Negation, Polarity and Inverse Scope[*]

1. Licensing of negative polarity items

Expressions like *any, ever, lift a finger* in English and *een rooie cent* 'a red cent', *ook maar* 'any' and *hoeven* 'need to' in Dutch have been called negative polarity items (NPIs), because they can only be felicitously used in contexts with a certain 'negative' flavor. NPIs typically have to be 'in the scope' of an appropriate licensor. This observation immediately raises two important questions: what is an appropriate licensor and what is the appropriate view of scope?

1.1 *Semantic properties of the licensor*

Ladusaw (1979), Zwarts (1986) and others have pointed out that not only sentence negation (1a, 2a), but more generally, downward entailing operators such as *no one, few children, hardly any students* can license negative polarity items, as exemplified in (1b, 2b). An even more general perspective is adopted by Zwarts (1995) and Giannikidou (1997), who argue that NPIs can be licensed in non-veridical contexts. The set of non-veridical contexts includes the downward entailing operators, but also certain modal (subjunctive) environments and rhetorical questions (1c), (2c):

(1) a. Phil did not lift a finger to help us.
     b. No one has ever read this paper.
     c. Did anyone ever read this paper?

(2) a. De tandarts zei dat Flip niet terug hoefde te komen.   [Dutch]
       The dentist said that Flip did not need to come back
    b. Weinig kinderen hoefden hun huiswerk over te doen.
       Few children need to do their homework again
    c. Heeft Flip ooit ook maar iets bijgedragen aan het project?
       Did Flip ever contribute anything to the project?

I will take the results from the literature for granted, and assume that negative polarity items are licensed in downward entailing or non-veridical contexts. The main emphasis of the paper is on the second question raised above. I want to investigate what it means for the NPI to be in the scope of its trigger.

1.2 *Semantic scope*

Ladusaw (1979), Zwarts (1986), Giannikidou (1997) and others argue that the appropriate notion of scope is semantic in nature. Support for the claim that a negative polarity item must be in the semantic scope of its trigger comes from pairs of sentences like (3):

(3) a. Sue did not read a book by Chomsky.
    b. Sue did not read any book by Chomsky.

(3a) is ambiguous depending on the scope of the negation operator with respect to the existential quantifier introduced by the indefinite NP, and has the two readings spelled out in (4):

(4) a. $\neg\exists x(\text{Book-by-Chomsky}(x) \wedge \text{Read}(s,x))$
    b. $\exists x(\text{Book-by-Chomsky}(x) \wedge \neg\text{Read}(s,x))$

(3b) is not ambiguous: it can only mean that there is no book by Chomsky that Sue read. The interpretation of the sentence is then the one spelled out in (4a). Reading (4b) is not available for (3b), because under this interpretation the negative polarity item would not be in the semantic scope of its licensor.

1.3 *Direct scope*

In many languages, semantic scope is constrained by syntactic structure. In languages like Dutch and English, the semantic scope of an operator involves at least its c-command domain. We expect then that a sufficient condition for an NPI to be licensed is for it to occur in the c-command domain of its trigger. We say that an NPI is licensed in the 'direct scope' of its trigger:

– Direct scope:
An expression a has direct scope over an expression b if and only if b is in the semantic scope of a and a c-commands b at S-structure.

The question arises whether it is not just a sufficient, but also a necessary condition for the NPI to be in the c-command domain of its trigger at S-structure. At first sight, the answer to this question seems to be affirmative. Ladusaw (1979), Hoekstra, de Hoop and Zwarts (1988) and Hoeksema (1997) argue that NPIs involving *any* in English or *ook maar* in Dutch require the licensor to c-command the NPI at S-structure. The linear restrictions explain the contrast between the grammatical (a)-sentences and the ungrammatical (b)-sentences in (5)–(8):

(5) a. Phil did not say anything to me.
     b. *Anyone did not talk to me.

(6) a. No one said anything to me.
     b. *Anyone said nothing to me.

(7) a. Niemand heeft ook maar een woord tegen mij gezegd.   [Dutch]
         No one said even a word to me
     b. *Ook maar iemand zei niets tegen mij.
         Anyone said nothing to me

(8) a. Geen collega van mij kent ook maar één leuke grap.
         No collegue of mine knows any funny joke
     b. *Ook maar één leuke grap kent geen collega van mij.
         Any funny joke knows no collegue of mine

These examples suggest that the occurrence of the NPI in the direct scope of the trigger is not only a sufficient, but also a necessary condition for the NPI to be licensed. However, in the literature on negative polarity, we find examples of NPIs which are not in the c-command domain of their trigger at S-structure.

1.4   *Inverse scope of negation*

The constraints on linearity vanish if we embed the NPI in a preverbal indefinite subject or a preposed complement clause:

(9) a. That he had stolen anything was never proved.
     b. Finding any green vegetables is impossible there.
     c. A doctor who knew anything about acupuncture was not available.
     d. An article with any convincing examples of NPIs in subject relative clauses has never appeared in any journal of linguistics so far.
     e. Examples with any relevance to that issue didn't come up in the discussion.

(10) a. Dat ook maar iemand ontslagen zou worden had niemand verwacht.
         That anyone fired would be had no one expected
         'That anyone would be fired, no one had expected'
     b. Een kind dat ook maar iets aan zijn huiswerk gedaan heeft kent niemand.
         A child that anything to his homework done had knows no one
         'A child that had done any homework, no one knew'

c. Een arts met ook maar enige kennis van deze ziekte was niet te vinden
   A doctor with any knowledge of this disease was not to be found

(9a) and (b) are from Ross (1967) and quoted in Linebarger (1980). (9c) is Linebarger's (1980) example. (9d) and (9e) are attributed to B. Partee and reported in Uribe-Etxebarria (1996). (10a) and (10b) are examples given by Hoekstra, de Hoop and Zwarts (1988) and Hoekstra (1991) respectively; Hoeksema (1997) discusses similar data. The problem is that the NPI is not c-commanded by negation at S-structure, but the sentences are felicitous. This cannot be due to variation within the class of negative polarity items, because the examples involve NPIs like *any* and *ook maar*, which have been argued to be subject to a strict c-command constraint at S-structure (compare 5–8).

The well-formedness of the examples in (9) and (10) is due to the fact that they are interpreted with negation taking wide scope over the indefinite NP or the preposed complement clause. The semantic wide scope of negation seems to license the NPI in the relative clause of the indefinite subject or the preposed complement clause in this particular configuration. In the terminology used by May (1977), Szabolcsi (1997), Beghelli and Stowell (1997) and others, the NPI is licensed under 'inverse scope' of negation:

– inverse scope:
An expression a has inverse scope over an expression b if and only if b is in the semantic scope of a but a does not c-command b at S-structure.

The question I will address in the rest of this paper is how we can account for licensing of negative polarity items under inverse scope of negation. The challenge is to develop an account which on the one hand explains the examples given in this section, and on the other hand preserves the insight that NPIs are usually restricted to the direct scope of their trigger as argued in Section 1.3.

2. Constraints on inverse scope

2.1 *Syntactic approaches*

One way of dealing with the problems outlined in Section 1.4 would be to try and explain away inverse scope readings by appealing to an interpretation of indefinite NPs as strong, generic quantifiers with a (quasi-)universal interpretation. In de Swart (1998), I show why this solution needs to be rejected, and I will not repeat the argumentation here. The conclusion is that we have to take inverse scope seriously. In the syntactic literature on licensing of negative polarity items, we find roughly two approaches. Linebarger (1980) and Uribe-Etxebarria (1996) take the data on inverse scope presented in Section 1.3 above to argue in favor of a constraint on c-command at LF rather than S-structure. They allow reordering or reconstruction in order to give negation wide scope over the indefinite subject or preposed clause at LF. However, they do not spell out the constraints on this reconstruction process. If we freely allow reconstruction, and c-command at LF is sufficient to license the NPI in (9) and (10), we do not have an

explanation for the unacceptability of (5b), (6b), (7b) and (8b).

The other line of argumentation is found in work by Szabolcsi (1997), Stowell and Beghelli (1997) and others, who have argued that unconstrained quantifier raising at LF is not a good approach to account for scope ambiguities in general. They claim that the specific syntactic and semantic properties of wide scope and narrow scope taking NPs are crucial to determine possible scope configurations. Stowell and Beghelli (1997) are the only ones who specifically treat the interaction of NPs with negation. In their approach, NPs get scope in their landing site. The landing site of quantifiers in subject position is higher than that of negation, so their system does not derive the inverse scope reading of the sentences in (11):[1]

(11) a. All that glitters is not gold.
      b. A doctor was not available.
      c. Many people aren't likely to arrive on time.
      d. Meer dan twee artikelen die ook maar iets zinnigs beweren over bereik heb ik niet kunnen vinden.
          More than two articles that say anything sensible about scope I have not been able to find

They suggest that universal and existential NPs are not real quantifiers, which might account for the inverse scope readings of (11a) and (b), but that argumentation does not extend to the cases in (11c,d). In the remainder of this section, I will argue that the constraints on inverse scope of negation are pragmatic in nature. In Section 3, I will discuss the implications of the analysis developed here for the licensing of negative polarity items.

In English and Dutch, the syntactic scope of negation is generally smaller than the entire sentence: negation typically occurs somewhere lower than the subject, and higher than the verb and its inner arguments. Thus the inverse, sentential scope of negation implies that its semantic scope is wider than its syntactic scope. I claim that the discrepancy between syntax and semantics needs to be pragmatically motivated by the contribution the utterance makes to the discourse. Inverse scope is felicitous only if the wide scope interpretation carries some additional informational value. This arises when the wide scope interpretation of negation semantically entails a positive statement, or pragmatically carries a positive implicature (compare Büring 1997 for a related position). Following Horn (1989: 194ff), I distinguish two kinds of implicatures that arise through weakening or strenghtening of the assertion.

2.2 *Scalar implicatures*

Horn (1972) shows that the combination of the Gricean maxims of Quantity and Quality leads to systematic implicatures when items are ordered on a scale. Horn argues that the assertion of the weaker element on the scale triggers the implicature that the statement

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[1] See de Swart (1998) for discussion and motivation of this claim.

involving the stronger element is false. From an assertion which involves the weaker element of the scale, the hearer infers that the speaker does not have evidence for the stronger claim, or believes the stronger claim to be false. If the hearer thinks that the speaker has all the relevant information about the situation, she can take the fact that the speaker did not make the stronger claim to mean that the stronger claim is false. For instance, there is a scale <a, all>, where *a* (or *some*) makes the weaker statement and *all* conveys the stronger claim. The assertion of the weaker claim triggers the implicature that the stronger claim is false:

(12) Some students passed the exam →
      Not all students passed the exam

Obviously, this invited inference is not a logical entailment, which is why Horn characterizes it as an implicature in the sense of Grice (1975).

If we consider universal statements under negation, we observe that they are equivalent to an affirmative sentence with narrow scope of negation, as in (13):

(13) Not all students passed the exam. ⇔
      Some students did not pass the exam.

Thus negative universal sentences carry a positive informational value. Furthermore, we know that scales are reversed under negation (compare Fauconnier 1975, 1978). If we embed the scale <a, all> under negation, we obtain the reversed scale <not all, not a>. Following the same argumentation as above, the weaker assertion implicates the negation of the stronger one. Thus, a statement involving *not all* invites the inference to *some* via double negation:

(14) Not all students passed the exam. →
      It is not the case that not a student passed the exam. ⇔
      Some students passed the exam.

If negation takes wide scope over the universal quantifier, the semantic scope of negation extends over the entire sentence. We would expect this interpretation to be dispreferred, because the report of a negative fact is typically not very informative. However, the semantic and pragmatic contribution of this negative sentence is positive because of the combination of the equivalence in (13) and the scalar implicature in (14). As a result, the sentence conveys that some students did, and some students did not pass the exam. If we assume that a positive informational value is crucial to license inverse scope, we can argue that the semantic equivalence and the scalar implicature is what makes the inverse scope interpretation of sentences like (11a) felicitous. As shown by de Swart (1998), the NPs in (15) trigger scalar implicatures along the same lines:

(15) a. Many people aren't likely to arrive on time. →
          Some people will arrive on time, but not many.
      b. Meer dan twee sigaretten heeft hij niet gerookt.   [Dutch]
          More than two cigarettes has he not smoked →
          He smoked some cigarettes, but not more than two.

This accounts for the inverse scope readings of examples like (11c) and (d).

2.3 *Contrastive interpretations*

The appeal to the maxims of Quantity and Quality cannot explain the wide scope of negation over indefinites such as *a* N, bare plurals or mass nouns (e.g. (11b)). These expressions denote the weakest item on the relevant scale, so under the reversed scale induced by negation they lead to the strongest possible statement, and do not trigger scalar implicatures. As Horn (1989) points out, there is a second strategy of generating implicatures, which are used to strengthen, rather than weaken the assertion. Grice's maxim of Relation requires the speaker to be relevant. In combination with the maxim of Quantity this tells the speaker to say no more than she must. As a result, the hearer is invited to read as much into the utterance as possible. Examples of strenghtening include the focus-sensitive interpretation of negation. Typically, sentences like (16) (from Jackendoff 1972) and (17) (from de Swart 1999) trigger an interpretation in which part of what is in the semantic scope of negation is outside the pragmatic scope of negation. Only the focussed part of the sentence (indicated with capitals) is affected by the negation operator:

(16)   He didn't kill the judge with a HAMMER. →
       He killed the judge, but not with a hammer.

(17)   He didn't arrive at SIX O'CLOCK. →
       He arrived, but not at six o'clock.

A sentence like (16) is not usually used to deny that any killing took place, but to deny that it happened with a hammer. If part of the sentence is interpreted outside the pragmatic scope of negation, the negative sentence conveys some positive information. In contexts like (16) and (17) the effect is purely pragmatic, and not truth-conditional in nature. However, if the negative sentence involves an indefinite NP in focus, the implicated statement is stronger than the assertion:

(18)   a.   Sue doesn't read NOVELS. →
            Sue reads things, but not novels.
       b. $\neg\exists x(\text{Novel}(x) \wedge \text{Read}(s,x))$ →
            $\exists y(\text{Read}(s,y) \wedge \neg\exists x(\text{Novel}(x) \wedge \text{Read}(s,x)))$

(19)   a.   Phil didn't wear a RED tie. →
            Phil wore a tie, but it was not red.
       b. $\neg\exists x(\text{Tie}(x) \wedge \text{Wear}(p,x) \wedge \text{Red}(x))$ →
            $\exists y((\text{Tie}(y) \wedge \text{Wear}(p,y)) \wedge \neg\exists x(\text{Tie}(x) \wedge \text{Red}(x) \wedge \text{Wear}(p,x)))$

The assertion and the implicature in (18a) and (19a) are spelled out in first-order logic in (18b) and (19b) respectively. The formal representations bring out the existential force of the implicature, which is missing from the assertion. The strategy of reading as much into the utterance as possible leads to a contrastive interpretation in which only part of the sentence is in the pragmatic scope of negation. Indefinite NPs of the form *a* N, bare

plurals and bare mass nouns easily trigger contrastive interpretations, in which we introduce a set of alternatives. A contrastive interpretation is compatible with inverse scope of negation, because the existential force of the implicature allows the utterance to convey positive information. Examples of contrastive interpretations of indefinites outside the syntactic scope of the negation operator are provided in (20):

(20) a. A doctor was not available.
 b. Reviews are not published by this journal.
 c. Beer and wine are not served here.
 d. A doctor who spoke Russian was not available.
 e. Articles on scope are not published by this journal.

(20a) is felicitous in a context in which someone was available (a nurse for instance), but the situation really required a doctor. (20b) can be used to contrast reviews with research articles. (20c) suggests that some drinks (presumably non-alcoholic beverages) are served in this restaurant. These examples illustrate that the contrast can bear on the common noun. (20d,e) show that the introduction of modifiers or a relative clause allows us to contrast subsets of the set of individuals that satisfy the common noun. (20d) contrasts doctors who speak Russian with doctors who don't speak this language. In (20e) we compare articles on scope with articles on other subjects. In all the cases in (20), negation focusses on the NP or part of the NP, and it triggers the presupposition that something satisfies the predicate, although it is not the value of the (full) NP itself.

3.   Back to NPIs

The idea that polarity is related to a scalar interpretation goes back to observations made by Fauconnier (1975, 1978). Recently, Krifka (1995) and Israel (1996) have argued that scalarity and emphasis are closely tied up with informativeness. In view of the literature and the results from Section 2, it is natural to establish a relation between the licensing of NPIs and the general conditions on inverse scope of negation.

3.1   *Bare NPIs that refer to the bottom of a scale*

Interestingly, we do not expect negation to take inverse scope over NPIs like *any* N in English, and *ook maar* in Dutch under any of the pragmatic options outlined in Section 2. This means that the analysis developed so far provides an immediate explanation for the ungrammaticality of the (b)-sentences of (5) though (8), repeated here as (21):

(21) a. *Anyone did not talk to me.
 b. *Anyone said nothing to me.
 c. *Ook maar iemand zei niets tegen mij.
  Anyone said nothing to me
 d. *Ook maar één leuke grap kent geen collega van mij.
  Any funny joke knows no collegue of mine

On the one hand, the NPIs in (21) do not trigger scalar implicatures. Fauconnier (1975, 1978), Ladusaw (1979), Heim (1987), Krifka (1995), Israel (1996) and others argue that NPIs involving *any* denote the lowest element, the 'bottom' of some scale. Rullmann and Hoeksema (1997) make similar claims about *ook maar* in Dutch. These NPIs generate the ordering <any, ...> or <ook maar, ...>. Accordingly, an affirmative statement which involves the NPI provides the weakest possible assertion. However, NPIs typically do not occur in affirmative sentences. NPIs are restricted to negative sentences, or other contexts that reverse the orientation of the scale. Thus the relevant scale we are using in the interpretation of sentences involving NPIs is <not ..., not NPI>. According to this reversed scale, the negation of an NPI makes the strongest possible statement. We know from the argumentation based on the Gricean maxims of Quantity and Quality developed in Section 2.2 that scalar inferences are invited by weak, not strong assertions. The strong nature of negative statements involving NPIs prohibits the sentence from generating scalar implicatures.

On the other hand, NPIs involving *any* or *ook maar* do not participate in the qualitative contrast that singular indefinites and other weak NPs exhibit. NPs involving *any* have existential force just like other indefinite NPs. This made it hard for Linebarger (1980) and Uribe-Etxebarria (1996) to explain why bare *any* NPs are not licensed under inverse scope. Note however that although singular indefinites, bare plurals and other weak NPs can get a scalar interpretation, this is not obligatory. The qualitative contrast which triggers an implicature to the strongest interpretation does not rely on a scalar interpretation of the determiner, and is in fact incompatible with it. The contrastive interpretation relies on the introduction of alternative values for (part of the) common noun denotation, not alternative values on the determiner scale. *Any* and *ook maar* are inherently scalar expressions, for they combine their existential force with a denotation as the bottom element of a scale. The obligatory scalar interpretation rules out the possibility of a qualitative contrast, because the information provided by the determiner is too heavy to just take into consideration alternative values for the common noun denotation. As a result, a negative sentence with a bare *any* or *ook maar* NP in subject position does not license an implicature along the lines of the argumentation developed in Section 2.3.

Summing up, we observe that both strategies to generate positive implicatures for a negative sentence fail when a bare NPI in subject position refers to the bottom of a scale. However, we know that NPIs must be interpreted under the semantic scope of negation. The ungrammaticality of sentences like (21) is thus a direct result of the fact that we put an NPI which does not license inverse scope of negation in a position where it is not in the direct scope of negation. This explains the observation made by Ladusaw (1979) and Hoekstra, de Hoop and Zwarts (1988) that bare NPIs that refer to the bottom of a scale cannot precede their trigger, but must be in the c-command domain of their licensor.

3.2   Embedded NPIs

The examples in (21) are ill-formed because the bare NPIs do not allow inverse scope. However, the English and Dutch examples (9) and (10), repeated here as (22) and (23) are well-formed, because the indefinite NP which contains the NPI allows inverse scope

by creating a contrastive interpretation along the lines of the pragmatic argumentation sketched in Section 2.3 above:

(22) a. That he had stolen anything was never proved.
      b. A doctor who knew anything about acupuncture was not available.
      c. An article with any convincing examples of NPIs in subject relative clauses has never appeared in any journal of linguistics so far.
      d. Examples with any relevance to that issue didn't come up in the discussion.

(23) a. Dat ook maar iemand ontslagen zou worden had niemand verwacht.
          That anyone fired would be had no one expected
          'That anyone would be fired, no one had expected'
      b. Een kind dat ook maar iets aan zijn huiswerk gedaan heeft kent niemand.
          A child that anything to his homework done had knows no one
          A child that had done anything about his homework, no one knew'
      c. Een arts met ook maar enige kennis van deze ziekte was niet te vinden.
          A doctor with any knowledge of this disease was not to be found

Focus on (part of) the indefinite subject triggers an implicature in which at least the verbal predicate is outside the pragmatic scope of negation. The inference to the strongest interpretation generates an implicature with existential force, where negation affects only (part of) the indefinite NP. Embedding the NPI in the relative clause of an indefinite subject contrasts the set of N's that satisfy the relative clause with the set of N's that do not. The comparison set triggers the existential implicature that some N's satisfy the property expressed by the VP, but they are typically not the ones that were desired, requested, expected, etc. in the context of utterance.

In English, a contrastive interpretation of the indefinite subject or preposed, topicalized clause seems to be the only way to license an NPI like *any* outside of the c-command domain of negation. Dutch is more liberal in allowing inverse scope with cardinal NPs. We can embed an NPI in the relative clause of a cardinal NP as illustrated in (11d), repeated here as (24):

(24) Meer dan twee artikelen die ook maar iets zinnigs beweren over bereik heb ik niet kunnen vinden.
      More than two articles that say anything sensible about scope I have not been able to find

The interpretation of the NPI in the semantic scope of negation created by this inverse scope reading guarantees the felicity of the sentence. Thus both strategies for the calculation of positive implicatures that we discussed in Section 2 play a role in the licensing of NPIs under inverse scope of negation.

3.3   *Conclusion*

The results of Section 3 bring us full circle in the argumentation. We started out with a set of examples which seemed to show that syntactic scope at S-structure plays a role in the licensing conditions on NPIs. However, a restriction to direct scope at S-structure

made it impossible to explain why embedded NPIs can precede their trigger. The analysis I developed in sections 2 and 3, gets us out of the dilemma created by the seemingly conflicting data presented in Section 1.3 by formulating precise pragmatic constraints on inverse scope. If we wish, we can build these constraints into the movement rules which allow negation to raise at LF or the NP to reconstruct under the scope of negation. However, it is clear that a purely syntactic (i.e. configurational) approach to the licensing conditions of NPIs is not sufficient to give a proper account of the data. Given the interesting differences between direct and inverse scope, we need to appeal to semantic and pragmatic properties of the expressions in question. Once we have this insight, we see that the data are fully consistent and allow for a simple and coherent analysis.

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