), the strategy just described may be applied to the comparative complement of (32), which like (3) reveals Rullmann ambiguity.

(32)   Mary spent more than she could have ~~spent d much~~.

        a.   . . . if she had been an economical housewife.

        b.   . . . if she had had to organize a wedding party.

If we choose the 'at least' interpretation of the bound degree in the scope of 'could', after three rounds of exhaustification the embedded clause denotes a set of degrees d that satisfy two conditions: any sum greater or equal to d could have been spent by

Mary and any sum less than d could not have been spent by Mary. This corresponds to the singleton set containing the minimum that Mary could have spent, cf. (33-a) '-Er' picks the unique element from (33-a) and compares it to Mary's actual expense, which results in the minimum ExR, cf. (33-b).[1]

(33)   a. $[\![\text{'than' clause}]\!](w) = \lambda d \forall d' \geq d : \exists w' \in Acc_w : \text{EXPENSE}_{w'}(Mary) = d' \wedge$
              $\neg \exists d'' < d : \exists w' \in Acc_w : \text{EXPENSE}_{w'}(Mary) = d''$
     b. $\text{EXPENSE}_w(Mary) > def([\![\text{'than' clause}]\!](w))$ [=(32-a)]

The truth conditions in (34-b), corresponding to the maximum ExR, result from the choice of the 'at most' interpretation of the numeral.

(34)   a. $[\![\text{'than' clause}]\!](w') = \lambda d \forall d' \leq d : \exists w'' \in Acc_{w'} : \text{EXPENSE}_{w''}(Mary) = d' \wedge$
              $\neg \exists d'' > d : \exists w'' \in Acc_{w'} : \text{EXPENSE}_{w''}(Mary) = d''$
     b. $\text{EXPENSE}_w(Mary) > def([\![\text{'than' clause}]\!](w'))$ [=(32-b)]

Thus, Rullmann ambiguity follows from the availability of two ways to apply the pragmatic reasoning that allows to derive a free choice interpretation of sentences with degree-denoting terms in the scope of a possibility modal and strengthen it by a scalar implicature. We may start out with the 'at least' interpretation of a degree term and derive an implicature that amounts to a comparison with the minimum; or we pick the 'at most' interpretation, which leads to a comparison with the maximum. The choice of the 'at least' or 'at most' reading of a numeral is pragmatically driven in the sense that it enriches the basic meaning of the whole clause and is therefore preferred over the choice of the 'exactly' reading in accordance with the strong meaning hypothesis.

Finally, I suggest that the same pragmatic mechanism is at work in comparatives with 'exactly' differentials. Take Heim's example in (2), repeated in (35). In (35-a) I give the truth conditions for the the weak interpetation, which just entails that 15 pages is a permitted length of the paper. If we choose the 'at most' interpetation of the degree term under 'than', see (35-b), the maximum ExR, coveying that the paper is not allowed to be longer than 15 pages, can be inferred pragmatically, see (35-c).

(35)   (The draft is ten pages long.) The paper is allowed to be exactly five pages longer than that.
     a. $\exists w' \in Acc_w : \text{LENGTH}_{w'}(paper) - 5pp = 10pp$
     b. $\exists w' \in Acc_w : \text{LENGTH}_{w'}(paper) - 5pp \leq 10pp$
     c. $\forall d' \leq 10pp : \exists w' \in Acc_w : \text{LENGTH}_{w'}(paper) - 5pp = d' \wedge$
              $\neg \exists d'' > 10pp : \exists w' \in Acc_w : \text{LENGTH}_{w'}(paper) - 5pp = d''$

To sum up, I claim that all three examples under discussion may be pragmatically strengthened in certain contexts, which accounts for their ambiguity. Thus, Heim and Rullmann ambiguities are not structural but result from the possibility to choose between plain assertions and pragmatically enriched meanings.

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[1]Alternatively, the comparative complement may be treated as a definite degree description.

4   Consequences of a Pragmatic Approach

In this subsection I want to address two consequences of a pragmatic approach to Rullmann and Heim ambiguities. First, in a pragmatic approach the availability of Rullmann ambiguity is not predicted to depend on the polarity of the gradable predicate involved. However, most existing approaches to Rullmann ambiguity take for granted that sentences with positive polar adjectives are not ambiguous, cf. Rullmann (1995), Heim (2007), Büring (2007). The second consequence is that an ExR derived in a pragmatic approach is logically stronger than an ExR derived in a structural ambiguity approach. There happen to be contexts in which the weaker meaning derived in Heim's approach is more appropriate.[2]

4.1   Constraints on Rullmann ambiguity: Strong Meaning Hypothesis

I argued that Rullmann ambiguity is not restricted to comparatives with negative pole adjectives. However, it is worth while looking at the cases that are reported unambiguous. It turns out that the lack of ambiguity is not directly related to the polarity but resides in certain pragmatic restrictions on the use of this or that kind of comparative sentence. There are three factors the interplay of which is crucial for the availability of two readings. They are the modal flavour of the embedded possibility modal, the polarity of the gradable predicate and a preference for a maximum or minimum reading of degree-denoting terms outside of comparatives.

Let us first consider the case of deontic modals. A deontic modal in a comparative complement is generally not compatible with a more-than-minimum reading. This might be the reason the example in (36) from Meier (2002) is usually judged to lack that interpretation. One tends to compare Chuck's actual speed with the upper speed limit even if the context does not support this type of comparison, e.g. in Meier's context Chuck is a driver of a truck transporting a fragile load.

(36)   Chuck is driving faster than he is allowed to drive.

The lack of the more-than-minimum interpretation suggests that one can only use (36) to convey that Chuck does not comply with the regulations. One cannot express the idea that Chuck is conform to the rules by comparing his speed to what is allowed. Comparatives with negative polar adjectives also reveal this pattern. Thus, for (37) the prominent interpretation is that Chuck is driving below the minimum speed.

(37)   Chuck is driving slower than he is allowed to drive.

Put concretely, if we assume that the shaded area in the middle of the scale in (38) corresponds to how fast one is allowed to drive, a comparative sentence with a deontic possibility modal would normally set Chuck's actual speed to X1 or X3 but hardly to

X2. On reflection, it is not surprising that one does not use a comparative to state that Chuck's speed falls within the compliance interval. A comparative can relate Chuck's speed to one of the bounds of the admissible interval; it cannot refer to both bounds simultaneously. If Chuck is said to drive faster than the minimum or slower than the maximum this meaning appears too weak to ever surface. In both cases nothing can prevent the hearer from inferring that the speaker does not know if Chuck complies with the rules or not. I suggest that the strong meaning hypothesis determines the preference for a rule violation report and as a result blocks comparison with the minimum in positive comparatives and comparison with the maximum in negative ones.

(38)   ——X1———//////////X2//////////—X3———>

A slight asymmetry between negative and positive polar cases remains unaccounted, though. To be more precise, occasional availability of a less-than-maximum reading calls for an explanation. My guess is that another factor at stake is the preferred interpretation of a degree term in a non-comparative environment. For instance, (39) normally conveys that 45mph is the maximum Chuck is allowed to drive. The prominence of a maximum interpretation undoes the effect of the strong meaning hypothesis and gives way to a less-than-maximum reading of a comparative with a negative polar adjective, e.g. (37). In a positive polar case, e.g. (36), there is no reason a more-than-minimum interpretation could surface. A reference to the minimum is not prominent under the comparative, nor can that reading express a violation of a rule.

(39)   Chuck is allowed to drive 45mph fast on this highway.

Comparatives with non-deontic modals are not subject to the pragmatic constraints discussed above. However, they must be conform to a different kind of usage rules. For example, the more-than-minimum reading of (32), repeated in (40-a), is the prominent one for many speakers. If Mary is understood to be the agent of the same kind of event in the counterfactual worlds as she is in the actual one, the more-than-maximum interpretation makes this statement inconsistent. The span covering Mary's expenses in counterfactual worlds cannot be exceeded by Mary's expense in the actual world without producing a contradiction. Why should that be so? Counterfactual modals belong to a class of root modals. Root modality is a handy term covering those kinds of modal interpretations that are sensitive to the facts in the world of evaluation, i.e. requiring realistic conversational backgrounds. Thus, what Mary could have spent should be compatible with the actual circumstances. Mary's actual expense therefore cannot exceed what is possible in view of the facts. The strong meaning hypothesis can again be appealed to to block the inconsistent more-than-maximum reading. The same reasoning can be used to explain why (40-b) is reported to express only a comparison with the maximum.

(40)   a.   Mary spent more than she could have.
          b.   Mary spent less than she could have.

Note that if the events of the main and the embedded clause are explicitly made distinct, cf. (32-b), or if the subjects of the main and the embedded clause do not co-refer, cf. (41), the inconsistency effect is immediately lifted.[3] (41) certainly has a more-than-minimum reading. It is prominent in a context of Mary and Peter spending money for the same purpose, to be more precise, if Mary and Peter are considered the agents of the same event associated with the same circumstances. If Mary and Peter are understood to be the agents of different events, say, Mary organising a party and Peter buying a laptop, a more-than-maximum interpretation becomes possible.

(41)   Mary spent more than Peter could have spent.

To sum up, the lack of Rullmann ambiguity should not be directly linked to the positive polarity of the gradable predicate involved. I argued that the apparent dependence of Rullmann ambiguity on the negative polarity is not semantic but pragmatic – it varies with the kind of modal flavour and is sensitive to which interpretation of the degree term embedded under the modal is prominent.

4.2 Cancellation

The truth conditions corresponding to the ExR of (1) derived by Heim (2007) and by a pragmatic approach defended here are not equal. Heim (2007) predicts that (1) is true on its ExR iff the maximum length the paper is allowed to have is below the length of the draft, cf. (7). According to (25), derived by pragmatic strengthening, any length under ten pages is compliant with the rules. Therefore the maximum lies just below ten pages. This may seem too strict a requirement judging by the consistency of the discourse in (42). Heim's truth conditions in (7) are compatible with the continuation in (42) and therefore prima facie appear more adequate than the meaning in (25).

(42)   The draft is ten pages long. The paper is allowed to be less long than that. But I don't know what length exactly it is allowed to have.

On a closer examination though, the fact that (42) is consistent is not a knock-down argument for a pragmatic theory, but is actually predicted by it. The last sentence of (42) contradicts the free choice interpretation of the 'less' comparative, i.e. the claim that the paper is allowed to have any length under ten pages. Since the free choice interpretation has a status of an implicature, it is expected that it can be cancelled if the context makes clear that the speaker is not opinionated enough for the implicature to arise. I submit that this is what is happening in (42). The first conjunct of (25) is replaced by the basic meaning of (1), which results in the following truth conditions.

(43) $\exists w' \in Acc_w : \text{LENGTH}_{w'}(paper) < 10pp \wedge$
         $\forall d \geq 10pp \neg \exists w' \in Acc_w : \text{LENGTH}_{w'}(paper) = d$

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[3]I thank Daniel Büring for drawing my attention to this issue and Vera Hohaus for an extremely enlightening discussion.

This raises an important question. How is it possible to cancel the free choice implicature without cancelling the scalar implicature that lives on it? To give a satisfactory answer to this question one would have to develop a theory of implicature cancellation, which hasn't been done so far. I therefore have to confine myself to a couple of informal remarks. In a localist approach to pragmatic implicatures, which I relied upon in this work, cancellation amounts to backtracking and replacing a parse with an exhaustification operator by a corresponding parse without, cf. Fox, Chierchia and Spector (to appear). This produces an incorrect result for the case at hand, since the computation of the scalar implicature, i.e. the second conjunct in (43), depends on the presence of the two *exh* operators responsible for the free choice interpretation. To solve the problem, one needs a dynamic framework for computing and cancelling scalar implicatures which enables one to store the original strengthened meaning and intersect it with the meaning computed in a backtracking step. This would allow to cancel what is contradictory and preserve what is consistent with the following discourse.

In a global neo-Gricean approach to implicatures no grammatical mechanism is introduced to account for strengthening effects. Scalar implicatures are added at the top level after the semantic meaning has been computed. Therefore cancellation targets only the components of a strengthened meaning that produce contradiction. This approach seems better suited to account for the cancellation effect discussed in this section. I leave it open whether a global approach could generate the strengthening effects discussed here, including strengthening at the level of a comparative complement.

5   Conclusion

A pragmatic approach to Heim and Rullmann ambiguities meets the challenges of the structural ambiguity analysis in Heim (2007). It offers a unified account of ambiguity in comparatives, possibility statements with numerals and sentences with temporal prepositions. The lack of ambiguity in comparatives with epistemic modals falls out from the status of ExR as a pragmatically strengthened meaning: epistemic possibility modals are associated with ignorance inferences and therefore do not give rise to pragmatic implicatures. Since a pragmatic approach does not predict a dependence between the availability of ExR and the polarity of the gradable predicate, it makes more adequate empirical predictions on the distribution of ambiguities. Finally, it uncovers the role of 'only' in facilitating ExR. ExR results from a scalar implicature that can be realised as part of the literally meaning by inserting an overt 'only'.

Pursuing a pragmatic approach instead of a scope one has important consequences for the theory of comparatives. First, it refutes crucial semantic arguments for the degree operator analysis of the comparative morpheme: under a pragmatic account Heim and Rullmann ambiguities do not provide an evidence for the LF mobility of '-er'. Another important claim is that the ambiguity in comparatives with embedded modals is not anchored in the semantics of antonyms, in particular, it does not motivate the decomposition of negative polar adjectives into a negation and a positive polar counterpart.

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