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SCALAR ADDITIVE PARTICLES IN NEGATIVE CONTEXTS*

German has a family of expressions corresponding to the English scalar additive particle *even*, featuring the negative polarity items *einmal* and *auch nur* in addition to affirmative *sogar*. This study reports novel findings on the meanings of *einmal* and *auch nur* which are unexpected under existing analyses of English *even*. First, the particles *einmal* and *auch nur* are shown to differ from *sogar* in that they consistently contribute information about the truth values of alternative propositions, as opposed to their mere likelihood. Second, it is shown that the implications in question do not have the compositional behavior of presuppositions and instead call for the assumption that *einmal* and *auch nur* quantify existentially over alternative propositions at the level of truth conditions.

1. INTRODUCTION

This study examines the meanings of the German particles *einmal* and *auch nur*. As illustrated in (1), where capitalization marks focal stress, both expressions translate English *even*. In the terminology of König (1991), they are *scalar additive particles*.

(1) a. Hans kann nicht einmal ITALIENISCH.
        Hans knows not   eveN Italian
        'Hans doesn't even know ITALIAN.'
   b. Keiner von uns kann auch nur ITALIENISCH.
        none of us knows eveN   Italian
        'None of us even knows ITALIAN.'

In both examples in (1), the particle appears in a negative context: in the scope of sentential negation in (1a) and in the scope of a negative subject quantifier in (1b). This is not an accident. *Einmal* and *auch nur* are negative

polarity items of sorts (hence the mnemonic gloss *eveN*). As observed in König (1981, p. 123), the particle *auch nur* is licensed in the usual negative polarity contexts. The one exception is the position immediately after sentential negation *nicht*. In this position, and only there, the particle *einmal* is used instead. Sentence (2) below shows that German features a third scalar additive particle, *sogar*, which can appear in affirmative contexts.[1]

(2)   Hans kann   sogar ITALIENISCH.
       Hans knows even   Italian
       'Hans even knows ITALIAN.'

It is natural to assume that the correct analysis of English *even* will translate straightforwardly into the correct analysis of *sogar*, *einmal*, and *auch nur*. This is in fact often taken for granted in the literature. However, there is currently no agreement as to the proper analysis of *even*, and it also has not been established that *sogar*, *einmal*, and *auch nur* indeed behave like *even* in all relevant respects. The conclusion to be reached in this study is in fact that no existing view on *even* correctly applies to the German data. The reason for this is that all existing proposals on *even* adopt at least one of two basic assumptions which do not fit the German facts.

The first assumption has to do with the effect of polarity on the perceived meaning contribution of *even*. Notice that, while *Hans even knows ITALIAN* suggests that Italian is a hard language to learn, *Hans doesn't even know ITALIAN* and *None of us even knows ITALIAN* instead invite the inference that Italian is easy. Existing accounts of this contrast are minimalist. If they posit any ambiguity in the lexicon, they take the two entries for *even* to be naturally related, one being the inner negation of the other. What we will see, however, is that the particles *einmal* and *auch nur* differ from *sogar* in a less natural way. They will be shown to strengthen the meanings of their host sentences in a way that *sogar* does not.

The second assumption is that *even* is a presupposition trigger without truth-conditional content. This view may correctly characterize the meaning of *sogar*. We will see, however, that the strengthening caused by *einmal* and *auch nur* cannot in general be credited to a presupposition, as it does not

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[1] Scalar additive *einmal* is to be distinguished from the homophonous frequency adverb *einmal* 'once'. As noted in König (1991, p. 80), the fact that scalar additive *einmal* is always adjacent to *nicht* suggests that the two form one lexical item *nicht einmal*. While the final conclusion reached in this study is consistent with this view, the following discussion will not presuppose it. Also, while the paper will follow most authors in assuming that scalar additive *auch nur* is a lexical item, none of the findings reported below are inconsistent with Guerzoni's (2003) recent proposal that this expression can and should be decomposed into its independently attested components *auch* 'also' and *nur* 'only'.

show the compositional behavior of a presupposition. The data instead suggest that these particles affect truth conditions, and that they do so through existential quantification in much the way adverbial *at least* does in English.[2]

These results will be of interest not only to those interested specifically in German scalar additive particles. Naturally, they might inspire another look at other languages as well. In fact, it seems that at least English *even* behaves much like the German scalar additive particles in the relevant respects. However, this study will focus on the German data; the question whether the conclusions reached here for German indeed carry over to other languages will be left open.[3]

The presentation proceeds as follows. As a point of departure, section 2 outlines two well-known analyses of *even*, a version of the account in Karttunen and Peters (1979) and a variation on it due to Rooth (1985), and applies these analyses to the German scalar additive particles. Section 3 points to an unexpected meaning contrast between *einmal* and *auch nur* on the one hand and *sogar* on the other. *Einmal* and *auch nur* are shown to strengthen their host sentences in a way not found in sentences with *sogar*. Section 4 argues that this strengthening cannot in general be credited to a presupposition and shows that *einmal* and *auch nur* should instead be analyzed as affecting truth conditions in much the way English *at least* does. Section 5 summarizes and formulates questions for future research.

2. Two Theories

As a point of departure, this section reviews the well-known analysis of English *even* provided in Karttunen and Peters (1979) and the variant of it presented in Rooth (1985). It also translates the two accounts into analyses of the German scalar additive particles. The two following sections then explain in what ways these analyses fail to correctly apply to the German data.[4]

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[2] Lycan (1991) may be the only one to argue that English *even* contributes to truth conditions, but he takes the particle to quantify universally, rather than existentially. In the literature that discusses German additive scalar particles (e.g. Altmann 1976; König 1981, 1991; Jacobs 1983; von Stechow 1991; Guerzoni 2003) there seems to be unanimous agreement that these are truth conditionally vacuous.

[3] German is not alone in having a richer inventory of scalar additive particles than English. Similar patterns have been described for Dutch (Rullmann 1997), Spanish (Herburger 2000, 2003), Greek (Giannakidou 2003), Italian (Guerzoni 2003). König (1991, p. 76) also mentions Danish, Norwegian, and Finnish, and Alexandra Teodorescu (personal communication) reports that Romanian can be added to the list.

[4] No attempt is made here to evaluate the two accounts as analyses of *even* itself. For discussion of these accounts of *even* and for possible alternatives, see e.g. Kay (1990), von Stechow (1991), Lycan (1991), Wilkinson (1996), Rullmann (1997), Herburger (2000), and Guerzoni (2003).

2.1 *Two Theories of* Even

Any theory of *even* must accommodate the observation that the particle is sensitive to the placement of focal stress within its sentence. As Jackendoff (1972, p. 248) notes, for example, the implication that *even* adds in *JOHN even gave his daughter a new bicycle* is different from the one found in *John even gave his daughter a new BICYCLE*. This suggests that focal stress must be reflected at logical form, the level of representation that feeds semantic interpretation. Using F subscripts to mark focus, and assuming that *even* is a sentence operator, sentence (3), for example, will then have a logical form like (4).[5]

(3)   Hans even knows ITALIAN.

(4) $even_C$ [Hans knows $Italian_F$]

This logical form, following Rooth (1985, 1992), posits a silent restrictor variable C, intended to range over sets of propositions. More specifically, C is meant to denote a subset of the *focus value* of the clause forming the scope of *even*. In the framework of Rooth, the focus value of a clause is the set containing the proposition expressed by this clause as well as all the propositions obtained by replacing F-marked material with alternatives of the same type. Thus the focus value of the bracketed clause in (4) contains the proposition that Hans knows Italian as well as, for any individual x other than the Italian language, the proposition that Hans knows x. Which of the propositions in this set enter the semantic value of C is assumed to depend on which individuals are relevant alternatives to the Italian language in the context of utterance. In a context where only Spanish and Portuguese are relevant alternatives, for example, C will denote the set of propositions shown in (5).

(5)   {that Hans knows Italian,
         that Hans knows Spanish,
         that Hans knows Portuguese}

What remains to be specified is the meaning of *even*. Karttunen and Peters (1979) suggest that *even* is truth-conditionally vacuous and merely contributes to meaning at the level of presupposition.[6] They take the presupposition

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[5] As noted in Chomsky (1971) and Jackendoff (1972), a word bearing focal stress need not itself be focus marked but may be properly contained in a larger focus marked expression. Unless indicated otherwise, however, in the examples discussed in this study the intended reading is always one where focal stress indicates focus marking of the stressed word.

[6] Karttunen and Peters actually refer to the implication contributed by *even* as a *conventional implicature*. This is a mere terminological difference, however, as Karttunen and Peters consistently apply this term to implications usually labeled *presupposition*.

triggered by *even* to compare alternative propositions in terms of likelihood. Translated into Rooth's framework the proposal reads as in (6) below. According to this meaning rule, *even* triggers the presupposition that the proposition expressed by its scope is the least likely among the propositions in C.[7]

(6) "even$_C$ φ" presupposes that
$[[\varphi]]$ is less likely than any other element of C

In this analysis, then, the logical form (4) presupposes that Hans is less likely to know Italian than Spanish or Portuguese. Note that this makes sense of the intuition that (4) presents Italian as a difficult language. Difficult languages, after all, are less likely to be known than easy languages.[8]

How does this theory apply to examples like (7) below, where *even* is accompanied by sentential negation? To begin, given that in (7) *even* is in the scope of negation at the surface, one would expect the sentence to allow for the logical form in (8), where this scope order is preserved.

(7) Hans doesn't even know ITALIAN.

(8) not [even$_C$ [Hans knows Italian$_F$]]

Since the scope of negation in (8) is identical to the logical form in (4) above, it should carry the same presupposition. Since, moreover, negation is a presupposition hole in the sense of Karttunen (1973), this presupposition is expected to be passed on to (8) as a whole. Sentence (7) is then predicted to suggest that Italian is a difficult language, just like its affirmative counterpart in (3).

As Horn (1969) noted for similar cases, this prediction is incorrect. Sentence (7) does not allow for the interpretation in question and instead is unambiguously judged to carry the reverse implication, suggesting that Italian is easy. It may be concluded from observations of this kind that *even* is a positive polarity item. If so, the logical form (8) may not be available as an input to semantic interpretation, in which case the unattested reading will

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[7] The rule in (6), like those to follow below, is not quite accurate in that it fails to make explicit the role of variable assignments in cases where the scope of the particle is an open sentence. For present purposes, though, this level of formalization is sufficient. Also, to minimize notational complexity, the letter "C" is used both as a variable in the object-language and for the contextually determined value of that variable in the meta-language.

[8] Karttunen and Peters (1979) assume that *even* in addition triggers an existential presupposition. Thus according to their actual proposal, sentence (3) also presupposes that Hans knows some relevant language other than Italian. Such existential implications are discussed in Rooth (1985), von Stechow (1991), Wilkinson (1996), and Rullmann (1997). They are not crucial to the arguments made in this paper.

not be derived. Of course, the question that remains is how sentence (7) comes to have the interpretation that it does have.

Two different answers have been given. Building on Karttunen and Peters (1979), the analysis of Rooth (1985) posits two lexical items *even* with distinct interpretations. It assumes that in addition to the positive polarity *even* described above, the lexicon lists a homophonous negative polarity item *even^{npi}*. Rooth's analysis posits that, like positive polarity *even*, this particle is purely presuppositional but, as spelled out in (9) below, Rooth takes it to trigger the reverse presupposition.

(9)   "even$^{npi}_C$ φ" presupposes that
        [[φ]] is more likely than any other element of C

(10)   not [even$^{npi}_C$ [Hans knows Italian$_F$]]

The intended interpretation for (7) can then be credited to the logical form in (10), which differs from (8) only in that *even^{npi}* substitutes for *even*. This logical form is predicted to presuppose that Hans is more likely to know Italian than Spanish or Portuguese, which accounts for the judgment described above.

Karttunen and Peters (1979) themselves offer a different account of *even* under negation. This account does not posit lexical ambiguity and instead credits the intended reading of (7) to the logical form in (11), where *even* takes inverse scope over the negation preceding it at the surface.

(11)   even$_C$ [not [Hans knows Italian$_F$]]

(12)   {that Hans does not know Italian,
        that Hans does not know Spanish,
        that Hans does not know Portuguese}

Assuming the same old set of relevant languages, the restrictor set in (11) will contain the three negative propositions in (12). Rule (6) then derives the presupposition that Hans is less likely not to know Italian than he is not to know Spanish or not to know Portuguese. While this presupposition may seem different from the one derived from (10), the difference is only apparent. The reason is that a proposition p is more likely than a proposition q if and only if the negation of p is less likely than the negation of q. If Hans is more likely to be present than Maria, for example, then he is also less likely than her to be absent, and vice versa. Given this condition on likelihood, (11) ultimately derives the very same presupposition as (10), namely that Hans is more likely to know Italian than Spanish or Portuguese.

In general, the above condition on likelihood ensures that *[even^{npi}_C φ]* carries the same presupposition as *even_C [not φ]*. Thus while *even* is lexically

ambiguous in Rooth's analysis, the two entries are naturally related. Negative polarity *even* is the inner negation of its affirmative polarity counterpart at the level of presupposition, much like *nothing* is the inner negation of *everything* at the level of truth conditions.

Both analyses of *even* can also be applied successfully to examples like (13) below, where the particle appears in the surface scope of a negative quantifier. The scope analysis of Karttunen and Peters (1979) assigns this sentence the logical form in (14a), where the restrictor variable C will denote the set in (14b).

(13)   None of us even knows ITALIAN.

(14)a. $even_C$ [[none of us] knows $Italian_F$]
    b.   {that none of us knows Italian,
         that none of us knows Spanish,
         that none of us knows Portuguese}

Rule (6) then predicts the sentence to presuppose that it is less likely for none of us to know Italian than for none of us to know Spanish or Portuguese, or equivalently, that it is more likely for some of us to know Italian than for some of us to know Spanish or Portuguese. This prediction is again in accordance with intuitions, and it can be held responsible for the perception that sentence (13) presents Italian as an easy language.

Under suitable assumptions about presupposition projection, the lexical analysis of Rooth (1985) covers example (13) as well. In this analysis, the sentence has the logical form in (15a), where the scope of the particle hosts a free variable e_1 bound from outside of that scope by the negative quantifier. For any given value x assigned to this variable, C will denote the set shown in (15b) and rule (9) will predict the scope of the quantifier to presuppose that x is more likely to know Italian than Spanish or Portuguese.[9]

(15)a. $[\text{none of us}]_1$ $[even^{npi}_C [e_1 \text{ knows } Italian_F]]$
    b.   {that x knows Italian,
         that x knows Spanish,
         that x knows Portuguese}

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[9] The logical form shown here is not quite accurate in that it fails to reflect the fact that the value of the restrictor C can vary with different choices of x. As Heim (1991) and von Fintel (1994) make clear, this dependency should strictly speaking be made transparent by replacing the variable C with the complex restrictor C(1). Sacrificing formal accuracy for notational simplicity, however, simple restrictor variables are used in the text throughout.

The remaining question is how this intermediate result leads one to the presupposition of the sentence as a whole. The theory of presupposition projection developed in Heim (1983), call it the *standard theory*, has the effect needed here.[10] This theory predicts that, if a variable in the scope of a presupposition trigger is bound from a position outside that scope, the variable ends up being interpreted as universally quantified. The standard theory sets the domain of this universal quantification to the set of all values for the variable which are to be considered in calculating the truth conditions of the sentence.

To the particular case at hand the standard theory applies as follows. In calculating the truth conditions of the logical form (15a), every one of us must be considered as a possible value of the variable e_1. Under the standard theory, therefore, rule (9) assigns to sentence (13) as a whole the presupposition that every one of us is more likely to know Italian than Spanish or Portuguese. This presupposition also seems in accordance with intuitions, and it again provides a possible explanation for why (13) suggests that Italian is easy.[11]

2.2. *Two Theories of* Einmal *and* Auch Nur

The German examples in (1) and (2) above, repeated below in (16) and (17), are very close translations of the English examples examined in the previous subsection. In particular, sentence (16) suggests that Italian is a hard language to learn while the examples in (17) suggest that Italian is easy.

(16)   Hans kann   sogar ITALIENISCH.
         Hans knows even   Italian
         'Hans even knows ITALIAN.'

(17)a.   Hans kann   nicht einmal ITALIENISCH.
         Hans knows not   eveN   Italian
         'Hans doesn't even know ITALIAN.'

    b.   Keiner von uns kann   auch nur ITALIENISCH.
         none   of   us knows eveN   Italian
         'None of us even knows ITALIAN.'

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[10] The predictions made by the standard theory of presupposition projection are not generally accepted (see e.g. Beaver 1994; Kadmon 2001). For the sake of the argument, however, they will be considered correct in the following.

[11] Note that the presupposition assigned to (15a) is somewhat stronger than that assigned to (14a). This difference in prediction might be expected to decide between the two analyses. However, intuitions on the interpretation of cases like (13) do not in fact seem clear enough to decisively favor one analysis over the other.

In a transparent way, the two theories of *even* reviewed above can be translated into two conceivable analyses of German scalar additive particles. The two analyses share the assumption that all of the three German particles under discussion are truth-conditionally vacuous and they agree fully on the treatment of the particle *sogar*, analyzing it just like Karttunen and Peters (1979) and Rooth (1985) analyze positive polarity *even*. Thus both posit the lexical entry in (24) and both assign sentence (16) the logical form in (19).

(18)   "sogar$_C$ φ" presupposes that
        $[[\varphi]]$ is less likely than any other element of C

(19)   sogar$_C$ [Hans kann Italienisch$_F$]

But the two analyses differ as to the treatment of the negative polarity items *einmal* and *auch nur*. In the adaptation of Rooth's lexical account, recommended for *auch nur* in von Stechow (1991, p. 805), *einmal* and *auch nur* are identified with negative polarity *even^{npi}*. Thus the two particles are given the lexical entry in (20). Also, they are assumed to always appear in the logical scope of their negative polarity licenser. So the examples in (17) are assigned the logical forms in (21).

(20)   "einmal/auch-nur$_C$ φ" presupposes that
        $[[\varphi]]$ is more likely than any other element of C

(21)a.   nicht [einmal$_C$ [Hans kann Italienisch$_F$]]
    b.   [keiner von uns]$_1$ [auch-nur$_C$ [e$_1$ kann Italienisch$_F$]]

By contrast, in the adaptation of Karttunen and Peters' scope account, suggested for *auch nur* in Wilkinson (1996, fn. 6), *einmal* and *auch nur* trigger the very same presupposition as *sogar*, hence are assigned the lexical entry in (22). In addition, *einmal* and *auch nur* are assumed to always outscope their negative polarity licensers at logical form. So the examples in (17) are taken to have the logical forms shown in (23).

(22)   "einmal/auch-nur$_C$ φ" presupposes that
        $[[\varphi]]$ is less likely than any other element of C

(23)a.   einmal$_C$ [nicht [Hans kann Italienisch$_F$]]
    b.   auch-nur$_C$ [[keiner von uns] kann Italienisch$_F$]

To be sure, the logical forms in (23) are somewhat less plausible than those in (21). First, the well-known fact that operators in German often cannot take logical scope over preceding material raises the question

whether *einmal* and *auch nur* can indeed take inverse scope as assumed in (23).[12] Second, the logical forms in (23) are blatantly inconsistent with the standard view on negative polarity licensing, which holds that a negative polarity item is always interpreted in the scope of its licenser.[13]

However, given that neither the principles of scope assignment nor the workings of negative polarity licensing are fully understood at present, logical forms like those in (23) cannot be excluded with certainty on the basis of these considerations. Therefore, the strategy adopted in this study, in contrast to Jacobs (1983), von Stechow (1991), and Rullmann (1997), among others, is not to rely on assumptions about the syntax-semantics interface or the theory of negative polarity licensing in assessing theories of scalar additive particles. Instead, theories will be evaluated with regard to their predictions on meaning alone.

The purpose of the next two sections is to demonstrate that in fact neither of the two accounts stated above captures the meaning contribution of *einmal* and *auch nur*. Section 3 shows that *einmal* and *auch nur* differ from *sogar* in that they consistently contribute information about the truth values of relevant alternative propositions, as opposed to their mere likelihood. Section 4 then shows that these implications have the compositional behavior of truth-conditional entailments, rather than that of presuppositions. *Einmal* and *auch nur* are proposed to derive these implications by quantifying existentially within the scope of their licensers. Thus the final conclusion is consistent after all with the standard view of negative polarity licensing and the assumption that logical scope in German is assigned from left to right.

3. CHARACTERISTIC IMPLICATIONS

This section shows that *einmal* and *auch nur* make a contribution to meaning that is not accounted for by either of the rules presented in the previous

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[12] The logical forms in (23) are in fact excluded by the principles of scope assignment in German formulated in Jacobs (1983, p. 189f).

[13] The logical forms in (23) recall Quine's (1960, p. 138) proposal that negative polarity *any* in English takes logical scope outside its licensing context. They are problematic in particular because they suggest that it should be possible for *einmal* and *auch nur* to outscope their licensers at surface structure already. As the contrast between (i) and (ii) below illustrates, this is not in fact possible.

(i)   Hans hat nie   auch nur ITALIENISCH studiert.
       Hans has never eveN   Italian   studied
       'Hans never even studied ITALIAN.'

(ii)   *Hans hat auch nur ITALIENISCH nie   studiert.
        Hans has eveN   Italian   never studied

section. It then proceeds to show that *sogar* does not make the same kind of meaning contribution.

3.1. *Likelihood versus Truth*

An observation suppressed in the above discussion is that sentences with *einmal* and *auch nur* consistently carry implications as to the truth values of relevant alternative propositions. These implications are most clearly perceived in examples where, without much help from the utterance context, it is obvious what the alternative propositions are. The examples in (24) and (25) below are of this kind, as the obvious alternatives to the first volume of a series are the later volumes, and the obvious alternatives to the bronze medal are the silver and the gold.

(24)a. Hans hat nicht einmal den ERSTEN Band gelesen.
   Hans has not eveN the first volume read
   'Hans hasn't even read the FIRST volume.'

   b. Keiner von uns hat auch nur den ERSTEN Band gelesen.
   none of us has eveN the first volume read
   'None of us has even read the FIRST volume.'

(25)a. Hans hat nicht einmal die BRONZEMEDAILLE
   Hans has not eveN the bronze-medal
   gewonnen.
   won
   'Hans didn't even win the BRONZE MEDAL.'

   b. Keiner von uns hat auch nur die BRONZEMEDAILLE
   none of us has eveN the bronze-medal
   gewonnen.
   won
   'None of us even won the BRONZE MEDAL.'

If these obvious alternatives are assumed, sentence (24a) conveys that Hans did not read the second or third volume and (24b) conveys that none of us did; similarly, (25a) implies that Hans did not win the silver or gold medal, and (25b) implies that none of us did.

   These implications, call them *characteristic implications*, cannot be classified as mere conversational implicatures in the sense of Grice (1989). They are contributed by the particles *einmal* and *auch nur*, as is evident from the fact that the implication disappears in each case if the scalar additive particle is omitted. Moreover, characteristic implications cannot be suspended in the way conversational implicatures can; that is, none of the sentences in (24) and (25) can consistently be followed by a statement denying its

characteristic implication. So the implications must be contributed by the conventional meaning of *einmal* and *auch nur*.

This does not mean, however, that characteristic implications of sentences hosting these particles are always easy to detect. Naturally, they are less evident in cases where the identity of relevant alternative propositions is more heavily dependent on the utterance context than it is in (24) and (25). Out of context, for example, it is certainly unclear which languages count as alternatives to Italian. As a consequence, no definite characteristic implication is associated with the sentences in (17), repeated in (26) below, if the alternatives are not specified in the context of utterance.

> (26)a. Hans kann nicht einmal ITALIENISCH.
>   *Hans knows* not *eveN   Italian*
>   'Hans doesn't even know ITALIAN.'
>   b. Keiner von uns kann auch nur ITALIENISCH.
>   *none of us knows eveN   Italian*
>   'None of us even knows ITALIAN.'

In an utterance context that does specify the alternatives, however, characteristic implications are clearly perceived. For example, in reply to the question whether Hans knows Spanish or Portuguese, (26a) implies that he does not know either of the two languages, and (26b) implies that none of us does.

While *einmal* and *auch nur* consistently contribute characteristic implications, then, context dependency makes these implications harder to identify in some cases than in others. For ease of exposition, the remainder of this paper will focus on examples like (24) and (25), where characteristic implications are most easily detected. All of the arguments made, however, are also intended to apply to more context dependent examples such as those in (26).[14]

Note now that the examples in (24) and (25) differ from those in (26) not only in that context is less essential in determining the set of alternatives, but also in that these alternatives are naturally thought of as ordered in a particular way. Thus the first volume of a series can be thought of as ranked below the second and the third and the bronze medal can be thought of as being ranked below the silver and the gold. The corresponding alternative propositions can be taken to be ranked accordingly.

As the term suggests, scalar additive particles have often been assumed to be sensitive to such rankings of alternatives (for example in Fauconnier

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[14] The fact that the information content of sentences with *einmal* and *auch nur* often depends heavily on the utterance context may explain in part why characteristic implications contributed by *einmal* and *auch nur* have been overlooked in at least some of the relevant literature (e.g. König 1981, 1991; Jacobs 1983; von Stechow 1991).

1975; Altmann 1976; Jacobs 1983). The examples in (27) and (28) below suggest that reference to scales is indeed needed in the analysis of *einmal* and *auch nur*.

(27)a. Hans hat nicht einmal den DRITTEN Band gelesen.
   Hans has not eveN the third volume read
   'Hans hasn't even read the THIRD volume.'

  b. Keiner von uns hat auch nur den DRITTEN Band gelesen.
   none of us has eveN the third volume read
   'None of us has even read the THIRD volume.'

(28)a. Hans hat nicht einmal die SILBERMEDAILLE
   Hans has not eveN the silver-medal
   gewonnen.
   won
   'Hans didn't even win the SILVER MEDAL.'

  b. Keiner von uns hat auch nur die SILBERMEDAILLE
   none of us has eveN the silver-medal
   gewonnen.
   won
   'None of us even won the SILVER MEDAL.'

These examples differ from those in (24) and (25) merely in that the denotations of the focused expressions do not occupy the bottoms of their scales. The relevant observation is that in none of these cases is there an implication as to the truth value of an alternative ranked below the host proposition (that is, the proposition expressed by the host sentence minus the particle). Sentence (27a), for example, is consistent with Hans having read the first and second volume; (27b) is consistent with one of us having done so; (28a) is consistent with Hans having won the bronze medal; and (28b) is consistent with one of us having done so. These observations suggest that the characteristic implications contributed by *einmal* and *auch nur* quantify over those, and only those, alternatives under discussion that are ranked higher on the relevant scale than the host proposition itself.

 Note now that neither of the rules in (20) and (22) accounts for any of the characteristic implications described here. This is because likelihood and truth do not relate in the way that would be needed here. As Rullmann (1997) notes in related discussion, unlikely things have been known to happen. Thus a proposition may be false in spite of being considered more

likely than a given true alternative, and a proposition may be true in spite of being considered less likely than a given false alternative.

However, even though (20) and (22) are inadequate or insufficient as they stand, conservative modifications of these rules are sufficient to derive all the observations reported in this section. To accommodate the role of scales, the modifications considered below assume that *einmal* and *auch nur* carry a restrictor variable " > " ranging over scales of propositions. In the spirit of Krifka (1999), it is then natural to construe focus values as scales as well. The nature of these scales will be taken to depend in part on context and non-linguistic knowledge. However the denotation of a focused expression and its alternatives are ranked on their scale, the proposition expressed by the host of this expression and its alternatives will be ranked accordingly. Such a ranking of propositions can then serve as the value of the restrictor variable >.

Naturally, just as the identity of alternatives can be more or less dependent on the utterance context, so too can the intended ranking of these alternatives. The nature of the applicable scales is not always as obvious as it is in cases in (24) through (28). For example, while languages can certainly be thought of as ranked according to various criteria, such as their difficulty, their order in a curriculum, or the number of their speakers, out of context no such ranking seems as salient as the obvious rankings of volumes or medals. Yet the present account assumes that the sentences in (26) too are interpreted with respect to some particular ranking. In the present view, then, if the utterance context itself does not explicitly raise a ranking to salience, an appropriate scale will need to be accommodated in order for the sentence to be interpreted.[15]

Consider now the possible entry for *einmal* and *auch nur* in (29) below. This rule is modeled after (20) above and accordingly presupposes that

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[15] Actually, the assumption that restrictor variables range over scales is an expository convenience rather than an essential ingredient in the arguments to be made below. All of these arguments are also consistent with an alternative view suggested by a reviewer. The reviewer notes that, while there is no doubt that alternatives are often thought of as ranked in scales, these scales may enter the semantics of *einmal* and *auch nur* in a more roundabout way than assumed in the text. For all we have seen, it is conceivable that the restrictor variables carried by *einmal* and *auch nur* range over unordered sets after all and that scales merely help determine the values of these variables. Specifically, alternatives ranked below the focus may generally be taken as not being under discussion, and therefore as not being included in the value of the restrictor variable. The reviewer reports an observation suggesting that this alternative view is in fact superior to the view that restrictor variables range over scales: the examples in (27) and (28) are infelicitous in precisely those contexts where the low-ranked alternatives are clearly under discussion. For example, the reviewer notes that, in contrast to (24a), (27a) does not seem an appropriate answer to the question which of the first four volumes Hans has read, a question which explicitly marks the first two volumes as being under discussion.

einmal and *auch nur* take scope above negation and other negative polarity licensers.[16]

(29) "einmal/auch-nur $_>$ φ" presupposes that
for all p such that p $>$ [[φ]]: p is true

For example, the proper logical form for (24a) above will be as shown in (30a). There, assuming that a series of three volumes is under discussion, the variable $>$ will denote the scale of propositions in (30b). Rule (29) will then straightforwardly derive the desired implication, that is, the presupposition that Hans did not read the second or third volume.

(30) a. einmal $_>$ [nicht [Hans hat den ersten$_F$ Band gelesen]]
    b. that Hans did not read the third volume $>$
      that Hans did not read the second volume $>$
      that Hans did not read the first volume

In much the same way, rule (29) derives a characteristic implication for sentence (24b). The appropriate logical form is that shown in (31a), where $>$ will denote the scale of propositions in (31b). The rule again has the intended effect, deriving the implication that none of us read the second or third volume.

(31) a. auch-nur $_>$ [[keiner von uns] hat den ersten$_F$ Band gelesen]]
    b. that none of us read the third volume $>$
      that none of us read the second volume $>$
      that none of us read the first volume

The natural alternative to (29) is the entry in (32) below. This rule is modeled after (22) above and accordingly assumes that *einmal* and *auch nur* scope below their negative polarity licensers.

(32) "einmal/auch-nur $_>$ φ" presupposes that
for all p such that p $>$ [[φ]]: p is false

Example (24a) will thus be assigned the logical form in (33a). There the restrictor variable $>$ will denote the scale indicated in (33b) and the scope of negation will presuppose that Hans did not read the second or third volume. Negation being a hole for presuppositions, rule (32) also assigns this

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[16] This analysis is close to a proposal on English *even* by Van Rooy (2003, p. 257), who suggests that *Even JOHN likes Mary* presupposes that there is a set of relevant alternatives to John, all members of which like Mary (and also that John is less likely to like Mary than any of these alternatives is).

presupposition to the sentence as a whole, hence has the same effect as its wide scope counterpart in (29).

(33)a.   nicht [einmal$_>$ [Hans hat den ersten$_F$ Band gelesen]]
    b.   that Hans read the third volume >
        that Hans read the second volume >
        that Hans read the first volume

Under the standard theory of presupposition projection, rule (32) also applies in the intended way to example (24b). For any given value x assigned to this variable, > will denote the scale shown in (34b), and so (32) predicts the scope of the negative quantifier to presuppose that x did not read the second or third volume.

(34)a.   [keiner von uns]$_1$ [auch-nur$_>$ [e$_1$ hat den ersten$_F$
        Band gelesen]]
    b.   that x read the third volume >
        that x read the second volume >
        that x read the first volume

Under the standard theory of presupposition projection, therefore, rule (32) assigns to sentence (24b) as a whole the presupposition that every one of us did not read the second or third volume. Once again (32) has the same effect as its wide scope counterpart (29).

In summary, the meaning rules in (20) and (22) in the previous section are inadequate or insufficient, in that they fail to account for the observation that *einmal* and *auch nur* contribute characteristic implications concerning the truth values of alternative propositions, as opposed to their mere likelihood. For the examples considered so far, the conservative modifications of these rules formulated in (29) and (32) derive these implications in a straightforward way.

Note now that an analogous modification of the rule for *sogar* in (18) above reads as in (35) below, where *sogar* is assigned the same meaning that the wide scope rule in (29) assigns to *einmal* and *auch nur*. This is the rule that must be assumed if the semantic relation between *sogar* on the one hand and *einmal* and *auch nur* on the other is to be modeled after either of the analyses of *even* in Karttunen and Peters (1979) and Rooth (1985).

(35)   "sogar$_>$ φ" presupposes that
      for all p such that p > [[φ]]: p is true

The purpose of the next subsection, however, is to show that the rule in (35) is descriptively inadequate. The particle *sogar* does not in fact

consistently contribute information about the truth values of alternative propositions.[17]

3.2. *An Unexpected Contrast*

That the rule in (35) is inadequate is demonstrated by examples with *sogar* where the host proposition is inconsistent with its alternatives. Sentence (36) below, the affirmative counterpart of (25a) above, is a case of this kind.[18]

(36)   Hans hat sogar die SILBERMEDAILLE gewonnen.
        Hans has *even   the silver-medal   won*
        'Hans even won the SILVER MEDAL.'

This sentence is to be read as a report on Hans' performance in a particular competition. The host proposition is then clearly inconsistent with the alternative propositions that Hans won the bronze medal and that he won the gold medal. After all, common knowledge implies that any participant is awarded at most one of the three medals in any given competition. If *sogar* had the meaning assigned to it in (35), therefore, the sentence should be judged inconsistent. In fact, however, (36) is judged felicitous and no inconsistency is perceived.

Actually, for this intuition on (36) to argue against (35) it must be assumed that focus marking is on the stressed word itself, rather than on a larger constituent that properly contains it. For if the stress were to mark focus on the verb phrase or the entire sentence, then the propositional alternatives would not have to be those assumed above and they could well be consistent with the host proposition. For example, if the stress in (36) marked verb phrase focus, then the only relevant higher ranked alternative proposition might be the proposition that, say, Hans liked the weather in Greece. Since this proposition is certainly consistent with the proposition that Hans won the silver medal, the felicity of (36) might after all be compatible with the rule in (35).

It is not in fact clear that sentence (36) is read with narrow focus on the stressed word when encountered out of context. However, the sentence is judged to be felicitous even in contexts suggesting that focus marking is

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[17] In a conceivable alternative to (35), the condition "p < [[φ]]" substitutes for "p > [[φ]]". The arguments presented below apply to this alternative in the same way as they apply to rule (35) itself. That is, none of the arguments made below depends on assumptions as to the direction of the contextually provided scale.

[18] Sentence (36) is inspired by an English example discussed in Rullmann (1997). Hirschberg (1985), Horn (1989, 2000, p. 151), and Krifka (1999) discuss the significance of scales with inconsistent alternatives in other empirical domains.

indeed confined to the stressed word. Example (37) below, modeled after an analogous English discourse in Rullmann (1997), is a case in point. Verb phrase or sentence focus is excluded in (37B) under the natural assumption that there, focus marking is confined to material that contrasts with material in the assertion (37A). The fact that (37B) is nevertheless felicitous therefore confirms the conclusion that (35) is inadequate.

> (37) A: Hans hat die Bronzemedaille gewonnen.
>   *Hans has the bronze-medal   won*
>   'Hans won the bronze medal.'
>   B: Falsch, er hat sogar die SILBERMEDAILLE gewonnen.
>   *Wrong, he has even the silver-medal   won*
>   'Wrong, he even won the SILVER MEDAL.'

The same conclusion can be based on examples where the position of the stressed word prevents focus marking from spreading to a larger constituent. Example (38) below is a case of this kind. The fact that this sentence is not usually felicitous as an answer to the question what Hans does for a living indicates that there focus is confined to the stressed word and cannot spread to the verb phrase.[19] Therefore, the obvious alternatives to the host propositions are the proposition that Hans is an assistant professor in linguistics and the proposition that he is a full professor in linguistics.

> (38)   Hans ist ein ASSOCIATE PROFESSOR in Linguistik.
>   *Hans is an associate   professor   in linguistics*
>   'Hans is an ASSOCIATE PROFESSOR in linguistics.'

Evidently, convention dictates that being an assistant professor or a full professor is inconsistent with being an associate professor at the same time. Rule (35) therefore predicts sentence (39) below to be contradictory. This prediction is again incorrect, as the sentence is actually felicitous.

> (39)   Hans ist sogar ein ASSOCIATE PROFESSOR in Linguistik.
>   *Hans is even an associate   professor   in linguistics*
>   'Hans is even an ASSOCIATE PROFESSOR in linguistics.'

In summary, then, *einmal* and *auch nur* differ from *sogar* not merely in distribution but also in meaning. The German data are thus not in harmony with the analysis of *even* in Karttunen and Peters (1979), which makes do

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[19] Sentence (39) can be turned into a felicitous answer to the question what Hans does for a living by moving focal stress from *Associate Professor* to *Linguistik*. See, for example, Höhle (1982) on the relation between stress assignment and focus marking in German.

with just one lexical entry for the particle. But they are also not expected under the analysis of *even* in Rooth (1985), as the meaning of *einmal* and *auch nur* are not as naturally related to that of *sogar* as negative and positive polarity *even* are in Rooth's account. *Einmal* and *auch nur* are not just the inner negation of *sogar*, as the former particles, but not the latter, consistently contribute characteristic implications.[20]

To further strengthen this conclusion, the following presents a set of data that argues for it in a slightly different way. Consider first the examples in (40) below, where focal stress falls on a numeral denoting an academic grade (in the scale of grades common in Germany, ranging from failing Six to excellent One).

(40)a. Hans hat nicht einmal eine DREI gekriegt.
      Hans has not eveN a Three got
      'Hans didn't even get a THREE.'

   b. Keiner von uns hat auch nur eine DREI gekriegt.
      none of us has eveN a Three got
      'None of us even got a THREE.'

These examples show an ambiguity of a sort not encountered so far in that either of the extreme grades One and Six can be thought of as either the bottom or the top of the scale. That is, (40a) can be read as implying either that Hans did not get a grade better than Three or that he did not get a grade worse than Three. Likewise, (40b) can imply that none of us got a grade better than Three or that none of us got a grade worse than Three. For example, as an answer to the question whether Hans again scored a Two in the exam, (40a) implies that Hans did not get a grade better than Three, while as an answer to the question whether Hans again scored a Four, (40a) implies that Hans did not get a grade worse than Three. Sentence (40b) can be contextually disambiguated in much the same way. For

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[20] An observation reported in Jacobs (1983, p. 204) also suggests that *sogar* and *auch nur* do not relate exactly in the way that the analyses of *even* in Karttunen and Peters (1979) and Rooth (1985) would lead one to expect. Jacobs reports that (ii) below conveys more clearly than (i) does that the speaker doubts that Peter will lend any money to the addressee. Jacobs suggests that this additional implication of (ii) can be derived from the theory of negative polarity licensing (but he does not actually point to a general theory that would have this effect).

(i)   Sogar wenn Peter dir FÜNF MARK leiht, hast du Glück gehabt.
        even if Peter to-you five Marks lends have you luck had
        'Even if Peter lends you FIVE MARKS, you are lucky.'

(ii)   Wenn Peter dir auch nur FÜNF MARK leiht, hast du Glück gehabt.
        if Peter to-you eveN five Marks lends have you luck had
        'If Peter even lends you FIVE MARKS, you are lucky.'

example, as an answer to the question whether many of us got a Two again, (40b) implies that none of us got a grade better than Three, but as an answer to the question whether many of us got a Four again, it implies that none of us got a grade worse than Three.[21]

What makes the examples in (40) interesting in the present context is not this ambiguity, however, but the fact that under any reading, the medial grade Three cannot felicitously be replaced with one of the extremes Six or One. The sentences in (41) below are hard to make sense of. By contrast, the affirmative sentence with *sogar* in (42) is easily interpretable.

(41)a.# Hans hat nicht einmal eine SECHS/EINS gekriegt.
  Hans has not eveN a Six/One got
  'Hans didn't even get a SIX/ONE.'
  b.# Keiner von uns hat auch nur eine SECHS/EINS
  none of us has eveN a Six/One
  gekriegt.
  got
  'None of us even got a SIX/ONE.'
(42) Hans hat sogar eine EINS/SECHS gekriegt.
  Hans has even a One/Six got
  'Hans even got a ONE/SIX.'

The judgments on (41) can be given a natural explanation. To begin, it is not expected that the focused grade in any of the cases in (41) can be construed as the top of its scale. For it is natural to assume that *einmal* and *auch nur* require that there be some relevant proposition in the scale ranked above the host proposition. After all, if the host proposition were considered the top of its scale, *einmal* and *auch nur* would be predicted to be redundant, that is, they would be predicted not to make any contribution to the meaning of their host sentences.

Moreover, assuming that *einmal* and *auch nur* contribute the characteristic implications derived by the rules in (29) and (32), the focused grade in (41) is also not expected to be interpretable as the bottom of its scale. Take the two versions of sentence (41a). To begin, a sentence reporting on someone's grade presupposes that that person did, in fact, participate in an examination for which a grade was to be assigned. In particular, the two versions of (41a) are expected to presuppose that Hans got a grade. At the

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[21] Manipulating the direction of the relevant scale is not always as easy as in the case of academic grades. In most cases, in fact, it is hard or impossible to detect an ambiguity of the sort found in (40). The question why scales should differ in this way is left as a topic for future study.

same time, they are also expected to carry the characteristic implication that, apart from not getting a Six (or One), Hans also did not get any grade better than Six (or worse than One). In short, they are predicted to imply that Hans did not get any grade at all, hence are predicted to deny what they presuppose. The oddness of (41a) is plausibly credited to this inconsistency. The explanation of the oddness of the two versions of (41b) is analogous.

On the other hand, given that scoring a One or Six on the test entails not scoring any of the other grades at the same time, the two versions of (42) are analogous to the example in (36) above. Since they are judged to be consistent, they illustrate again that *sogar* need not contribute an implication as to the truth of alternative propositions.

In summary, this section has argued that negative polarity *einmal* and *auch nur* differ from affirmative *sogar* in ways not described in previous literature. The former consistently introduce a characteristic implication not found with the latter. The next section examines this implication in greater detail.[22]

4. DERIVING CHARACTERISTIC IMPLICATIONS

In (29) and (32), the preceding section has presented two conceivable accounts of characteristic implications contributed by *einmal* and *auch nur*. So far, however, these proposals have only been applied to a very limited set of data. The question is, therefore, whether either of the two accounts has the intended effect in a wider range of cases. Two more specific questions suggest themselves. Since both analyses construe characteristic implications as presuppositions, one should ask whether characteristic implications in general show the characteristic compositional behavior of presuppositions. A related question is whether either of the two analyses extends to cases where the negative polarity licenser is something other than sentential negation or a negative quantifier. This section addresses these questions in turn. The final conclusion drawn is that characteristic implications are not in fact presuppositions, but truth-conditional entailments.

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[22] A reviewer notes that, even though the observations reported in this subsection are correct, in many cases *sogar* does after all seem to contribute the implication that the relevant alternative propositions are true. For example, the reviewer suggests that sentence (i) below implies that Hans read the first two volumes. In the present view, this implication cannot be due to the conventional meaning of *sogar* alone. How exactly the implication arises is an open question, though. See Rullmann (1997, section 7) and Guerzoni (2003, section 2.7) for related discussion.

    (i)   Hans hat sogar den DRITTEN Band gelesen.
             Hans has even the third volume read
             'Hans even read the THIRD volume.'

4.1. *Embedding and Conditional Presuppositions*

Presuppositions and truth-conditional entailments show systematic differences in compositional behavior. One characteristic difference emerges when a sentence is embedded under a higher operator which is neither factive in the sense of Kiparsky and Kiparsky (1971) nor implicative in the sense of Karttunen (1971). If this operator is a presupposition hole in the sense of Karttunen (1973), then the presuppositions of the embedded sentence, but not its truth-conditional entailments, will be implications of the larger sentence as well.

That negation is a presupposition hole was already assumed in the above discussion. Modal operators are another case in point. The sentence *It is possible that John is upset again*, for example, implies that it is possible for John to be upset now and that he was actually upset at some earlier time. In the standard view, this is because *John is upset again* truth-conditionally entails that John is upset now and presupposes that he was upset earlier.

In this light, compare the sentences in (24) above, repeated below in (43), to the examples in (44), where the verb final counterparts of these sentences are embedded under *möglich* 'possible'.

(43)a. Hans hat nicht einmal den ERSTEN Band   gelesen.
         Hans has not   eveN the first   volume read
         'Hans hasn't even read the FIRST volume.'

   b. Keiner von uns hat auch nur den ERSTEN Band
       none   of us has eveN   the first   volume
       gelesen.
       read
       'None of us has read even the FIRST volume.'

(44)a. Es ist möglich, dass Hans nicht einmal den ERSTEN
         it is possible that Hans not   eveN   the first
         Band   gelesen hat.
         volume read   has
         'It is possible that Hans hasn't even read the FIRST volume.'

   b. Es ist möglich, dass keiner von uns auch nur den
       it is possible that none of us eveN   the
       ERSTEN Band   gelesen hat.
       first   volume read   has
       'It is possible that none of us has even read the FIRST volume.'

Recall from the last section that both of the rules in (29) and (32) assign to (43a) the presupposition that Hans did not read the second or third volume. *Möglich* being a presupposition hole, the embedding example in (44a) is

predicted to carry the very same presupposition. Similarly, we saw that both (29) and (32) predict (43b) to presuppose that none of us read the second or third volume. Again, *möglich* being a presupposition hole, the same presupposition is assigned to the embedding example in (44b).[23]

These predictions, however, do not accord with intuitions. Sentence (44a) implies that it is possible for Hans not to have read the second or third volume, but fails to imply that he actually did not. Similarly, sentence (44b) implies that it is possible for none of us to have read the second or third volume, but is also consistent with some of us actually having done so.

In these cases, then, characteristic implications seem to behave more like truth-conditional entailments than presuppositions. Like truth-conditional entailments, they seem to enter the content of the proposition operated on by the higher modal operator. Accordingly, it would seem natural to conclude that they indeed are truth-conditional entailments and hence that *einmal* and *auch nur* are not purely presuppositional.

However, the judgments reported above are also open to a more conservative, and perhaps more interesting, interpretation. Holding on to the position that the particles are purely presuppositional, it might be suggested that it is sufficient to adjust the content of the presupposition triggered. To begin, the rule in (29) above might be modified as shown in (45).

(45)   "einmal/auch-nur$_>$ φ" presupposes that
        for all p such that p $>$ [[φ]]: if [[φ]] is true, then p is true

This rule, which is similar to the analysis of *even* in Kay (1990), differs from its predecessor (29) only in that the truth of higher ranked alternatives is made conditional upon the truth of the proposition expressed by the scope of the particle.[24] Just like (29), it assumes that *einmal* and *auch nur* take logical scope over their negative polarity licenser.

Rule (45) thus assumes that the sentences in (43) have the logical forms in (46) below, which repeat (30a) and (31a) above. Accordingly, it assigns to (43a) the presupposition that if Hans did not read the first volume, then he did not read the later volumes, and it assigns to (43b) the presupposition that if none of us read the first volume, then none of us read the later

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[23] It is taken for granted here that the modal *möglich* in each case is the highest operator at logical form. Note that, in an analysis where *einmal* and *auch nur* outscope their licensers, it is conceivable that they outscope *möglich* as well. For ease of exposition, however, this possibility will be suppressed until subsection 4.3.

[24] As will be apparent from the discussion below, the meta-language conditional in this rule is not intended to be read as a material conditional but is instead to be understood much like a natural language conditional in an analysis like that of Stalnaker (1968) or Lewis (1973).

volumes. Again, each of the embedding cases in (44) is predicted to carry the same presupposition as its counterpart in (43).

(46)a.   einmal$_>$ [nicht [Hans hat den ersten$_F$ Band gelesen]]
    b.   auch-nur$_>$ [[keiner von uns] hat den ersten$_F$ Band gelesen]

These presuppositions seem benign in that they harmonize with a natural default assumption. While it is of course possible for someone to read the second or third volume of a series without first having read the first, it is certainly more typical for volumes to be read in the proper order. For this reason, the presuppositions that (45) assigns to the sentences in (43) and (44) are at least not in obvious conflict with intuitions.

Rule (45) moreover succeeds at deriving the intended characteristic implications. In the simple cases in (43), the antecedent of the predicted conditional presupposition is asserted, and so the truth of the consequent is guaranteed by *modus ponens*. In these cases, then, the perceived characteristic implication follows from the conjunction of the assertion and the presupposition. In the embedding cases in (44), by contrast, the antecedent of the conditional presupposition is not asserted, but merely asserted to be a possibility. Accordingly, it is not predicted that the characteristic implications attested in (43) are also entailed in (44), but merely that they are entailed to be possibilities.

Naturally, the conditional wide scope rule in (45) has a narrow scope counterpart. The rule in (47) is like (32) except that the falsity of higher ranked alternatives is made conditional upon the falsity of the proposition expressed by the scope of the particle.

(47)   "einmal/auch-nur$_>$ φ" presupposes that
        for all p such that p$>$[[φ]]: if [[φ]] is false, then p is false

This rule has much the same effect for the cases at hand as its wide scope counterpart (45). It assumes that the sentences in (43) have the logical forms in (48) below, which repeat (33a) and (34a) above. It is apparent that, negation being a presupposition hole, (47) again assigns (43a) the presupposition that Hans did not read the later volumes if he did not read the first. Also, under the standard theory of presupposition projection, (47) predicts (43b) to presuppose that none of us read the later volumes if he did not read the first. While this presupposition is somewhat stronger than that derived from (45), it seems equally benign. And one more time, of course, the embedding examples in (44) are predicted to carry the same presuppositions as their simple counterparts in (43).

(48)a. nicht [einmal$_>$ [Hans hat den ersten$_F$ Band gelesen]]

    b. [keiner von uns]$_1$ [auch-nur$_>$ [e$_1$ hat den ersten$_F$
        Band gelesen]]

Finally, rule (47) predicts the same distribution of characteristic implications as (45). By *modus ponens*, the conjunction of the assertion and the presupposition entails the intended characteristic implications in (43), whereas in (44) the same conjunction merely entails that these implications are possibilities.

The assumption that *einmal* and *auch nur* trigger conditional presuppositions, then, renders intuitions in the embedding examples in (44) consistent with the assumption that these particles are truth-conditionally vacuous. However, it turns out that the conditional rules do not in fact improve on their non-conditional counterparts in the general case. To see this, consider again (25a) above, repeated here as (49).

(49)   Hans hat nicht einmal die BRONZEMEDAILLE gewonnen.
        Hans has not eveN the bronze-medal   won
        'Hans didn't even win the BRONZE MEDAL.'

The conditional rules in (45) and (47) apply to (49) in much the way they apply to (43a). Thus both rules assign sentence (49) the presupposition that Hans did not win silver or gold if he did not win bronze. In conjunction with the assertion, then, the intended characteristic implication, the implication that Hans did not win silver or gold, follows by *modus ponens*.

So far, (49) does not seem interestingly different from (43a). What makes (49) special, however, is that in this case the assertion is not in fact needed as a premise in deriving the characteristic implication. As noted above, common knowledge implies that at most one medal is awarded to any participant in a given contest. It can be assumed, therefore, that Hans did not win silver or gold if he won bronze. Transparently, the conjunction of this assumption with the predicted presupposition that Hans also did not win silver or gold if he did not win bronze entails that whether or not Hans won the bronze medal, he definitely did not win silver or gold. By what might be called *condition elimination*, therefore, the intended characteristic implication of (49) is again derived.

Condition elimination is the reason why the conditional rules in (45) and (47) do not apply correctly to the example in (50) below, where the verb final version of (49) is embedded under *möglich*.

(50)   Es ist möglich, dass Hans nicht einmal die
        it is possible that Hans not eveN the
        BRONZEMEDAILLE gewonnen hat.
        bronze-medal   won   has
        'It is possible that Hans didn't even win the BRONZE MEDAL.'

Assuming again that *möglich* is a presupposition hole, the conditional rules predict the same characteristic implication for (50) that they predict for (49). Thus they assign (50) the presupposition that Hans did not win silver or gold if he did not win bronze; and assuming again that he also did not win silver or gold if he did win bronze, sentence (50) too is predicted to imply, by conditional elimination, that Hans definitely did not win silver or gold.

This prediction is incorrect. Just like (44a) above, sentence (50) does not in fact have the characteristic implication associated with its embedded clause in isolation. That is, (50) implies that it is possible for Hans not to have won silver or gold, but fails to imply that he actually did not. In generally, the conditional rules fail to improve on the non-conditional ones in all those cases where the property expressed by the core verb phrase is inconsistent with its alternatives.

This observation may be taken to suggest that, after all, *einmal* and *auch nur* are not purely presuppositional. While they have a straightforward account in the assumption that characteristic implications are truth-conditional entailments, it does not seem possible to define a presupposition that has the appropriate effect in all relevant cases.

Yet this conclusion can once again be questioned. This is because presuppositions and truth-conditional entailments are not quite as easy to distinguish as the above discussion made them out to be. Theories of presupposition posit a process of *presupposition accommodation* by which an implication contributed by a presupposition trigger can come to be interpreted just like a truth-conditional entailment. Specifically, by what Heim (1983) calls *local accommodation*, an implication contributed by a presupposition can come to be interpreted in the scope of another operator as though it were a truth-conditional entailment. Accordingly, one conceivable interpretation of the data presented so far postulates that the presuppositions triggered by *einmal* or *auch nur* are routinely accommodated locally within the scope of *möglich*. It is apparent that, if presupposition accommodation indeed worked in this way, then any of the four analyses considered above would be consistent with the data presented so far.[25]

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[25] The assumption that the presuppositions triggered by *einmal* and *auch nur* are subject to local accommodation under modal operators is not altogether implausible. Observations discussed in Horn (1992) and Atlas (1996, p. 311f) could be taken to indicate that the presupposition triggered by English *only* can similarly be locally accommodated in intensional contexts.

The preliminary conclusion must be, therefore, that the evidence from embedding examples remains inconclusive. While the most straightforward account of these data might analyze characteristic implications as truth-conditional entailments, they are also consistent with the assumption that *einmal* and *auch nur* are purely presuppositional. The purpose of the next two subsections is to present more conclusive evidence against a purely presuppositional account.

4.2. *Presupposition Not Triggered Low*

This study has so far confined attention to examples where the polarity sensitive particles *einmal* and *auch nur* are licensed by negation and a negative quantifier, respectively. While there are no other permissible contexts for *einmal*, *auch nur* is more widely distributed and can appear in most or all of the familiar negative polarity contexts. This subsection shows that neither of the narrow scope rules in (32) and (47), repeated below for convenience, is general enough to cover all the cases.

(32) "einmal/auch-nur $_>$ φ" presupposes that
      for all p such that p $>$ [[φ]]: p is false

(47) "einmal/auch-nur $_>$ φ" presupposes that
      for all p such that p $>$ [[φ]]: if [[φ]] is false, then p is false

It is well known that negative polarity items are typically licensed in the antecedent clauses of conditional sentences. Example (51) below illustrates that the particle *auch nur* is not exceptional in this respect.

(51) Wenn Hans   auch nur den ERSTEN Band   gelesen hat,
      if   *Hans*   *even*   *the* *first*   *volume* *read*   *has*
      dann verliere ich   die Wette.
      then *lose*   *I*   *the* *bet*
      'If Hans has even read the FIRST volume, I lose the bet.'

In this environment too the particle strengthens its host sentence in a characteristic way. Specifically, sentence (51) implies that I lose the bet if Hans read the second or third volume. This implication disappears if the particle is omitted, so it is indeed contributed by *auch nur*.

Suppose now that the particle is interpreted within its licensing context, that is, within the antecedent clause hosting it at the surface. The antecedent clause will then be assigned a presupposition by one of the narrow scope rules (32) and (47). This presupposition will be expected to be associated

with the entire conditional sentence as well. This is because conditional antecedents are also holes for presuppositions; they pass on their presuppositions unaltered. For example, just like *John is upset again* in isolation, the conditional *If John is upset again, we will leave* implies that John was upset at some earlier time.

The non-conditional rule (32) will accordingly predict (51) to presuppose that Hans did not read the second or third volume. This prediction certainly does not meet intuitions. Sentence (51) is perfectly consistent with Hans having read the second or third volume. In fact, the sentence does not seem quite felicitous if Hans is already known not to have read the second or third volume.

The conditional rule (47) makes more acceptable predictions about (51). It predicts the sentence to presuppose that Hans did not read the second or third volume if he did not read the first. This conditional presupposition is familiar from the last subsection and was already judged benign there. Being in harmony with a natural default assumption, it is at least not obviously inadequate. It moreover accounts for the characteristic implications described above. Again, the characteristic implication is entailed by the conjunction of the conditional presupposition and the assertion: by contraposition, the conditional presupposition guarantees that if Hans read the second or third volume, then he also read the first. In conjunction with the assertion that if Hans read the first volume I will lose the bet, it then follows that I will lose the bet if Hans read the second or third volume. So rule (47) seems to have the intended effect in this particular case.

However, as the above discussion of embedding cases might lead one to suspect, rule (47) does not improve on (32) in all cases of *auch nur* in conditional antecedents. Specifically, cases that involve inconsistent alternatives once again prove problematic. Sentence (52) below illustrates this.

(52) Wenn Hans auch nur die BRONZEMEDAILLE gewonnen
      if   Hans eveN   the bronze-medal   won
      hat, dann verliere ich die Wette.
      has then lose   I   the bet
      'If Hans even won the BRONZE MEDAL, then I lose the bet.'

The perceived characteristic implication associated with this example is analogous to that found in (51). Thus the sentence implies that I lose the bet if Hans won silver or gold. The sentence is also analogous to (51) in that it is judged consistent with the truth of higher ranked alternatives to the proposition expressed by the antecedent. That is, (52) is consistent with Hans having won silver or gold.

It is apparent that, just as in the case of (51), the non-conditional rule (32) does not account for the latter observations. For (52), moreover, the conditional rule (47) also does not have the intended effect. Once again, an unwelcome implication is derived by condition elimination. While the presupposition assigned to (52) by rule (47) guarantees that Hans did not win silver or gold if he did not win bronze, common knowledge implies that he also did not win silver or gold if he did win bronze. In the end, then, sentence (52) is incorrectly predicted to imply that, no matter what, Hans did not win silver or gold.

Can the narrow scope rules (32) and (47) be dismissed, then? In a transparent way, the discussion of conditional sentences has so far moved in parallel with the discussion of embedding examples in the last subsection. In the latter cases, the possibility of local presupposition accommodation made it impossible to show conclusively that appropriate characteristic implications cannot be derived under a purely presuppositional analysis of *einmal* and *auch nur*. It might be suspected, therefore, that the possible effects of local accommodation play the same role in conditionals, and so will also undermine the present argument against the narrow scope rules (32) and (47).

However, local accommodation does not in fact have the same effect in the problematic conditionals as in the corresponding embedding cases. Note that in the embedding cases, the accommodated presupposition was not assumed to be added to the truth-conditional content of the smallest domain in which the negative polarity item is licensed, but to the content of a larger embedded constituent. That is, the presupposition was taken to accommodate locally in the immediate scope of the higher modal operator, not in the immediate scope of the lower negation. In the conditional examples, by contrast, the only relevant option is to locally accommodate within the antecedent clause, which is the smallest domain in which the negative polarity item is licensed. It can be shown that accommodation at this level does not have the intended effect.

Accommodating the presupposition triggered according to the non-conditional rule (32) in the antecedent clause of (52) would add to the truth-conditional content of this antecedent the proposition that Hans did not win silver or gold. It is apparent that the truth-conditional content of the antecedent would not thereby be strengthened. After all, since winning bronze implies not also winning silver or gold, the truth conditions of the antecedent alone already entail that Hans did not win silver or gold. Similarly, accommodating the presupposition triggered according to the conditional rule (47) in the antecedent clause of (52) would add to the truth-conditional content of the antecedent the proposition that Hans did not win silver or gold if he did not win bronze. Since this is the proposition that

Hans won at most the bronze medal, it is again already implied by the truth-conditional content of the antecedent. Local accommodation thus again fails to strengthen the antecedent.

In the conditional cases, then, local accommodation in the antecedent effectively neutralizes the meaning contributed by the particle. Naturally, this neutralization of meaning has the benefit of avoiding the unwelcome implications that the narrow scope rules would otherwise predict. By the same token, however, it will of course prevent these rules from deriving the intended characteristic implications.

It is therefore appropriate to conclude that the narrow scope rules in (32) and (47) cannot in general account for intuitions on examples where *auch nur* is licensed in a conditional antecedent. The particles *einmal* and *auch nur* thus do not seem to contribute characteristic implications by triggering presuppositions within the negative polarity contexts where they are licensed. The next subsection argues that characteristic implications are not due to presuppositions triggered outside the licensing contexts, either.

4.3. *Presupposition Not Triggered High*

While the observations reported in the previous subsection argue against the narrow scope rules in (32) and (47), they do not by themselves make a conclusive case against a purely presuppositional analysis of *einmal* and *auch nur*. For these observations can be derived under the wide scope rules in (29) and (45), repeated below for convenience.

(29)   "einmal/auch-nur$_>$ φ" presupposes that
        for all p such that p > [[φ]]: p is true

(45)   "einmal/auch-nur$_>$ φ" presupposes that
        for all p such that p > [[φ]]: if [[φ]] is true, then p is true

To illustrate, consider the conceivable logical form for (52) shown in (53a) below. In this logical form the particle takes scope over the entire conditional clause and so the restrictor variable will denote the scale of conditional propositions in (53b). It is apparent, then, that both (29) and (45) will predict (52) to imply that I lose the bet if Hans wins silver or gold; and thus will both derive the characteristic implication that the particle is perceived to contribute.[26]

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[26] It is admittedly doubtful that the logical form in (53a) is syntactically well-formed. For one, the movement assumed is unusual in that the particle does not leave a trace in its surface position. In addition, the logical form posits scope shifting out of a conditional antecedent even though conditional antecedents are generally considered scope islands (see e.g. Reinhart 1997). However, in keeping with the strategy followed so far, logical forms like (53a) will be considered well-formed for the sake of the argument. See Rullmann (1997) and Guerzoni (2003) for more discussion on scope assignment in the analysis of scalar additive particles.

(53)a. auch-nur $_>$ [[wenn Hans die Bronzemedaille$_F$ gewonnen hat]
        [dann verliere ich die Wette]]

   b.   that I lose the bet if Hans wins the gold medal $>$
        that I lose the bet if Hans wins the silver medal $>$
        that I lose the bet if Hans wins the bronze medal

Problems for the wide scope analysis arise from another kind of case, however. In fact, a closer look at the embedding examples already discussed above reveals that (29) and (45) are in danger of generating unattested readings. Consider once more the sentence in (50), repeated here as (54).

(54)   Es ist möglich, dass Hans nicht einmal die
       It is possible that Hans not eveN the
       BRONZEMEDAILLE gewonnen hat.
       bronze-medal   won   has
       'It is possible that Hans didn't even win the BRONZE MEDAL.'

In the above discussion of this example, attention was confined to logical forms where *einmal* scopes within the embedded sentence. Under the view that the particle must be interpreted in the scope of its negative polarity licenser, there is indeed no other possibility. However, if the particle is taken to always outscope its licenser, another option is to be considered. As shown in (55a) below, *einmal* might conceivably escape from the embedded clause at logical form and take scope over the embedding possibility modal.

(55)a. einmal$_>$ [möglich [nicht [Hans die Bronzemedaille$_F$
        gewonnen hat]]]
   b.   that it is possible that Hans did not win the gold medal $>$
        that it is possible that Hans did not win the silver medal $>$
        that it is possible that Hans did not win the bronze medal

The restrictor variable $>$ in this logical form will denote the scale of propositions shown in (55b). The wide scope rules (29) and (45) will accordingly predict sentence (54) to imply that it is possible for Hans not to have won silver and that it is possible for him not to have won gold. With the assertion added to this, the sentence is thus predicted to convey that each medal is such that it is possible that Hans did not win it.

   This prediction is not quite what is needed here. The problem is not that (54) lacks the implication in question. The sentence is indeed judged false if Hans is known to have won bronze, is known to have won silver, or is

known to have won gold. The problem is rather that the predicted meaning is weaker than what is actually attested. While the predicted meaning allows for (54) to be true if Hans is known to have won some medal or other, as long as it is not known which, the sentence is actually judged false in such a scenario. The sentence actually conveys that it is possible for Hans not to have won any medal.

The problem of weak implications is not peculiar to examples with modal operators. Much the same issue arises in (56) below, which features negation and *einmal* in the surface scope of an existential indefinite.[27]

(56)   Einer von uns hat nicht einmal die
      one   of   us has not eveN the
      BRONZEMEDAILLE gewonnen.
      bronze-medal   won
      'One of us didn't even win the BRONZE MEDAL.'

In the conceivable logical form (57a) below, the particle outscopes not only its licensing negation but the indefinite as well. The value of the restrictor variable $>$ is then the scale of propositions in (57b), and the wide scope rules accordingly derive the implication that one of us did not win silver and that one of us did not win gold. With the assertion added, the sentence is thus predicted to convey that each medal is such that one of us did not win it.

(57)a. einmal$_>$ [[einer von uns]$_1$ [nicht [e$_1$ hat die
        Bronzemedaille$_F$ gewonnen]]]
    b. that one of us did not win the gold medal $>$
        that one of us did not win the silver medal $>$
        that one of us did not win the bronze medal

Once again, this meaning is too weak to account for actual intuitions. It allows for the sentence to be true if all of us won some medal or other, even though it is actually judged false in such a scenario. The sentence actually conveys that one of us did not win any medal.

These observations may be taken to indicate that a theory of *einmal* and *auch nur* that assumes one of the wide scope rules in (29) and (45) must be supplemented with a constraint that prevents logical forms like (55) and (57)

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[27] Like (60) and (62) below, sentence (56) is not very natural under the standard assumption that only three participants in the contest receive a medal. It makes more sense in a slightly unusual scenario where medals are used much like grades, so that the same medal can be assigned to multiple participants, just like the same grade can be given to more than one student.

from serving as inputs to semantic interpretation. This constraint will have to impose a suitable condition on the logical scope of *einmal* and *auch nur*. It might require, for example, that at logical form the particle have its negative polarity licensers in its immediate scope. This would prevent a third operator from intervening between the two in the way *möglich* and *einer von uns* do in (55a) and (57a), respectively.[28]

However, it can be shown that a condition on logical scope is not a general solution to the problem that the sentences in (54) and (56) exemplify. Such a condition would not have the desired effect, for example, for the variant of (54) shown in (58) below.

(58)   Es ist nicht sicher, dass Hans auch nur die
        it is not certain that Hans eveN   the
        BRONZEMEDAILLE gewonnen hat.
        bronze-medal   win   has
        'It is not certain that Hans even won the BRONZE MEDAL.'

If one of the wide scope rules is to account for the interpretation of this example, the only available logical form to apply the rule to is that shown in (59) below. This logical form would accordingly have to satisfy whatever condition is assumed to rule out the problematic logical forms in (55) and (57). If the immediate scope constraint mentioned above is adopted, this is not in fact a problem. Given that no third operator intervenes between the particle and negation, (59) could pass as well-formed.

(59)   auch-nur$_>$ [nicht [sicher [Hans die Bronzemedaille$_F$
        gewonnen hat]]]

The problem is, however, that this logical form again does not express the intended meaning. Since the modals *möglich* 'possible' and *sicher* 'certain' are duals, (59) is bound to be equivalent to (55a) above. Therefore, sentence (58) is predicted to allow for the very interpretation that was found to be unavailable for sentence (54), hence should be consistent with the knowledge that Hans won some medal or other. This prediction is incorrect. Sentence (58) is actually perceived to be equivalent to (54) and, in particular, is false if Hans is known to have won a medal. In other words, sentence (58) is perceived to convey that it is not certain that Hans won any medal, but is

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[28] This would be something like the inverse of Linebarger's (1987) *minimal scope constraint,* which requires that a negative polarity item must be in the immediate scope of its licenser at logical form without any third operator intervening between the two.

merely predicted to convey that it is not certain that he won bronze, that it is not certain that he won silver, and that it is not certain that he won gold.

Although not fully acceptable, the example in (60) below challenges the wide scope rules (29) and (45) in much the same way. To the extent that the sentence can be interpreted, it is judged to be equivalent to (56) above. Thus it conveys that one of us did not win any medal.[29]

(60)?? Nicht jeder   von uns hat auch nur die
       not   everyone of us has eveN   the
       BRONZEMEDAILLE gewonnen.
       bronze-medal   won
       'Not every one of us even won the BRONZE MEDAL.'

The only relevant logical form for the wide scope rules to apply to in this case is that shown in (61) below. Since the quantifiers *einer von uns* and *jeder von uns* are duals, this logical form is equivalent to (57a) above. Accordingly, it incorrectly predicts sentence (60) to be consistent with the assumption that every one of us won a medal.

(61)   auch-nur $_>$ [nicht [[jeder von uns]$_1$ [e$_1$ hat die Bronzemedaille$_F$
        gewonnen]]]

A final example that the wide scope rules fail to analyze correctly is given in (62) below. According to (29) and (45), this sentence should merely convey that at most one of us won bronze, that at most one of us won silver, and that at most one of us won gold. This implication is of course consistent with all of us having some medal or other. However, the sentence is actually judged false in this case. It actually conveys that at most one of us won a medal.

(62)   Höchstens einer von uns hat auch nur die
        at-most   one of us has eveN   the
        BRONZEMEDAILLE gewonnen.
        bronze-medal   won
        'At most one of us even won the BRONZE MEDAL.'

In summary, this subsection has demonstrated that the implications contributed by the particles *einmal* and *auch nur* cannot in general be credited to presuppositions triggered outside the scope of their negative polarity licensers. In certain contexts, the wide scope rules in (29) and (45)

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[29] The marginality of sentence (60) is presumably due to the fact that the universal quantifier intervenes between the negative polarity item and its licensers, and hence presumably illustrates a violation of Linebarger's (1987) *immediate scope constraint*.

derive implications which are weaker than the characteristic implications actually attested.[30] In conjunction with the results reached in the previous subsection, this finding indicates that *einmal* and *auch nur* are not purely presuppositional. Whether these particles are assumed to scope low or high, it seems impossible to define a presupposition that has the desired effect in the general case.

4.4. *Characteristic Implications Asserted*

If the characteristic implications contributed by *einmal* and *auch nur* cannot be derived from presuppositions, the only remaining option seems to be that they are asserted, that is, truth-conditionally entailed. In fact, the findings presented narrow down the options even more. The observations reported in the last subsection not only exclude an analysis in which *einmal* and *auch nur* are purely presuppositional and outscope their licenser, but they more generally exclude any analysis in which these particles outscope their licenser. That is, they also exclude a wide scope analysis of *einmal* and *auch nur* in which these particles contribute to truth conditions. In particular, the examples in the last subsection show that in a wide scope account, characteristic implications cannot be derived by a rule like (63) below, according to which *einmal* and *auch nur* are universal quantifiers over alternatives at the level of truth conditions.

(63)   "einmal/auch-nur$_>$ φ" is true iff
        for all p such that p$=[[\varphi]]$ or p$>[[\varphi]]$: p is true

It is apparent that in cases where the particles *einmal* and *auch nur* are assumed to take widest scope, (63) derives exactly the same information content as the presuppositional wide scope rules in (29) and (45). The only difference in such cases is that according to (63), characteristic implications are asserted, rather than based on a presupposition. This is why the truth-conditional wide scope rule (63) fares no better than the presuppositional wide scope rules (29) and (45) with respect to the examples presented in the last subsection. For example, assuming that *auch nur* takes widest scope,

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[30] The contexts in question are contexts which are not *anti-additive* in the sense of Zwarts (1998). Informally, anti-additive contexts guarantee the equivalence of wide scope universal quantification (or conjunction) and narrow scope existential quantification (or disjunction). Ladusaw (1979) argues against an analysis of polarity sensitive *any* as a wide scope universal on the basis of its meaning contribution under the non-anti-additive licenser *rarely*. This argument is analogous to the one made here with regard to *einmal* and *auch nur*. In fact, just like Ladusaw concluded that *any* is an existential generalized quantifier that takes scope under its licenser, it is concluded below that *einmal* and *auch nur* are narrow scope existential quantifiers over alternatives.

(63) predicts sentence (58) to be true just in case it is not certain that Hans won bronze, it is not certain that he won silver, and it is not certain that he won gold. This meaning is again too weak, as the sentence actually conveys that it is not certain that Hans won any medal.

Given that *einmal* and *auch nur* are not purely presuppositional and do not outscope their licensers, the remaining option is that these particles contribute to truth conditions and are interpreted within the scope of their licensers. Indeed, an analysis which fits this description can be shown to solve all the problems encountered in this section. In this analysis, *einmal* and *auch nur* contribute to truth conditions in the way described by rule (64) below. This rule, which is very similar to the analysis of adverbial *at least* in Krifka (1999), differs from (63) merely in that the particle quantifies existentially rather than universally.

(64)   "einmal/auch-nur$_>$ φ" is true iff
        for some p such that p$=$[[φ]] or p$>$[[φ]]: p is true

It is perhaps obvious that (64) has the desired effect for all the cases featured in the above arguments against a purely presuppositional analysis of *einmal* and *auch nur*. This section concludes by applying the rule to four representative examples. First, sentence (49), repeated one more time in (65) below, is assumed to have the logical form in (66a).

(65)   Hans hat nicht einmal die BRONZEMEDAILLE gewonnen.
        Hans has not   eveN   the bronze-medal   won
        'Hans didn't even win the BRONZE MEDAL.'

(66)a.   nicht [einmal$_>$ [Hans hat die Bronzemedaille$_F$ gewonnen]]
    b.   that Hans won the gold medal >
         that Hans won the silver medal >
         that Hans won the bronze medal

The restrictor variable in this logical form will denote the scale in (66b). By (64), therefore, the scope of negation in (66a) is true just in case Hans won some medal or other, and so (66a) as a whole is true just in case Hans did not win any medal. Evidently, these truth conditions for (65) entail the intended characteristic implication that Hans did not win silver or gold.

Second, example (67) below, which one more time repeats (54), features the verb final version of (65) embedded under the modal *möglich*. Assuming that the embedded clause has the logical form in (66a) above, (67) is predicted to be true just in case it is possible that Hans did not win any medal. As desired, these truth conditions entail the characteristic implication that it

is possible for Hans to not have won silver or gold. In general, of course, rule (64) accounts for the fact that characteristic implications behave like truth-conditional entailments under embedding.

(67) Es ist möglich, dass Hans nicht einmal die
      it is possible that Hans not eveN the
      BRONZEMEDAILLE gewonnen hat.
      bronze-medal won has
      'It is possible that Hans didn't even win the BRONZE MEDAL.'

Third, the antecedent clause of example (68) below, which repeats (52), will be assumed to have the logical form in (69a), where the restrictor variable will denote the scale shown in (69b). By (64), therefore, the antecedent will be true just in case Hans won some medal or other, and so the conditional as a whole is true just in case I will lose the bet if Hans won a medal. These truth conditions entail the desired characteristic implication that I lose the bet if Hans won silver or gold.

(68) Wenn Hans auch nur die BRONZEMEDAILLE
      if Hans eveN the bronze-medal
      gewonnen hat, dann verliere ich die Wette.
      won has then lose I the bet
      'If Hans even won the BRONZE MEDAL, then I lose the bet.'

(69)a. auch-nur $_>$ [Hans die Bronzemedaille$_F$ gewonnen hat]
    b. that Hans won the gold medal $>$
        that Hans won the silver medal $>$
        that Hans won the bronze medal

Finally, in sentence (70) below, which repeats (58), the clause in the antecedent of (68) is embedded under negation and the modal *sicher* 'certain'. Assuming that this embedded clause has again the logical form in (69a), rule (64) predicts it to be true just in case Hans won some or other medal. Accordingly, (70) as a whole is correctly predicted to convey that it is not certain that Hans won any medal.

(70) Es ist nicht sicher, dass Hans auch nur die
      it is not certain that Hans eveN the
      BRONZEMEDAILLE gewonnen hat.
      bronze-medal won has
      'It is not certain that Hans even won the BRONZE MEDAL.'

In much the same way, rule (64) derives the intended characteristic implications in all the remaining relevant examples discussed above. All of the problems encountered in this section are only problems under the

assumption that all scalar additive particles are purely presuppositional. They do not arise under the assumption that *einmal* and *auch nur* are narrow scope existential quantifiers over alternatives at the level of truth conditions.

5. CONCLUDING REMARKS

To summarize, this study has reported two novel findings on the meanings of German scalar additive particles which are unexpected under existing analyses of English *even*. First, the negative polarity items *einmal* and *auch nur* have been shown to differ from affirmative *sogar* in that they consistently contribute characteristic implications concerning the truth values of salient alternative propositions, as opposed to their mere likelihood. Second, it has been shown that characteristic implications do not have the compositional behavior of presuppositions and instead call for the assumption that *einmal* and *auch nur* quantify existentially over alternative propositions at the level of truth conditions.

In arguing that *einmal* and *auch nur* are existential quantifiers at the level of truth conditions, this study has presented a novel conclusion based on novel observations. It has not, however, presented a complete analysis of German scalar additive particles in negative contexts. In the way of conclusion, three issues which call for further study are pointed to below.

First, while it has been argued here that presuppositions cannot be the source of characteristic implications contributed by *einmal* and *auch nur*, the findings presented have of course not established that these particles do not trigger presuppositions. In fact, there is certainly more to the meaning of *einmal* and *auch nur* than existential quantification over alternatives. Recall, for example, that the sentences in (17) above, repeated in (71) below, suggest that Italian is an easy language to learn. It is apparent that without further assumptions this implication, call it an *evaluative implication*, is not derived by the analysis proposed here. Assuming that Spanish and Portuguese are relevant alternatives ranked above Italian, for example, (71a) is predicted to be true just in case Hans does not know any of the three languages and (71b) is predicted to be true just in case none of us does. By themselves, these truth conditions certainly do not derive the intuition that the two sentences present Italian as an easy language.

(71)a. Hans kann   nicht einmal ITALIENISCH.
         Hans knows not   eveN   Italian
         'Hans doesn't even.know ITALIAN.'
    b.   Keiner von uns kann auch nur ITALIENISCH.
         none   of us knows eveN   Italian
         'None of us even knows ITALIAN.'

In the literature, evaluative implications of this sort are generally considered presuppositions. This seems indeed correct, for unlike the characteristic implications focused on in this study, evaluative implications do not show the compositional behavior of truth-conditional entailments. In particular, evaluative implications project past modal operators such as *möglich* 'possible'. Thus, just like their embedded clauses in isolation, the examples in (72) below suggest that Italian is easy, not merely that it is possible for Italian to be easy.

(72) a. Es ist möglich, dass Hans nicht einmal ITALIENISCH
         it   is possible that Hans not   eveN   Italian
         kann.
         knows
         'It is possible that Hans doesn't even know ITALIAN.'

    b. Es ist möglich, dass keiner von uns auch nur
         it   is possible that none   of   us   eveN
         ITALIENISCH kann.
         Italian   knows
         'It is possible that none of us even knows ITALIAN.'

It is conceivable, therefore, that evaluative implications come about in much the way suggested for *even* in the analyses of Karttunen and Peters (1979) and Rooth (1985). That is, it is conceivable that *einmal* and *auch nur* trigger a presupposition which compares alternative propositions in terms of likelihood. However, some authors have argued that evaluative implications contributed by scalar additive particles cannot in general be described in this way and various alternatives have been proposed (Jacobs 1983, p. 128ff; Kay 1990; König 1991). In focusing on characteristic implications, this study has not directly contributed to this debate. The question how evaluative implications arise will accordingly be left open.[31]

Secondly, this paper has not addressed the question why *einmal* and *auch nur* are negative polarity items. With respect to scalar additive *einmal*, the answer to this question might be trivial. The reason why *einmal* must always be right adjacent to *nicht* might be that the two form a lexical item.

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[31] A reviewer presents the following case against an analysis of evaluative implications contributed by *even* based on likelihood. In a context where a company considers which employee to send to Portugal for an important assignment, it might be said *Take João, he is a very good negotiator, he is the best subject area specialist, and he even knows PORTUGUESE.* In one interpretation, João's knowing Portuguese is not at all unlikely, as everyone in the company knows that Portuguese is João's native language. The reviewer takes this to suggests that relevance, rather than likelihood, is the general notion behind the meaning of *even*. This is close to Herburger's (2000) proposal that *even* compares alternatives in terms of noteworthiness.

However, this view does not extend to the particle *auch nur*, which is more widely distributed than *einmal* and is rarely adjacent to its licenser. According to one prominent school of thought, the polarity sensitivity of negative polarity items is a consequence of what these items mean. Unlicensed occurrences of negative polarity items are assumed to give rise to semantic ill-formedness (Kadmon and Landman 1993; Krifka 1995; Lahiri 1998; Chierchia 2001). It should be clear that without further assumptions, the proposal that *auch nur* is an existential quantifier over alternatives does not predict semantic ill-formedness in cases where the particle is unlicensed. But Guerzoni (2003) offers an analysis of *auch nur* that does just that. In this account, *auch nur* is decomposed into its independently attested components *auch* 'also' and *nur* 'only'. Guerzoni proposes a semantics for these components which is intended to yield semantic ill-formedness unless a negative polarity licenser intervenes between *auch* and *nur* at logical form. While this is a promising attempt to derive the polarity sensitivity of *auch nur*, the proposed analysis does not derive the characteristic implications that this study has been concerned with. It remains to be seen, therefore, how the polarity sensitivity of *auch nur* is to be derived in an analysis that also accounts for characteristic implications.[32]

Finally, it is to be acknowledged that in a certain class of cases, the analysis of *auch nur* as an existential quantifier at the level of truth conditions makes predictions which do not do justice to intuitions. Specifically, this analysis makes inaccurate predictions in cases where the negative polarity licenser of *auch nur* is factive in the sense of Kiparsky and Kiparsky (1971). Consider sentence (73) below, for example, where *auch nur* is licensed by the adversative factive predicate *überraschend* 'surprising'.

(73)   Es ist überraschend, dass Hans auch nur die
         it is surprising   that Hans eveN   the
         BRONZEMEDAILLE gewonnen hat.
         bronze-medal   won   has
         'It is surprising that Hans even won the BRONZE MEDAL.'

In the current analysis, the embedded sentence in (73) is predicted to be true just in case Hans won a medal. Given the factivity of *überraschend*, sentence

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[32] Apart from being a negative polarity item itself, *auch nur* can often be added to other negative polarity items without noticeable effects on interpretation. For example, the idiomatic negative polarity item *mit der Wimper zucken* 'bat an eyelid' seems to have much the same use as the extended version *auch nur mit der Wimper zucken* 'even bat an eyelid'. Similar observations in English and other languages have been taken to suggest that scalar additive particles play an important role in the theory of negative polarity sensitivity (e.g. Fauconnier 1975; Heim 1984; Krifka 1995; Lee and Horn 1995; Lahiri 1998; Guerzoni 2003).

(73) as a whole is also predicted to imply that Hans won a medal. The problem is that this predicted implication is too weak to account for actual intuitions. For the sentence is not merely understood to carry the implication that Hans won a medal, but the more informative implication that Hans won the bronze medal.

Note that a purely presuppositional analysis will fare better in this case. If *auch nur* is considered truth-conditionally vacuous, then the embedded clause in (73) will be true just in case Hans won the bronze medal, and the factivity of *überraschend* will ensure that the entire sentence too will imply that Hans won bronze.

This observation highlights a fundamental difference between the truth-conditional existential analysis of *auch nur* proposed here and purely presuppositional analyses. In a purely presuppositional analysis, *auch nur* is predicted to invariably strengthen the meaning of its host sentence, as the presupposition it triggers will always add information to the containing sentence, rather than remove information from it.[33] At first sight, it might seem that the present account too predicts *auch nur* to strengthen its host sentence in the general case. To begin, if *auch nur* is an existential quantifier at the level of truth conditions, the logical form *auch-nur* ϕ is bound to be weaker than ϕ by itself. Of course, the present assumption is that this weaker logical form will never be perceived in isolation, as *auch nur* must be interpreted in the scope of a negative polarity licenser. In the standard analysis of Ladusaw (1979), moreover, all negative polarity licensers are downward entailing operators. By definition, such operators reverse implication relations among their possible arguments. Therefore, given that *auch nur* weakens the truth conditions of the clause that serves as its scope, the standard analysis of negative polarity licensing predicts the particle to strengthen the truth conditions of its host sentence as a whole.[34]

The standard analysis of negative polarity licensing, however, is known not to be completely accurate. Von Fintel (1999) notes, in particular, that by virtue of triggering a factive presupposition, factive negative polarity

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[33] This statement is not completely accurate, as it ignores the possible effects of local presupposition accommodation. If the presupposition triggered by *auch nur* is locally accommodated in the scope of a downward entailing operator, it may well weaken the information content of its host sentence. However, assuming that local accommodation is the exception rather than the rule (e.g. Heim 1983; Beaver 1994; Kadmon 2001), a purely presuppositional account does predict that *auch nur* usually strengthens its host sentence.

[34] More accurately, under the standard analysis of negative polarity licensing, the particle is predicted to strengthen the truth conditions of its host sentence, if its negative polarity licenser is the highest downward entailing operator in the sentence. Naturally, an additional higher downward entailing operator would be predicted to once more reverse the direction of entailment, and thus to again yield a weakening.

licensers do not in general reverse implication relations among their possible arguments. This is why cases where *auch nur* is licensed by a factive predicate are expected to differentiate the present truth-conditional analysis from the purely presuppositional analyses assumed in the previous literature. As we have seen, intuitions on such cases actually favor a purely presuppositional account over the truth conditional analysis. It remains to be seen how this observation can be reconciled with the findings reported in this study that have been taken to show that a purely presuppositional account cannot be correct.

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