Negation, polarity and deontic modals

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Abstract:

Universal deontic modals may vary w.r.t. whether they scope over or under negation. For instance, English modals like *must* and *should* take wide scope with respect to negation, modals like *have to* and *need to* take narrow scope. Similar patterns have been attested in other languages. In this article we argue that the scopal properties of modals w.r.t. negation can be understood if (i) modals that outscope negation are Positive Polarity Items (PPIs); (ii) all modals originate in a position lower than I°; and (iii) modals undergo reconstruction unless reconstruction leads to a PPI licensing violation.

Keywords: Modality, Negation, Polarity, Reconstruction, Verb Movement

1. Introduction

When a clause contains more than one scope-taking element, the question always arises as to what determines their relative scope relations, especially when these scope relations are not reflected by their surface order. In this article, we discuss one such scopal interaction, namely the scopal relations between negation and deontic modals.

1.1 The problem

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[1]

Existential deontic modals ('◊') in English and as far as we know in all languages scope under negation:

(1) a. John cannot leave   ¬ > ◊

  b. John may not leave   ¬ > ◊[1]

However, some universal deontic modals ('□')scope over negation, whereas other universal modals scope under negation. This can be attested in English as well as in other languages:

(2) a. John doesn't / does not have to leave ¬ > □

  b. John doesn't / does not need to leave ¬ > □

(3) a. John mustn't/must not leave   □ > ¬

  b. John oughtn't/ought not to leave   □ > ¬

  c. John shouldn't/ should not leave   □ > ¬

  d. John isn't to leave   □ > ¬

(4) a. Dhen chriazete na figis.[2]   ¬ > □ Greek

   NEG need NA leave

   'You don't need to leave.'

  b. Dhen prepi na to kanume afto.   □ > ¬

   NEG must NA it do this

'We must not do this.'

(5)   a.   Hans moet niet vertrekken $> \neg$[3]   Dutch

Hans must NEG leave

'Hans musn't leave'

       b.   ... dat Hans niet moet vertrekken $> \neg$[4]

... that Hans NEG must leave

'... that Hans mustn't leave'

(6)   a.   tumhen Dilli nahiiN jaa-naa hai.[5] $\neg >$ Hindi

you.DAT Delhi NEG go-INF be.PRES

'You don't have to go to Delhi.'

       b.   tumhen Dilli nahiiN jaa-naa caahiye. $> \neg$

you.DAT Delhi NEG go-INF should

'You should not go to Delhi.' modal NEG

(7)   a.   Hans muss nicht abfahren $\neg >$ German

Hans must NEG leave

'Hans does not have to leave'

       b.   ... dass Hans nicht abfahren muss $\neg >$

... that Hans NEG must leave

'... that Hans doesn't have leave'

In addition, there are universal deontic modals which must appear in the scope of negation, such as English *need*, Dutch *hoeven* and German *brauchen*. These modals are standardly taken to be NPIs (van der Wouden 1994 et seq):[6]

(8) a. You need *(not) leave[7]

  b. No /*every /*some student need leave

(9) a. Hans braucht *(nicht) zu gehen   ¬ >   German

    Hans need not go

  b. Kein/*jeder/*ein Student braucht zu gehen

    No /every /a student need to go

(10) a. Je hoeft *(niet) weg te gaan.   ¬ >   Dutch

    You need not away to go

  b. Geen/*iedere / *een student hoeft weg te gaan

    No /every /a student need way to go

1.2 Polarity-sensitive modals

There are at least two previous types of accounts that have aimed to address the question of the scopal interaction between modals and negation. In one type the basic idea is that different modals are generated in different heights of the tree (some above negation, others below) and

that differences between similar types of modals of similar quantificational force (like universal *need to* and *must*) are due to lexical idiosyncracies (Cormack and Smith 2002, Butler 2003).

The second type of approach (Horn 1989, 2007, De Haan 1997) relates the scopal behavior that modals exhibit with respect to negation to the functional needs of a language to express negated modality. Since there is a functional need in languages to express both ¬ > and > ¬, languages may have a different universal modal items for each scope relation. As a result of some pragmatic mapping principle each modal element is then specified for a particular scope relation.

The problem with both types of approaches is that they reduce the difference between the two types of universal modals to idiosyncracies: there is no principled difference that sets the two different types of modals apart. Moreover, under these approaches it is impossible for a modal that generally scopes over negation to scope under negation in particular cases. However, as will become clear in the next section, this is very well possible.

For these reasons, in Iatridou and Zeijlstra (2010) we took a completely different approach. We started from the assumption that since NPIs surface in the domain of deontic modality, we might also expect there to be Positive Polarity Items (PPIs)[8], basing ourselves on the working hypothesis that any domain that has one class of polarity items also has the other (along the lines of Van der Wouden 1994).

In short, we analyzed modals that scope over negation, namely English *must, should, ought to*, Greek *prepi,* Dutch *moeten*, Hindi *caahiye* etc. as PPIs, a conclusion first suggested in Israel (1996) and also reached in Homer 2010 for English *must*. We called modals that scope under negation but do not require negation "neutral". This means that in English, deontic modals group as follows:

	PPIs	Neutral	NPIs
Universal	*must, should, ought to, to be to*	*Have to, need to*	*Need*
Existential	-	*Can, may*	-

Focusing on the universal modals, we see that immediately, four questions arise, which we will discuss in the following four sections:

Q1: To what extent do deontic PPI modals and better-known PPIs exhibit the same distributional behavior?

Q2: How do deontic modals take scope with respect to negation given their polarity requirements and their surface position?

Q3: How can the NPI/PPI properties of deontic modals be captured?

Q4: To what extent does the analysis apply to epistemic modals too?

It is these four questions that we will address in this article. If we have good answers to these four questions it can safely be concluded that it is NPI and PPI properties of modals that underlie their scopal relations with respect to negation.

The article is set up as follows. In section 2, we address Q1 and we demonstrate that the distributional patterns of the alleged modal PPIs and other PPIs are virtually identical. In section 3, we will address Q2 and show that all non-PPI modals must reconstruct to a position below negation. In section 4, we will address Q3 and investigate to what extent current theories of negative and positive polarity can answer the question as to what particular property makes modals like English *must* PPIs, modals like English *need* NPIs, and modals like English *have to* neutral. In section 5 we discuss to what extent the analysis can be extended to epistemic modals as well. Section 6 concludes.

2.   Q1. To what extent do deontic PPI modals and better-known PPIs exhibit the same distributional behavior?

The first question that arises is how it can be established that those modals that outscope negation are PPIs. Just saying that these are PPIs because they cannot take scope under negation is not sufficient. Are there additional arguments that those modals that outscope negation are indeed PPIs? We answer this question in the affirmative by comparing distributional properties of better known PPIs, such as English *some*[9], with distributional properties of modals that outscope negation. If the distributional properties of those modals that take scope over negation are similar to those of other PPIs (or if any differences between them receive independent explanation), we can conclude that the scopal properties of such modals follows from their PPI-hood.

The behavioral characteristics of PPIs distribute along three dimensions:

First, Szabolcsi (2004) and references cited there show that although PPIs are generally banned from negative contexts, there are actually three types of negative contexts in which all known PPIs, such as English PPI *some NP*, may surface under the scope of negation. We take these behavioral properties as diagnostics for PPI-hood and it will be shown for three different languages, namely English, Dutch and Greek, that vary syntactically in the way they express negation and/or modality in sections 2.1-3 in detail that according to these diagnostics modals outscoping negation are also PPIs.

Second, it is also attested that, just like NPIs, PPIs may vary with respect to the exact logical properties of their licensing contexts: some PPIs are banned in all downward-entailing contexts (so-called strong PPIs), whereas other PPIs are banned in anti-additive or anti-morphic contexts only (PPIs of medium strength or weak PPIs respectively). In section 2.4 it will turns out that the same kind of variation is also attested among English, Dutch and Greek PPI modals.[10]

Third, it is known that those PPIs that count as weak PPIs or PPIs of medium strength are fine under negation once that negation itself is embedded in a downward entailing context. Strong PPIs, by contrast, cannot appear in such contexts. We will see in section 2.5 that this contrast also applies to PPI modals.

Given that the distributional patterns discussed above are the same for better known PPIs and for modals that take scope over negation, we conclude that those modals are PPIs indeed.[11]

2.1.   *Metalinguistic/contrastive negation*

PPIs may appear under the scope of metalinguistic negation and/or contrastive negation (cf. Szabolcsi 2004 and references therein), as is shown for English *something* below:

(11)   You didn't do SOMETHING wrong, you did everything wrong!

(12)   If you push the red button, you will see something, but if you press the blue button you

        WON'T see something.[12]

It is thus predicted that if modals such as Dutch *moeten*, Greek *prepi* or English *must* are PPIs, they should also be fine under the scope of metalinguistic negation and/or contrastive negation. For Greek *prepi* and Dutch *moeten* this straightforwardly appears to be the case, as is shown in (13) and (14).

(13)   Se afto to scholio prepi na dhiavazis poli. Se ekino to scholio then

        In this the school, must read   much.   In that the school neg

        prepi na dhiavazis poli

        must read   much

        'If you go to this school you will must to study a lot. If you go to that school you

        mustn't study a lot.'

(14)   Op deze school moet je hard werken; maar op die school moet je niet hard werken

        At this school must you hard work; but at that school must you NEG hard work

        'At this school you must work hard; but at that school you mustn't work hard'

Similarly, as observed in Iatridou and Sichel (2011), contrastive focus on the modal itself in Greek (and also in Dutch) permits modals that normally scope over negation to scope under it:

(15) A: o Kostas prepi na grapsi 2 arthra fetos

            The Kostas must   write   2 article this year

            'Kostas must write 2 articles this year'

       B: dhen PREPI na grapsi 2 ala kala tha itan.   ¬ >

            Neg MUST write 2 but good fut be-pst

            'He doesn't have to but it would be good'

(16) A: Theresa moet op negatie werken

            Theresa must on negation work

            'Theresa must work on negation'

       B: Ze MOET niet op negatie werken,   ¬ >

            She must neg on neation work

            ze wordt hooguit aangemoedigd

            she is at best encouraged

            'She doesn't have to work on negation; she is at best encouraged'

On the other hand, English *must* cannot be contrastively focused when it appears in a sentence with a negative marker:

(17) A: He must read 5 books

      B: # He MUST not read 5 books but he is encouraged to do so

However, this is due to an independent property of English contrastive focus. Following Jackendoff's (1972) discussion on licensing of focus, if negation licenses focus, it must c-command the focus already at S-structure.[13] This explains why (17)B is ruled out.

However, it is possible to find cases in English where *must* is c-commanded by negation, and then we can duplicate this phenomenon. Iatridou & Sichel (2011) point out that negative subjects scope in exactly the same way with respect to modals as plain negative markers do, while at the same time preceding the modal at S-structure. Therefore, the negation in a negative subject is expected to license the modal's focus. Consequently, a modal like *must* should be allowed to take scope under contrastive negation induced by a negative subject. This is indeed the case, as is shown in (18), with stress on the modal enabling the metalinguistic reading of the example. Predictably, negation contained in an object cannot focus the modal, for the same reason that sentential negation fails to do so (see (19)).

(18) A: One student must read 5 articles on the topic

      B: No student MUST read 5 articles on the topic but one student is encouraged to do

             so.

(19) A: He must read certain articles on the topic

      B: # He MUST read no article on the topic but he is encouraged to do so.

Thus, English *must* can appear under the scope of metalinguistic and/or contrastive negation as well, thus meeting the first criterion of PPI-hood too.[14,]

2.2 Intervention effects

A sentence with a PPI in the immediate scope of an anti-additive operator is bad (cf. Szabolcsi 2004 and references therein). However, when the PPI is not in the immediate scope of an anti-additive operator, because some other intervening element takes scope between the anti-additive operator and the PPI, the sentence is fine again (cf. Kroch 1979).[15] This is illustrated in the following examples taken from Szabolcsi (2004).

(20) a. John didn't offend someone because he was malicious (but because he

   was stupid).   √ not > because ... > some

   b. Not every student said something.   √ not > every > some

   c. John didn't say something at every party.   √ not > every > some

   d. John doesn' t always call someone.   √ not > always > some

   e. John didn't show every boy something.   √ not > every > some

Again, it is predicted that if a modal that outscopes negation is a PPI, it can appear under the scope of an anti-additive operator as long as some other scope-taking element intervenes between that operator and that modal.

This is indeed the case. As is shown below, the intervention tests straightforwardly apply for Greek *prepi* and Dutch *moeten*, and as is indicated by the translations, for English *must* as

well. The readings that (21)-(22) give rise to have the scopal relations: negation > because > must; the readings of (23) and (24) are: negation > always > must.[16]

(21)   Dhen prepi na ton pandrefti epidhi ine oreos ala epidhi ine eksipnos

         Neg must   him marry   because is handsome but because is smart

         'She must not marry him because he is handsome but because he is smart'

(22)   Ze moet niet met hem trouwen omdat hij er goed uit ziet,

         She must NEG with him marry because he there goed out looks

         maar omdat hij een goede taalkundige is

         but because he a good linguist is

         'She must not marry him because he looks smart but because he is a good linguist'

(23)   A: Panda esi prepi na vgazis ta skupidia?

                always you must   take-out the garbage

                'Must you always take out the garbage'

         B: dhen prepi na ta vgazo panda. Polles fores ta vgazi o yios mu

                NEG must always take out the garbage. Many times it take-out the son my

                'I mustn't always take the garbage outside. Many times my son does that'

(24)   A: Moet je altijd het vuilnis buiten zetten?

                Must you always the garbage outside put

                'Must you always put the garbage outside?'

B: Nee, ik moet niet altijd het vuilnis buitenzetten; vaak doet Jan het

No I must NEG always the garbage outside-put; often does Jan it

'No I mustn't always take the garbage outside; Jan often does that'

So English *must*, Greek *prepi* and Dutch *moeten* also obey this second criterion of PPI-hood.

2.3   Clause-external negation

A third property of PPIs is that they are fine in the scope of negation or any other context that known to ban PPIs if the latter is extra-clausal (Szabolcsi 2004: 24-27), as illustrated in (25):

(25) a.   I don't think that John called someone.   not > [CP/IP some

      b.   No one thinks/says that John called someone.   no one > [CP/IP some

      c.   I regret that John called someone.   regret > [CP/IP some

      d.   Every boy who called someone got help.   every [CP/IP some

As expected, clause-external negation is also able to scope above Greek *prepi*, English *must* and Dutch *moeten*, showing one more environment where these behave like better known PPIs.

(26)   Dhen nomizo oti prepi na figi

        neg   think   that   must leave

        'I don't think that s/he must leave'

(27)   Ik denk niet dat ze moet vertrekken

I think NEG that she must leave

'I don't think that she must leave'

2.4   *Variation among PPIs*

A fourth well-known observation about PPIs is that PPIs may differ with respect to the logical properties of their licensing contexts. Van der Wouden (1994) calls PPIs that are only banned from anti-morphic contexts weak PPIs. So-called PPIs of medium strength may not appear under the direct scope of an anti-additive operator and, finally, strong PPIs are banned from all downward entailing contexts. This is shown in table 1 for three Dutch PPIs, based on Van der Wouden (1994).

TABLE 1: VAN DER WOUDEN 1994:

Weak PPI (only blocked in anti-morphic[17] contexts)	"nog" *(yet)*	*De monnik is niet nog gelukkig *The monk isn't yet happy* Niemand is nog gelukkig *Nobody is yet happy* Weinig monniken zijn **nog** gelukkig *Few monks are yet happy*
PPI of medium strength (blocked in all anti-additive contexts)	"een beetje" *(a bit)*	*De monnik is niet **een beetje** gelukkig *The monk isn't a bit happy* *Niemand is **een beetje** gelukkig

		Nobody is a bit happy Weinig monniken zijn **een beetje** gelukkig *Few monks are a bit happy*
Strong PPI (blocked in all downward-entailing contexts)	"allerminst" *(not in the least)*	*De monnik is niet **allerminst** gelukkig *The monk is not not.in.the.least happy* *Niemand is **allerminst** gelukkig *Nobody is not.in.the.least happy* *Weinig monniken zijn **allerminst** gelukkig *Few monks are not.in.the.least happy*

If such variation is attested among 'plain' PPIs, it might be expected that such variation is also attested in the domain of modals outscoping negation if these are taken to be PPIs. Again, this is indeed the case. *Should*, for instance, is a PPI, which cannot appear in the direct scope of any downward entailing context. *Must* and *to be to*, by contrast, are a weaker type of PPI, since they may appear in those contexts that are downward entailing but not anti-additive:

(28) a. Few students should leave   Should > few; *Few > should

       b. Few students must leave   Must > few; Few > must

       c. Few students are to leave   Are to > few; Few > are to

(29) a. At most five students should leave Should > at most five

                                              *At most five > should

       b. At most five students must leave   Must > at most five

			At most five > Must
	c.	At most five student are to leave	Are to > At most five
			At most five > are to

(30)	a.	Not every student should leave	Should > not every[18]
			*Not every > should
	b.	Not every student must leave	Must > not every
			Not every > Must
	c.	Not every student is to leave	Is to > not every
			Not every > Is to

(31)	a.	Only John should leave	Should > only; *Only > should
	b.	Only John must leave	Must > only; Only > must
	b.	Only John is to leave	Is to > only; Only > is to

However, in order to ensure that the differences between *must / to be to* and *should* are a consequence of their differences in PPI-strength and not due to something else, it must be shown that *should* patterns with *must* with respect to the three diagnostics of PPI-hood discussed in sections 2.1-3. *Should* indeed exhibits similar behaviour in those respects, as is shown below for metalinguistic/contrastive negation (32), intervening scope-takers (33)-(34) and clause-external negation (35).

(32)   No student SHOULD read Shakespeare; they are just encouraged to

(33)   a.   A student's mistakes shouldn't necessarily be hurled on the shoulders of

              his teachers   ¬ > necessarily > should

        b.   A student's mistakes mustn't necessarily be hurled on the shoulders of his

              teachers.[19]   ¬ > necessarily > must

        c.   A student's mistakes are not necessarily be hurled on the shoulders of his

              teachers.   ¬ > necessarily > are to

(34)   a.   She should not marry him because he looks smart but because he is a good

              linguist   ¬ > because > should

        b.   She must not marry him because he looks smart but because he is a good

              linguist   ¬ > because > must

        c.   She is not to marry him because he looks smart but because he is a good

              linguist   ¬ > because > is to

(35)   a.   The doctor doesn't think that Peter must stop smoking   ¬ > must

        b.   The doctor doesn't think that Peter should stop smoking   ¬ > should

        c.   The doctor doesn't think that Peter is to stop smoking   ¬ > is to

So English at least exhibits variation between strong and less strong PPIs. This kind of variation can also be attested in Greek and Dutch. It should be noted though, that the Greek and Dutch

modals that are comparable with *should*, are composites of the regular universal modal (*prepi/moeten*) and counterfactual morphology (In Greek, future plus past imperfective; in Dutch, a past future auxiliary, cf. Iatridou 2000; Von Fintel & Iatridou 2007):

(36)　tha eprepe　　　　　　　　　　　　　Greek

　　　fut must+past[20]

　　　'should', 'ought to'

(37)　zou moeten　　　　　　　　　　　　　Dutch

　　　would must

　　　should', 'ought to'

As is shown below, the Greek and Dutch modals expressing *should* cannot take scope between downward entailing, but non-anti-additive operators, such as 'few' and 'only', whereas the regular universal modals *prepi* and *moeten* can.

(38)　a.　　Ligi fitites prepi na figun

　　　　　　Few students must NA leave

　　　　　　'Few students must leave'

　　　　　　Must > few; Few > must

　　　b.　　Ligi fitites tha eprepe na figun

　　　　　　Few students FUT must NA leave

　　　　　　'Few students should leave'

Should > few; *Few > should

(39)   a.   Mono o Iannis prepi na figi

Only Iannis must NA leave

'Only Iannis must leave'

Must > only; Only > must

b.   Mono o Iannis tha eprepe na figi

Only Iannis FUT must NA leave

'Only Iannis should leave'

Should > only; *Only > should

(40)   a.   Weinig studenten moeten vertrekken

Few students must leave

'Few students must leave'

Must > few; Few > must

b.   Weinig studenten zouden moeten vertrekken

Few students would must leave

'Few students should leave'

Should > few; *Few > should

(41)   a.   Alleen Jan moet vertrekken

Only Jan must leave

'Only John must leave'

Must > only; Only > must

b.   Alleen Jan zou moeten vertrekken

Only Jan would must leave

'Only John should leave'

Should > only; *Only > should

So far in the section we have seen that modal PPIs differ with respect to the logical properties of their licensing contexts, just like other PPIs. This is not the only instance of variation that is attested among modals with respect to their PPI strength. Whereas *to be to* must always outscope negation and negative indefinites, as shown in (42), English exhibits variation among speakers with respect to the strength of *must* (43). While speakers agree on *must* having scope over the sentential negative marker, speakers differ in their judgments on sentences with *must* that contain a negative indefinite subject (cf. Iatridou and Sichel 2011): whereas all speakers assign a reading □ > ¬ > ∃ to sentences like (43), some speakers of English also permit ¬ > ∃ > □. We refer these two varieties of English as "English A" and "English B".

(42)   Nobody is to leave   a.   √ □ > ¬ > ∃, *¬ > ∃ > □   (English A and B)

(43)   Nobody must leave   a.   √ □ > ¬ > ∃, *¬ > ∃ > □   (English A)

                                        b.   √ □ > ¬ > ∃ , √¬ > ∃ > □   (English B)

Since *must* behaves the same in all the other diagnostics for both varieties of English, it follows that for speakers of English A *must* is a PPI of medium strength, so it cannot take scope in anti-

additive contexts (like *nobody*). However, for speakers of English B, *must* is only banned in the direct scope of the negative marker. I.e., *must*, for those speakers, is a weak PPI, which is, therefore, fine in the complement of negative indefinites.

What we see, thus far, is that the landscape of PPIs that was presented in Table I for non-modal PPIs, naturally extends to modal PPIs, as is depicted in Table II below. This further strengthens our conclusion that it is PPI-hood that underlies the scopal properties of modals with respect to negation.

TABLE II: DIFFERENT KINDS OF MODAL PPIS

Weak PPI	Must (English B),	He mustn't leave Nobody must leave Few people must leave	*: ¬ > OK: ¬ > ∃ > OK: few >
PPI of medium strength	Must (English A), to be to	He mustn't leave He isn't to leave Nobody must leave Nobody isn't to leave Few people must leave Few people aren't leave	*: ¬ > *: ¬ > ∃ > OK: few >
Strong PPI	Should	He shouldn't leave Nobody should leave Few people should leave	*: ¬ > *: ¬ > ∃ > *: few >

2.5   *Baker/ Szabolcsi facts*

A striking fact about PPIs is that whereas PPIs cannot be in the immediate scope of a clausemate negation/anti-additive operator, this configuration becomes licit when it is in the scope of an NPI licensing environment. This has been first observed by Baker (1970) and is also discussed at length in Szabolcsi (2004), for whom they are crucial to her explanation of PPI-hood (Szabolcsi 2004: 35-41). For this reason, we refer to these facts as the *Baker/Szabolcsi facts*. The relevant configurations of the Baker/Szabolcsi facts are represented and illustrated below:[21]

(44)   a.   *Neg>PPI

      b.   √ NPI licenser> Neg>PPI

(45) a.   I am surprised that John didn't call someone.   √ surprise > not > some

     b.   I regret that John didn't call someone.   √ regret > not > some

     c.   If we don't call someone, we are doomed.   √ if [not > some]

     d.   Every boy who didn't call someone...   √ every [not > some]

     e.   Only John didn't call someone.   √ only > not > some

     f.   Few boys didn't call someone.   √ few > not > some

     g.   Few boys thought that you didn't call someone.   √ few > not > some

We would like to point out, however, that the Baker/Szabolcsi facts do not apply to all PPIs, but only to those PPIs that are either weak or of medium strength. Strong PPIs cannot appear in the

scope of a negation embedded in a downward entailing context. This is shown in (46)-(47) below for a number of Dutch strong PPIs.

(46)   a.   *Hij is niet {allerminst / inderdaad / verre van} tevreden

He is not not.in.the.least / indeed / far from happy

b.   *Niemand is {allerminst / inderdaad / verre van} tevreden

Nobody is not.in.the.least / indeed / far from happy

c.   *Weinig mensen {allerminst / inderdaad / verre van} van tevreden

Few people are not.in.the.least / indeed / far from happy

(47)   a.   *Ik ben verbaasd dat je niet {allerminst / inderdaad / verre van} tevreden

bent

I am surprised that you are not not.in.the.least / indeed / far from happy

b.   *Het spijt me dat Jan niet {allerminst / inderdaad / verre van}tevreden is

I regret that you are not not.in.the.least / indeed / far from happy

c.   *Als we niet {allerminst / inderdaad / verre van} tevreden zijn, gaat het mis

If we are not not.in.the.least / indeed / far from happy, goes it wrong

d.   *Iedereen die niet {allerminst / inderdaad / verre van} tevreden is, ...

Everybody, who is not not.in.the.least / indeed / far from happy, …

e.   *Alleen Jan is niet {allerminst / inderdaad / verre van} tevreden

Only John is not not.in.the.least / indeed / far from happy

f.   *Weinig mensen zijn niet {allerminst / inderdaad / verre van} tevreden

Few people are not not.in.the.least / indeed / far from happy

g. *Weinig jongens dachten dat jij niet {allerminst / inderdaad / verre van} tevreden

was

Few boys thought that you not not.in.the.least / indeed / far from happy were

If modals outscoping negation are indeed PPIs, it is expected that exactly those PPIs that are weak or of medium strength, like English *must* or *to be to*, can occur under the scope of negation embedded in a downward entailing contexts, but that strong PPIs, such as English *should*, cannot. This is indeed the case, as is shown for English in (48)-(53) below.[22,23]

(48)   a.   If he must not work tonight he is allowed to go out with his girlfriend

$$\sqrt{} \; \neg > must$$

b.   If he is not to work tonight he is allowed to go out with his girlfriend

$$\sqrt{} \; \neg > is \; to$$

c.   If he should not work tonight he is allowed to go out with his girlfriend

$$* \; \neg > should$$

(49)   a.   Every boy who must not work tonight is allowed to go out with his girlfriend

$$\sqrt{} \; \neg > must$$

b.   Every boy who is not to work tonight is allowed to go out with his girlfriend

$$\sqrt{} \; \neg > is \; to$$

c.   Every boy who should not work tonight is allowed to go out with his

girlfriend' $$* \; \neg > should$$

(50) a. Only John must not work tonight $\quad\quad\quad\quad\quad$ √ ¬ > must

b. Only John is not to work tonight $\quad\quad\quad\quad\quad$ √ ¬ > is to

c. Only John should not work tonight $\quad\quad\quad\quad$ * ¬ > should

(51) a. Very few doctors must not work tonight. Most of them are on duty

$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad$ √ ¬ > must

b. Very few doctors are not to work tonight. $\quad\quad$ √ ¬ > are to

c. Very few doctors should not work tonight. $\quad\quad$ * ¬ > should

(52) a. I regret that John must not write a paper on that topic $\quad$ √ ¬ > must

b. I regret that John is not to write a paper on that topic $\quad$ √ ¬ > is to

c. I regret that John should not write a paper on that topic $\quad$ * ¬ > should

(53) a. I am surprised that he must not write a paper

about the Romans $\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad$ √ ¬ > must

b. I am surprised that he is not to write a paper

about the Romans $\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad$ √ ¬ > is to

c. I am surprised that he should not write a paper

about the Romans $\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad$ * ¬ > should

Finally, the Baker/Szabolcsi-facts also extend to Greek and Dutch modals. Greek *prepi* (the equivalent of English *must*) is fine in Baker/Szabolcsi contexts, but the Greek modal

construction expressing *should* (the composite of *prepi* with counterfactual morphology), is not, as is shown below: [24]

(54) a   An dhen prepi na dhulepsi apopse, bori na vgi me tin filenadha tu

        If neg must   work tonight, can   go out with the girlfriend his

        'If he must not work tonight he is allowed to go out with his girlfriend'

        if [¬ > must]

    b.   An dhen tha eprepe na dhulepsi apopse, bori na vgi me tin filenadha tu

        If neg   fut must-PST   work tonight, can   go out with the

        girlfriend his

        'If he should not work tonight he is allowed to go out with his girlfriend'

        *if [¬ > should]

(55) a.   Kathe pedhi pu dhen prepi na dhulepsi apopse bori na vgi me tin filenadha tu

        Every boy who neg must work tonight can go out with the girlfriend his

        'Every boy who doesn't have to work tonight is allowed to go out with his

        girlfriend'

        every [¬ > must]

b. Kathe pedhi pu dhen tha eprepe na dhulepsi apopse bori na vgi me tin filenadha tu

Every boy who neg fut must-PST work tonight can go out with the girlfriend his

'Every boy who should not work tonight is allowed to go out with his girlfriend'

*every [¬ > should]

(56) a. Monacha o Yanis dhen prepi na dhulepsi apopse

Only the John   neg must   work tonight

'Only John doesn't have to work tonight'

Only [¬ > must]

b.. Monacha o Yanis dhen tha eprepe na dhulepsi apopse

Only the John neg fut neg fut must-PST work tonight

'Only John should not work tonight'

*Only [¬ > should]

(57) a. Ekplissome pu then prepi na apofevgis to alati

Surprised   that neg must   avoid   salt

'I am surprised that you must not avoid salt'

Surprise [¬ > must]

b. Ekplisome pu then tha eprepe na troi alati

Surprised   that neg   should   eat salt

' I am surprised that she should not eat salt '

*Surprise [¬ > should]

The same applies to Dutch *moeten* ('must'), which is fine in Baker/Szabolcsi contexts. However, once it is combined with counterfactual morphology (*zouden moeten* 'would must'), which receives a *should*-like interpretation, it cannot be interpreted below the negation anymore:

(58)   a.   Als hij vanavond niet moet werken, kan hij met zijn vriendin uitgaan

                If he tonight neg must work,   can he with his girlfriend out.go

                'If he must not work tonight he is allowed to go out with his girlfriend'

                if [¬ > must]

        b.   Als hij vanavond niet zou moeten werken, kan hij uitgaan

                If he tonight NEG must work, can he out.go

                'If he must not work tonight he is allowed to go out'

                *if [¬ > must]

(59)   a.   Iederereen die vanavond niet moet werken, kan uitgaan

                Everybody who tonight neg must work, can out.go

                'Everybody who doesn't have to work tonight is allowed to go out'

                every [¬ > must]

b. Iederereen die vanavond niet zou moeten werken, kan uitgaan

Everybody who tonight NEG would must work, can out.go

'Everybody who shouldn't have to work tonight is allowed to go out'

*every [¬ > should]

(60) a. Alleen Jan moet vanavond niet werken

Only Jan must tonight neg work

'Only John doesn't have to work tonight'

Only [¬ > must]

b. Alleen Jan zou vanavond niet moeten werken

Only Jan would tonight NEG must work

'Only John shouldn't to work tonight'

*Only [¬ > should]

(61) a. Ik ben verbaasd dat je niet moet sporten

I am surprised that you neg must sport

'I am surprised that you must not do sports'

Surprise [¬ > must]

b. Ik ben verbaasd dat je niet zou moet sporten

I am surprised that you NEG should sport

'I am surprised that you should not do sports'

*Surprise [¬ > should]

Thus, in English, Greek and Dutch the *must*-type of modal is weak or of medium strength and may take scope in Baker/Szabolcsi contexts. However, in all these three languages, the *should*-type of modal is a strong PPI and is therefore banned from Baker/Szabolcsi contexts.

One might wonder what the difference is between *must* and *should*. It might be a "just so" matter, the way possibly the distinctions are in Table I. However, there are reasons to think that it may not be random. As said earlier, in Greek and Dutch (and many other languages; see von Fintel and Iatridou 2007), the modal that translates as *should*/*ought to* is a universal modal combined with counterfactual morphology. However, we do not yet know what the principle might be that makes the quantificationally weaker modal (*tha eprepe* / *zouden moeten*) be a strong PPI, even though the strong modal it contains (*prepi* / *moeten*) is not a strong PPI. We should point out, though, that this may not be a general pattern. We have reason to believe that in Hungarian and Croatian, the metamorphosis of *must* to *should*/*ought to* does not change the PPI properties of the resulting modal. So a lot more further investigation is needed on this point.

3 Q2. How do deontic modals take scope with respect to negation given their polarity requirements and their surface position?

In this section we address the question of how deontic modals take scope with respect to negation given their polarity requirements and their surface position (Q2 in section 1). First, in section 3.1, we discuss how neutral modals (i.e. those modals that are neither NPIs nor PPIs) end up taking scope below negation, even if they appear in a higher position than negation at surface

structure. In section 3.2 we show how the mechanism proposed in 3.1 also applies to those modals that are NPIs. In section 3.3, we discuss how PPI modals take scope above negation, regardless of their surface position in the sentence. Section 3.4 contains some concluding remarks.

We will make the following three assumptions:

(62) a.   Semantic scope should have a corresponding configuration in the (overt or covert) syntax (May 1985 and many others);

b.   Negation never lowers at LF: it is interpreted in its surface position and may only raise to a higher position at LF if it moves along with another, independently raising element (cf. Horn 1989, Zeijlstra 2004, Penka & von Stechow 2001, Penka 2010, Abels & Marti 2010);

c.   Deontic modals are base-generated lower than I°

The first and second assumptions are not controversial; the third, however, goes against received wisdom for English, so let us explicate our third assumption a bit further.

It is assumed since Chomsky 1957 that English modal verbs appearing in I^0 are base-generated in I^0. But is received wisdom correct in this case? The argument for generation in I^0 stems from the fact that these modals always *appear* in I^0. Such modals are taken to differ in two ways from regular verbs: they only come in tensed forms *and* they are generated in I^0.[25] However, only the first of these characterizations is needed, as it by itself derives the second one. We know that these deontic modal auxiliaries are moving verbs since they can make it up to C^0:

(63)   Can/may/must he leave?

If these modals are movers, and if they are always tensed, then it follows that if they are generated below I^0, they will always move to at least I^0, since tensed verbs that are able to move always move to I° or higher.
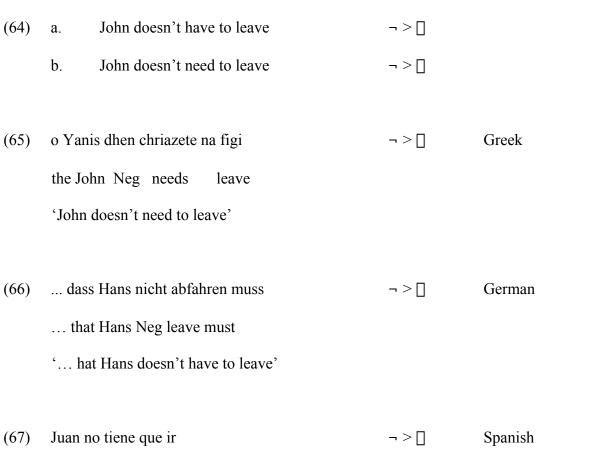
So, the view that modals that show up in I° originate in a position lower than I° is thus as consistent with the facts as the generation-in-I^0 view is. Moreover, it is superior to the latter as it requires only one assumption (modals are always tensed) instead of two assumptions (modals are always tensed and are always base-generated in I°.) In addition, as we will see, assuming that modals originate in a position lower than I° makes it possible to understand the scopal relations between modals and negation in a more straightforward way.

3.1   Neutral modals

Now it is already possible to explain the scopal behavior with respect to negation of those modals that we referred to as 'neutral deontic modals'. Those modals, like English *have to*, German *müssen* or Greek *chriazete* can occur in positive sentences and so they are not NPIs. In negative sentences, they scope under negation so they are not PPIs either.

Syntactically, however, neutral modals can appear to the right (e.g. *does not have to*) or the left of sentential negation (e.g. *can not*). Assuming that the surface position of negation corresponds to the position where negation is interpreted semantically (or at least not lower than that, as per assumption (62)b above), we do not need to say anything further for those that surface at the right of negation, as they are simply interpreted where they are in the overt syntax,

that is, their syntactic and semantic scopes are identical. Here are some examples of this category:

(64)   a.   John doesn't have to leave   ¬ >

       b.   John doesn't need to leave   ¬ >

(65)   o Yanis dhen chriazete na figi   ¬ >   Greek

       the John Neg   needs   leave

       'John doesn't need to leave'

(66)   ... dass Hans nicht abfahren muss   ¬ >   German

       … that Hans Neg leave must

       '… hat Hans doesn't have to leave'

(67)   Juan no tiene que ir   ¬ >   Spanish

       Juan Neg must PRT go

       'Juan doesn't need to leave'

However, the question remains open as to how neutral modals that syntactically appear above negation end up scoping under it. The question, in other words, is about situations where syntactic and semantic scope do not coincide, like the following English examples:

(68)   a.   John cannot leave   ¬ > ◊

b.   John may not leave $\neg > \Diamond$

Here is where our third assumption becomes relevant. If the modals in (57) are generated below I^0, then what needs to be added to account for the fact that they scope under negation is that despite the movement of these modals to a position above negation, they are interpreted in their base position, that is, below negation. There are, in principle, three options available that would achieve these results:

(69)   a.   Head-movement necessarily reconstructs

        b.   Head-movement reconstructs unless reconstruction would result in a grammatical

                  violation

        c.   Head-movement takes place at PF only and so does not feed LF (e.g.

                  Chomsky 1995, Boeckx and Stjepanović 2001, Harley 2004)

For now, we will not commit ourselves to any of the options in (69), though we will come back to these issues in much more detail in the section 3.3. But we do conclude that at least those modals that do not have polarity requirements are interpreted in their base position and therefore always take scope below negation.

3.2   NPI modals

The same reasoning for the cases in (68) can be extended to NPI modals like English *need,* German *brauchen* and Dutch *hoeven*, etc. If they appear syntactically under negation, as in the following example, there is nothing that needs to be said about them further. They are interpreted where they are in the overt syntax:

(70)   a.   ... dass Hans nicht abzufahren braucht   German

                ... that Hans not   leave   need

                '... that Hans doesn't need to leave'

       b.   dat Suzanne niet hoeft te vertrekken   Dutch

                that Suzanne not need to leave

                '... that Suzanne doesn't need to leave'

However, if the NPI modal precedes negation in the syntax, as in (60), then we need to force reconstruction to get the modal under the scope of negation.

(71)   John need not leave   ¬ >

We can again appeal to one of (69)a-c above or allude to (72):

(72)   NPIs reconstruct to a position that will satisfy their NPI-requirements.[26]

In short, neutral and NPI modal head-movement necessarily reconstructs in the examples containing neutral or NPI modals and negation or happens at PF (69).

3.3   *PPI Modals*

The problem now is to account for the scopal interpretation of PPI modals. Again, we need to discuss two cases: PPI modals that appear higher than negation in the overt syntax, and PPI modals that appear under negation in the overt syntax. Let us start with the former.

Recall the three possibilities that can derive the readings for neutral modals ((69), repeated as (73)):

(73)   a.   Head-movement necessarily reconstructs

       b.   Head-movement reconstructs unless reconstruction would result in a grammatical

             violation

       c.   Head-movement takes place at PF only and so does not feed LF (e.g.

             Chomsky 1995, Boeckx and Stjepanović 2001, Harley 2004)

If we want to say that PPI modals that are above negation in the syntax stay there for interpretation, we have to reject option (73)c right off the bat. Under the PF-movement scenario, the modal would have to be interpreted under negation[27]. See also Lechner 2006 and Hartman 2010 for more reasons to reject the suggestion that head-movement only takes place at PF[28].

Similarly, we also need to reject option (73)a, as it does not permit the modal to stay higher than negation. The only viable option is (73)b then.

Option (73)b will take care of neutral and NPI modals: NPI modals reconstruct because they have to, neutral modals because they have no reason to stay high (i.e. to not reconstruct)[29].

Option (73)b will also permit PPI modals that have moved over negation to be interpreted where they have moved to – if we add the assumption that satisfying the PPI licensing requirement is a strong enough reason for them not to reconstruct.

Finally, we come to the second (and the hardest) case, namely PPI modals that appear in the syntax under negation, like the following Greek and Spanish examples:

(74)   O Yanis dhen prepi na figi   syntactic order ¬ > ;   Greek

       John   NEG MUST leave   semantic scope: > ¬

       'John must not leave'

(75)   Juan no debe ir   syntactic order ¬ >   Spanish

       John NEG MUST   leave   semantic scope: > ¬

       'John must not leave'

How does the PPI manage to scope over negation here? DP PPIs that outscope negation are said to do so by QR (cf. Krifka 1992, Szabolcsi 2004).

(76)   John didn't see a man   ¬ > ∃; ∃ > ¬

       John didn't see some man   *¬ > ∃; ∃ > ¬

Extending this line of reasoning, it is predicted that modals, being quantifiers over world variables, may raise across negation as a result of QR as well.[30] However, this immediately brings us to the following questions:

(77) a. Where does the PPI modal move to?

   b. What is the type of the modal?

   c. What is the type of its trace?

We assume that the answer to (77)a is that some functional head should be available as a landing site for the modal, without going further into indentifying it.

   With respect to (77)b, we follow Bhatt 1997 and Wurmbrand 1999, who have argued that deontic modals are raising verbs. Thus the subject in a clause with such a modal reconstructs into its base position in the vP. Therefore, the complement of the modal at LF must be a proposition (type $<s,t>$) and we take the type of the modal thus to be $<<s,t>, t>$.

   As for (77)c, we follow Fox 2006 among others, who have argued that (using different mechanisms) in the absence of specific clues for a type, the trace has the lowest type that will make the composition work. That means that in our case, the type of the trace would be s.

   Hence the representations of the surface and LF structures containing the modals are as in (78) and (79) respectively:[31]

(78) [not   [PPI-modal   [vP]]]   Surface structure

   $[<t,t>$ $[<<s,t>, t>$ $[<s,t>]]]$

(79) [PPI-modal$_i$ [not   [t$_i$ [vP]]]]   LF

   $[<<s,t>, t>$ $[<t,t>$ [s $<s,t>]]]]$

If these assumptions are correct, PPI modals that appear syntactically under negation may thus undergo covert movement to a position above negation.

Note that this predicts that only those PPIs that can independently undergo movement (such as quantifier raising) are PPIs that can be rescued if they appear under the scope of negation. To the best of our knowledge, this is correct. PPIs like *some*, and as discussed above *must*, are quantificational and can be interpreted above negation even if they appear under negation at surface structure. Other PPIs, such as *tons, utterly, insanely, way (too), sorta, rather,somewhat* (all taken from Israel 1996) are not quantificational and cannot undergo raising across negation:

(80) a. *I don't have tons of money

b. *I am not way too tall

c. *I am not somewhat ill

In order to show that this is the best way to account for the scopal readings of PPI modals that appear below negation at surface structure, it needs to be shown that alternative accounts face problems.

One alternative would be to assume that the scope of the PPI over negation is not achieved syntactically but is the result of e.g. some interplay of presuppositions and implicatures. An instance of such a mechanism is Gajewski's pragmatic explanation of neg-raising (though see Homer 2010 for why neg-raising is not behind the interaction of *must* and negation).[32] However, more evidence can be provided that shows that it is a level of *syntactic* representation where the modal is higher than negation, even though in overt syntax it appears under negation.

One indication that the scope of modals and negation is computed at a syntactic level of representation is the sensitivity of other elements to this configuration. One such case in question is English PPI *must* and neutral *may,* on their deontic interpretations:

(81) a. John must not leave   > ¬

   b.   John may not leave   ¬ > ◊

Suppose now that the subject of these modals is a PPI. Both wide scope and narrow scope interpretations of the DP are possible:

(82) a. Some students must leave *some students>must, must>some students*

   b. Some students may leave *some students>may, may>some students*

Now consider what happens when negation enters the picture as well. For both modals, their relative scope with negation is fixed: *must* scopes over it, and *may* scopes under it. What about the scope of the DP?

As we indicate below, the two scope construals are still possible in the *must* case because the PPI *some students* can satisfy its PPI property while still scoping over or under the modal *must*[33]:

(83) Some students must not leave *some students > must >¬* (wide scope)

              must > some students >¬ (narrow scope)

However, with *may*, a narrow scope interpretation for the DP does not seem possible. We take it that this is because the PPI *some students* can now not satisfy its PPI property while scoping under *may* for a de dicto reading:[34]

(84)   Some students may not leave   *some >¬ >may*   (wide scope)

                                             * ¬ > *may* > *some*   (narrow scope)

In other words, even though both *must* and *may* syntactically appear before negation, a PPI subject cannot be under *may* without being under negation as well, which is a point in favor of the proposed LF configuration: It shows that at the level where the scope of the DP is determined, the modal already outscopes negation.

(85)   a.   [[Some students] must$_i$ [not t$_i$ [leave]]]   LF (wide scope)

        b.   [must$_i$ [[Some students] not t$_i$ [leave]]]   LF (narrow scope)

(86)   a.   [$_{IP}$ [Some students] [not may [$_{vP}$ leave]]]   LF (wide scope)

        b.   * [$_{IP}$ [not may [$_{vP}$ [Some students] leave]]]   LF (narrow scope)

If the narrow and wide interpretations are the result of the DP being in a certain position at LF, then the conclusion is that the modal outscopes negation already at LF, a level of syntactic representation. If pragmatic considerations were involved in determing the relative scope of the modal and the negation, then why do we see this relative scope having an effect on the scope of

another element in the sentence? On the other hand, if scope is determined at LF, all falls into place.

These considerations also naturally extend to Spanish. Spanish has PPI *deber* and neutral *tener que*[35]. Both verbs appear after negation in the overt syntax:

(87)   a.   Juan no debe ir   > ¬

                      Juan Neg must go

        b.   Juan no tiene que ir   ¬ >

                      Juan neg has to go

(88)   a.   Alguien no debe ir   alguien > debe > ¬,

                      somebody neg must go   debe > alguien > ¬

        b.   Alguien no tiene que ir   alguien > ¬ > tiene,

                      somebody neg has to go   *¬ > tiene > alguien

Again the narrow interpretation of the PPI subject is not possible with the neutral modal, because the PPI property of the subject cannot be satisfied in the position where it would have to be to receive the narrow scope[36]. On the other hand, the PPI subject can be above or under the scope of the PPI modal (to achieve wide or narrow scope with respect to it) even though in the overt syntax, the PPI modal appears under negation. This means that at the level where the relative scope of the modal and the subject DP is established, the *deber* modal is above negation.

If PPI modals take scope above negation by moving across it, we predict that if a modal is unable to move due to some independent mechanism that blocks movement (e.g. the Head

Movement Constraint (Travis 1984)), movement can no longer apply. One such case might well be the behaviour of the French universal modal in perfective constructions.

Homer 2010 shows that French universal modal *devoir* may scope both above and under negation, a property that he alludes to as lexical ambiguity: *devoir* comes about in two guises, according to him: one PPI and one what we would call "neutral":[37]

(89)   Il ne doit pas partir $\neg >$, $> \neg$

       He modal not leave

       'He must not leave', 'He does not have to leave'

We found that this scopal ambiguity persists when the modal is infinitival:

(90)   a.   Ne pas devoir faire la vaisselle, c'est super   preferred: $\neg >$

               Neg modal do   the dishes , that is great

               'It is great to not have to do the dishes'

       b.   Ne pas devoir fumer pendant 5 heures, c'est terrible   preferred: $> \neg$

               Neg modal smoke during 5 hours , that is terrible

               'To not be allowed to smoke during 5 hours, that is terrible'

Since the reading $> \neg$ is possible, it means that in (90)b the modal can covertly move across negation. Consider now (91), in which the modal is put in the perfective. When the modal is put

in the perfective, there is an entailment that the underlying event happened (Bhatt's 2000 "actuality entailment"; see also Hacquard 2006)

(91)   Jean a du prendre l'autobus

Jean has modal(participle) take the bus

' Jean was forced by circumstances to take the bus'

Putting aside the question of how the actuality entailments come about, the auxiliary provides us with a higher head that might potentially block movement of the modal over negation. Note that indeed this head blocks covert raising of *devoir* across *pas*:

(92)   Jean n'a pas du prendre l'autobus   ¬ > ,* > ¬

Jean have NEG modal.PART take the bus

This sentence means that Jean was not forced to take the bus. It does not mean that he was forced by the circumstances to not take it. Although, it is too early to conclude with any certainty that it is the HMC that is at play in (92), it is a clear possibility. The exact interplay of the HMC, modal raising and the possible interference of actuality entailments remains subject to further study.

3.4   Concluding remarks

To conclude, the assumptions adopted in this section correctly predict that exactly those modals that are neutral or NPIs take scope under negation: all such modals discussed are base-generated below negation and obligatorily reconstruct.

Reconstruction of head movement can only be overruled if head reconstruction causes ungrammaticality.[38] This is the reason why PPI modals do not reconstruct. Even stronger, since modals are quantifiers (over possible worlds) they may even covertly raise across negation if absence of raising would lead to a PPI violation.

Note that this does not entail that PPI modals must always take scope over negation. In all those cases, described in section 2, where PPIs may scope under negation (e.g. if some intervening element takes scope between the PPI modal and its licenser or if the PPI modals is embedded in a Baker/Szabolcsi type of context) it is predicted that the modal can take scope under negation, since reconstruction of the PPI modal to its base position no longer leads to a grammaticality violation.

4. **Q3. How can the NPI/PPI properties of deontic modals be captured? What makes a (modal) polarity item a polarity item?**

Our proposal is that the scopal properties of deontic modals with respect to negation follow from their polarity sensitivity properties: English *need* is an NPI; *must*, *should*, *to be to* are PPIs; *have to*, *need to* are polarity-neutral. The question now arises how the NPI and PPI property of these modals can be accounted for. That is, what sort of properties are associated with lexical items that exhibit polarity behavior?[39] We are unable to provide a conclusive answer to this question here; in fact, there is very little agreement about what is responsible for the properties of more

familiar PPIs. Even so, in this section we will sketch an outline of what might be said about modal PPIs within existing frameworks.

Basically, two different types of approaches to the question of what a polarity item is endowed with can be distinguished, aligned with the answer to the question of whether the licensing of NPIs and PPIs is of a semantic/pragmatic or rather of a syntactic nature.[40]

For the semantic/pragmatic approach, NPIs and PPIs are always endpoints of a scale and must obligatorily introduce alternatives. A sentence with an NPI or a PPI comes with certain semantic/pragmatic strengthening requirements that need to be fulfilled. If these are not fulfilled, the sentence violates its conditions of use. We will call this approach the "semantic/pragmatic approach."

On the other hand, the researchers who take NPI/PPI licensing to be a matter of syntax basically postulate a certain set of features on NPI and PPIs. These features come with particular requirements to be fulfilled, e.g. checking by negation, and if these requirements are not met, the resulting sentence is ungrammatical. We refer to this approach as the "syntactic approach."

4.1   Semantic/Pragmatic Approaches

The idea that sentences containing NPIs in non-downward entailing contexts are bad because such sentences violate their conditions of use goes back to Kadmon & Landman (1993). This insight has been adopted in various ways by Krifka (1995), Lahiri (1998), Israel (1996) and Chierchia (2006, 2011). All of these analyses share the following claim: (most) NPIs denote low scalar endpoints and PPIs high end points, and they introduce alternatives which affect the domain of quantification.[41] As a result of their domain widening property the contribution of

sentences containing an NPI or PPI is either extremely low or high, depending on the polarity of the clause they appear in. NPIs in non-negative (or non-downward entailing) contexts are highly uninformative; PPIs in such contexts are highly informative. Naturally, once such elements appear in a scale-reversing environment, their informativity reverses too: NPIs embedded in a negative (or other downward entailing) context become highly informative; PPIs in such contexts, by contrast, become very uninformative. Furthermore, all analyses share that, if by some semantic or pragmatic mechanism, sentences containing an NPI or PPI become exhaustified, (i.e. all stronger sentences than the one containing an NPI or PPI are taken to be false) then the sentences that are extremely uninformative will even yield a semantic contradiction.[42]

Under the analyses outlined above, high-scale elements, such as English *must*, can become PPIs if they are domain wideners (thus introducing domain alternatives) that are in need of strengthening by exhaustification. Thus, if it is assumed that *must*, as well as Dutch *moeten* and Greek *prepi*, has these properties, its PPI-hood can be formulated under the semantic/pragmatic approaches.[43]

How can we prove that *must* (and the other PPI-modals) obligatorily introduce domain alternatives? In truth, we cannot. The reality is that the diagnostics to detect whether some element introduces domain alternatives in general are very weak. For instance, it is very hard to prove independently that *any* obligatorily introduces domain alternatives and causes domain widening, while *a* does not. The only thing that can be said is that if elements like *must* are assigned the ability to introduce alternatives, then it may be possible to express their PPI-hood in certain pre-existing terms.

Moreover, if such an analysis is correct, the question arises as to why *must* is only banned

from anti-additive contexts and not from all downward entailing contexts.

Another problematic question that arises is the following: since nothing specific in the discussion of polarity hinges on the choice of world variables instead of variables over individuals, we would expect PPIs and NPIs to have either universal or existential force in both. This is not what is found, however. In the domain of individuals, PPIs and NPIs only seem to come with existential force; no polarity items with universal force over individuals seem to exist.[44] However, in the modal domain, PPIs and NPIs are found on items with universal force PPIs. and at least among the deontic modals, no PPIs or NPIs with existential force have been reported.[45] If these are not gaps in our knowledge but actual gaps, the related questions would need to be addressed before we can be satisfied that we have an adequate understanding of the issues involved.[46]

4.2   Syntactic approaches

The tradition that takes NPIs to come along with a syntactic requirement that they be licensed by a (semi-)negative operator goes back to Klima (1964), and has been presented in more recent frameworks by Progovac (1992, 1993, 1994), who takes NPI licensing to be some special instance of syntactic binding, and by Laka (1990), who relates NPIs to the obligatory presence of an affective phrase (ΣP). Postal (2000), followed by Szabolcsi (2004) introduces a revival of Klima's theory and claims that NPIs, such as English *any*, underlyingly carry a negation:[47]

(93)   any: [$_D$ NEG [SOME]]

On the other hand, a PPI like *somebody* has two negations:

(94)   any: [$_D$ NEG [NEG [SOME]]]

In regular positive contexts ¬¬∃ can be realized as *some*. But, why can't *some* appear in negative contexts as well? In other words, what explains the positive polarity of PPIs?

For Szabolcsi, following up on Postal's ideas, this is because the two negative features are "dormant". Dormancy is the state in which the two negative features cancel each other out. However, when the PPI finds itself under a downward entailing operator, something goes wrong. The downward entailing operator activates and licenses (in her terms "absorbs") one of the negative features of the PPI. Since now the first negative feature has been absorbed, the second negative feature is no longer in a dormant stage, as the first feature no longer cancels it out.

In short, the reason that a PPI is ungrammatical under a single downward entailing operator is not that there is an abstract prohibition against PPIs being in the scope of such operators (as also evidenced by the fact that they can appear in such scope when the operator is extraclausal). The reason that a PPI under a clausemate DE operator is bad is because the [DE-Op > PPI] complex contains what essentially is an unlicensed NPI.

Within this approach, the representation of NPI modals would be as follows::

(95)   need/hoeven/brauchen: [$_V$ NEG [   ]]

And that of PPI modals as follows::

(96)   must/prepi/moeten: [$_V$ NEG [NEG [   ]]]

The complex ¬¬∀ then spells out as *must/prepi/moeten*. But, the two negations can also be spelled out in different positions in the sentence (as long as both are spelled out).

So, in principle, the fact that among deontic modals both NPIs and PPIs can be attested for is accounted for under this approach. However, there are again several problems.

A first difficulty that such purely syntactic approaches face is to understand why most types of NPIs denote the endpoint of a scale, e.g. *lift a finger*, *have a red cent,* a fact that lies at the heart of the scalarity approach. If being an NPI is merely a matter of having certain syntactic features, then we would expect a more random distribution of NPIs, and not the observed higher concentration within the class of scalar items.[48]

A second problem, especially for feature-checking approaches, is that the locality restrictions on NPI licensing appear to be weaker than those for regular feature checking. For instance, NPIs can be licensed across the boundaries of a clause, even across an island, something, which is not possible in more established varieties of feature checking.

(97)   a.   I didn't say that Mary bought any cookies

        b.   I don't work in order to make any money

A third problem for the syntactic approach concerns the licensing of NPIs by downward entailing determiners. For Postal, this means that an NPI-licensing expression, such as *few*, must

contain an underlying (incorporated) negation. However, whereas for an element like *few* it can be easily seen that it is decomposable into a negation and a quantifier like 'many'. For other downward entailing environments, such as an *if*-clause or the first argument of a universal quantifier, this is less clear.

The first two problems naturally extend to the application of the syntactic approach to modals. PPI and NPI modals clearly denote endpoints of scales, as they are universal, and modal NPIs can also be checked by a negation in another syntactic domain:

(98) a.   Ik zeg niet dat hij hoeft te werken   Dutch

              I say NEG that he needs to work

              'I don't say that he has to work'

      b.   Ik werk niet om honger te hoeven lijden

              I work not PRT hunger to need I suffer

              'I don't work in order to have to suffer from starvation'

But it is unclear whether the third problem applies to modals. As has been noted by Hoeksema (2008), Dutch *hoeven* is much more restricted in terms of its licensing conditions than other NPIs. It can be licensed by some non-anti-additive downward entailing operators (e.g. negative universals or 'only'), showing that it is a weak NPI, but it fails to do so in others, such as the first argument of a universal quantifier or in an *if*-clause:

(99) a.   Niet iedereen hoeft te werken   Dutch

              Not everybody needs to work

'Not everybody needs to work'

b. Alleen Jan hoeft te werken

Only John needs to work

'Only John needs to work'

(100) a. *Iedereen die hoeft te werken wordt om 7:00 verwacht

Everybody who needs to work is at 7:00 expected

'Everybody who needs to work is expected at 7:00'

b. *Als je hoeft te werken, word je om 7:00 verwacht

If you need to work, are you at 7:00 expected

'If you need to work, are you expected at 7:00'

These facts also apply to English *need* and German *brauchen*.

(101) a. Not everybody need know

b. Only God need know

(102) a. *Everybody who needs know, should be informed

b. *If you need know, you'll be informed

(103) a. Nicht jeder braucht zu arbeiten   German

Not everybody needs to work

'Not everybody needs to work'

b.   Nur Hans braucht zu arbeiten

          Only John needs to work

          'Only John needs to work'

(104) a.   *Jeder der zu arbeiten braucht, wird um 7:00 erwartet

          Everybody who to work needs is at 7:00 expected

          'Everybody who needs to work is expected at 7:00'

b.   *Wenn zu arbeiten brauchst, wirdst du um 7:00 erwartet

          If you to work need, are you at 7:00 expected

          'If you need to work, are you expected at 7:00'

These data suggest that perhaps the NPI modals are actually better NPI candidates for the Postal proposal than English *any*-terms, as these modals are restricted to those contexts that seem to spell out a separate negation.[49,50]

Several additional questions arise when applying the syntactic approach to NPI and PPI modals. For instance, Szabolcsi's approach makes no predictions about what type of elements can be NPIs and PPIs. The only claim that is made in this respect is that PPIs in some sense form a subclass of NPIs (i.e. if NPIs are defined as elements carrying a negative feature, then all PPIs count as some specific type of NPIs). Hence, the question remains open as to why only universal deontic modals may come about as NPIs or PPIs and never existential deontic modals, something that is also a question for the scalarity approach.

4.3   *Comparison*

So far, it looks like both type of approaches have some amount of success in accounting for the PPI / NPI-hood of modals, but at the same time face problems as well.

Under the scalarity approach, it can be explained why *must*, as well as the other deontic modals that scope above negation, are PPIs, but only if some general assumptions about obligatory introduction of (domain) alternatives and obligatory exhaustification are adopted, as well as additional assumptions as to why PPIs like *must* are banned from anti-additive contexts only. Also, additional assumptions need to be adopted before we can understand why PPIs are widely attested among universal modals, but do not appear to show up in the domain of universal quantifiers over individuals. Also, under this approach, it cannot straightforwardly be accounted for why no existential deontic PPI modals are attested and why certain universal modals are NPIs.

Under the syntactic approach, the question of why certain modals are NPIs or PPIs appears less accute but mostly because under this approach there is no restriction as to what elements are prone to become NPIs or PPIs in the first place. Also, the syntactic approach argues that it is just negation (or more precisely, some negative feature) that can license NPIs and not downward entailment. Whereas this is generally thought to be problematic when it comes to accounting for the fact that most NPIs are licensed in all downward entailing contexts, interestingly, it may fit the nature of NPI modals, which appear to be restricted to those licensing contexts that exist of a decomposable negation.

5.   Q4. To what extent does the analysis apply to epistemic modals too?

Finally, the question arises as to what extent the account for the scopal relations between deontic modals and negation extends to epistemic modals as well. Generally, the way a modal scopes with respect to negation on its deontic interpretation is the same as the way it scopes with respect to negation on its epistemic interpretation. This is below *have to*, *can* and *must*:

(105) a. He doesn't have to leave   Neg>Modal

  b. He doesn't have to have fallen. (…Maybe somebody pushed him) Neg>Modal

(106) a. He can't leave   Neg>Modal

  b. He can't be home yet   Neg>Modal

(107) a. He must not leave   Modal>Neg

  b. (His car is not in the driveway.) He must not be home[51]   Modal>Neg

And the same holds for other languages, such as Greek (108), Dutch (109)-(110):

(108) a. Dhen bori na pai sinema   Neg>Modal

    Neg   can INFL go movies

    'He cannot go to the movies'

  b. Dhen bori na echi ftasi idhi   Neg>Modal

    Neg   can   has arrived already

    'He cannot have arrived already'

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(109) a.   Hij hoeft het niet te doen   Neg>Modal

He needs it not to do

'He doesn't have to do it'

b.   Hij hoeft het niet gedaan te hebben   Neg>Modal

He needs it not done to have

'He doesn't have to have done it'

(110) a.   Hij kan niet vertrekken[52]   Neg>Modal

He can not leave

'He can not leave'

b.   Hij kan niet in zijn kamer zijn   Neg>Modal

He can not in his room be

 'He cannot be in his room'

The data so far point in a direction where it appears that if a deontic modal is a PPI or an NPI, it exhibits the same kind of polarity-sensitive behavior in its epistemic usage, but we also found counterexamples to this.

However, we find, rather surprisingly, that certain modals are more restricted in their scopal properties with respect to negation in their epistemic usages rather than in their deontic usages. Below we provide two such puzzling cases, where modals that are polarity neutral in their deontic usages appear to be polarity-sensitive once they are interpreted epistemically.

It thus seems to be possible that modals may be more restricted in their scopal behavior with respect to negation when they receive an epistemic interpretation rather than when they are interpreted deontically. To the best of our knowledge, a reverse pattern has not been attested, but at this stage the number if investigated languages is too small to make any substantive claims along these lines.

5.1   *Puzzle #1: Epistemic* **may**

Deontic *may* scopes under negation. Epistemic *may*, however, scopes over negation:

(111) a.   He may not go to the movies   Neg>may

     b.   He may not have left earlier in the day   May>neg

At least three possible explanations open up at this point:

(112) a.   There are two independent modals, one neutral (the deontic one) and one PPI (the epistemic one). There is (accidental) homophony.

     b.   There is one modal, and depending on what modal base it combines with, it behaves like a neutral or a PPI modal.

     c.   The epistemic modal is generated in a position higher than negation. As a result, it can never reconstruct to a position under negation, which would be necessary in order for it to behave like a neutral modal.

Option (112)a is a "just so" story. It may very well be the truth, but if it is, there wouldn't be much more to say about it.

In Option (112)b, the information of which modal base is at play will have to be available at LF so that the option of reconstruction (to yield the neutral modal) or no reconstruction (to yield the PPI modal) can be chosen. But if this is the way to go, we have to be clear that we would still be dealing with a property of *may* itself and not of epistemic modals in general. The reason is that there are modals that scope under negation on both their deontic and their epistemic functions, as shown in above.

The same point should be made for Option (112)c: if *may* scopes over negation because it is generated higher than it, this is also a property of epistemic *may* and not of epistemic modals in general, as there are certainly such that scope under negation, and so cannot have been generated higher than it.

A final point that should be made here is that contra to what we saw in the domain of deontic modals, in *may* we would have an existential modal PPI.

5.2   *Puzzle #2: Epistemic* **can't**

For many English speakers, *can* does not appear to be able to function as an epistemic modal. However, *can't* does function epistemically:

(113) a.   He arrived very early. This means that he may have left early

      b.   He usually sleeps until noon. This means that he can't have left early.

One way to describe this situation is to say that epistemic *can* is an NPI modal. If this is the case, we have another difference with the deontic paradigm, where no NPI modals were found with existential force.

However, we should also point out that we have found considerable variation with respect to which DE environments license epistemic *can* (recall in this regard the discussion of Hoeksema 2008 above, about NPI modals being licensed by a surprisingly small number of environments):

(114) He may / $^{\%/*/?}$can never have left

(115) Few people may / $^{\%/*/?}$can have left

(116) Only John may / $^{\%/*/?}$can have left

(117) Everybody who may/ $^{*/?}$can have been there at the time of the murder should be interviewed

(118) If he may/ $^{*/?}$can have been there at the time of the murder he should be interviewed.

The aforementioned properties of epistemic *may* and *can't* may be related in that we have deviations from the deontic paradigm in two directions: both in the existence of PPI and NPIs. In

fact, it would actually nicely pattern with the observation by Van der Wouden (1994) that if you have NPIs in one domain, you may find PPIs there as well, and vice versa.

6.   Conclusions

In this article we addressed the questions Q1-4, which are repeated below.

Q1:   To what extent do deontic PPI modals and better-known PPIs exhibit the same distributional behavior?

Q2:   How do deontic modals take scope with respect to negation given their polarity requirements and their surface position?

Q3:   How can the NPI/PPI properties of deontic modals be understood?

Q4.   To what extent does the analysis apply to epistemic modals too?

We have shown that, with respect to Q1, the distribution of PPI modals and other known PPIs is virtually identical, providing evidence that an analysis that aims at accounting for the scopal behavior of deontic modals with respect to negation in terms of polarity properties of modals is on the right track.

As for Q2, we argue that once it is adopted that modals obligatorily undergo reconstruction to a position below negation, unless this reconstruction leads to a violation of a PPI licensing requirement, it can be understood why all neutral and NPI modals take scope under negation, whereas PPI modals do not. In addition, we provide evidence that shows that scope construal of NPI and PPI modals takes place at a moment no later than to the construal of wide and narrow reading of subjects with respect to modals, suggesting that the solution to the question as how modals take scope with respect to negation indeed lies in the syntax/semantic component of the grammar and is not an instance of post-grammatical computation of inferences.

With respect to Q3, we have argued that although several problems still arise, current approaches that aim at explaining why certain elements are sensitive to the polarity of the environment they appear in, may capture at least why some modals are PPIs or NPIs. In particular, the scalarity approach seems to fare quite well with explaining why certain modals may not appear in negative clauses and the syntactic approach seems to give a good handling of the exact licensing conditions of those modals that may not appear in positive clauses.

Finally, as for Q4, we find that generally speaking, the analysis above extends to epistemic modals as well (e.g. Dutch *hoeven*, Greek *prepi*, English *must*). But we also find, rather surprisingly, that certain modals are more restricted in terms of polarity-sensitivity in their epistemic usages rather than in their deontic usages. The exact cause for these further restrictions are subject to future study.

References

Abels, K. & L. Marti. (2010: 'A unified approach to split scope.' In *Natural Language Semantics 18*: 435-170.

van der Auwera. J. (2001): 'On the typology of negative modals.' In J. Hoeksema, H. Rullmann, V. Sánchez-Valencia & T. van der Wouden (eds.), *Perspectives on Negation and Polarity Items*, 23-48. Amsterdam: Benjamins.

Baker, C. (1970): 'Double negatives.' In *Linguistic Inquiry 1*: 169-186.

Beaver, D. & B. Clark. (2008): *Sense and Sensitivity: How Focus Determines Meaning*. Oxford: Wiley-Blackwell.

Bhatt, R. (1997): 'Obligation and Possession.' In H. Harley (ed.), *The Proceedings of the MIT roundtable on argument structure*. Cambridge, MA: MITWPL.

Bhatt, R. (2000): *Covert modality in non-finite contexts*. PhD dissertation, University of Pennsylvania.

Boeckx, C. and X. Stjepanović (2001): 'Head-ing toward PF.' *Linguistic Inquiry 32*: 345-355.

Butler, J. (2003): 'A minimalist treatment of modality.' *Lingua 113*: 967-996.

Chierchia, G. (2006): 'Broaden your views. Implicatures of domain widening and the "Logicality" of language.' In *Linguistic Inquiry 37*: 535-590.

Chierchia, G. (2011): *Meaning as an inferential system. Polarity and free-choice phenomena*. Ms Harvard University.

Chomsky, N. (1957): *Syntactic Structures*. The Hague: Mouton.

Chomsky, N. (1995): *The minimalist program*. Cambridge, MA: The MIT Press.

Corblin, F., V. Déprez, H. de Swart & L. Tovena (2004): 'Negative concord.' In F. Corblin & H. De Swart (eds), *Handbook of French Semantics*, 417-452. Stanford: CSLI Publications.

Cormack, A. & Smith (2002): 'Modals and negation in English.' In S. Barbiers, F. Beukema & W. van der Wurff (eds), *Modality and its Interaction with the Verbal System*, 133-163. Amsterdam: Benjamins.

De Haan, F. (1997): *The Interaction of Modality and Negation: A Typological Study*. New York: Garland.

De Swart, H. (1998): 'Licensing of negative polarity items under inverse scope.' *Lingua, 105*: 175-200.

Den Dikken, M. (2004): 'Parasitism, secondary triggering and depth of embedding.' In Zanuttini, R. Campos, H. Herburger, E & Portner. P. (eds.). *Crosslinguistic Research in Syntax and Semantics: Negation, Tense, and Clausal Architecture*. Georgetown: Georgetown University Press, Washington, D.C.

Diesing, M. (1992): *Indefinites*. Cambridge, MA: MIT Press.

von Fintel, K. & S. Iatridou (2007): 'Anatomy of a Modal Construction.' *Linguistic Inquiry 38*: 445–483.

Fox, D. (2006): *Economy and Semantic Interpretation*. Cambridge, MA: The MIT Press.

Fox, Danny, and Martin Hackl (2006): 'The universal density of measurement.' *Linguistics and Philosophy 29*: 537–586.

Gajweski, J. (2007): 'Neg-raising and polarity,' *Linguistics and Philosophy 30*: 289-328.

Gajewski, J. (2002): *On Analyticity in Natural Language*. Ms UConn.

Giannakidou, A. (1998): Polarity Sensitivity as (Non)veridical Dependency. John Benjamins: Amsterdam-Philadelphia.

Giannakidou, A. (2010): 'Negative and positive polarity items: licensing, compositionality and variation.' In C. Maienborn, K. von Heusinger & P. Portner (eds). *Semantics: An International Handbook of Natural Language Meaning*. Berlin: Mouton de Gruyter.

Harley, H. (2004: 'Merge, Conflation, and Head Movement: The First Sister Principle Revisited.' In K. Moulton & M. Wolf (eds.), *Proceedings of NELS 34*, 239-254. Amherst, MA: GLSA.

Hacquard, V. (2006): *Aspects of Modality*. PhD Dissertation, MIT.

Hartman, J. (2010): 'The semantic uniformity of traces.' In *Linguistic Inquiry 42*: 364-388.

Herburger, E. & S. Mauck (2007): 'A new look at Ladusa's puzzle.' In: H. Zeijlstra & J.-P. Soehn (eds.): *Proceedings of the Workshop on Negation and Polarity,* 64-70.Tübingen: Collaborative Research Centre 441.

Hoeksema, J. (2008): 'Distributieprofielen van negatief-polaire uitdrukkingen: een vergelijking van het Nederlands, Engels en Duits.' *Tabu 37*: 111-195

Homer, V. (2010): 'Epistemic Modals: High ma non troppo.' To appear in *The proceedings of NELS 40*.

Homer, V. (2012a): *Neg-raising and Positive Polarity: The View from Modals.* To appear in *Semantics and Pragmatics*.

Homer, V. (2012b): 'Domains for Polarity Items.' To appear in *Journal of Semantics.*

Horn, L. (1972): *On the Semantic Properties of Logical Operators in English*. Ph.D. Dissertation, University of California, Los Angeles.

Horn, L. (1989): *A natural history of negation*. Chicago: The University of Chicago Press.

Horn, L. (2007): 'Histoire d'*O: Lexical pragmatics and the geometry of opposition.' In J.-Y. Béziau & G. Payette (eds.) *New Perspectives on the Square of Opposition,* 393-426. New York; Peter Lang.

Iatridou, S. (2000): 'The grammatical ingredients of counterfactuality.' In *Linguistic Inquiry 31*: 231–270.

Iatridou, S. & I. Sichel (2011): 'Negative DPs, A-Movement, and Scope Diminishment.' *Linguistic Inquiry 42*: 595-629.

Iatridou, S. & H. Zeijlstra (2010): 'On the scopal interaction of negation and deontic modals.' In: M. Aloni, H. Bastiaanse, T. De Jager & K. Schulz (eds). *Logic, language and Meaning*. Berlin: Springer.

Israel, M. (1996): 'Polarity Sensitivity as Lexical Semantics.' In *Linguistics & Philosophy*. *19*: 619-666.

Jackendoff, R. (1972): *Semantic Interpretation in Generative Gramma*r. Cambridge, MA: The MIT Press.

Jacobs, J. (1980): 'Lexical decomposition in Montague Grammar.' In *Theoretical Linguistics 7*: 121-136.

Kadmon, N. & F. Landman (1993): 'Any.' In *Linguistics and Philosophy 16*: 353-422.

Klima, E. (1964): 'Negation in English'. In: J. Fodor & J. Katz (eds), *The Structure of Language. Readings in the Philosophy of Language*. Englewoods Cliffs, NJ: Prentice-Hall.

Krifka, M. (1992): 'Some remarks on polarity items.' In D. Zaefferer (ed.), *Semantic Universals and Universal Semantics*, 150-189. Berlin: Foris.

Krifka, M. (1995): 'The semantics and pragmatics of polarity items in assertion.' *Linguistic Analysis 15*:209-257.

Kroch, A. (1979): *The Semantics of Scope in English*. New York: Garland.

Ladusaw, W. (1979): *Polarity Sensitivity as Inherent Scope Relations*. NY: Garland Publishing.

Ladusaw, W. (1992): 'Expressing negation'. In: C. Barker & D. Dowty (eds), *SALT II*. Ithaca, NY: Cornell Linguistic Circle.

Lahiri , U. (1998): 'Focus and negative polarity in Hindi.' *Natural Language Semantics 6*: 57-23.

Laka, I. (1990): *Negation in Syntax: On the Nature of Functional Categories and Projections*. PhD Dissertation, MIT.

Lechner, W. (2004): 'An interpretive effect of Head Movement.' In M. Frascarelli (ed.), *Phases of Interpretation,* 45-69. Berlin/New York, Mouton de Gruyter,

Liberman, M. & I. Sag (1974): 'Prosodic form and discourse function'. In *Chicago Linguistics Society 10*: 416-427.

Linebarger, M. (1981): *The Grammar of Negative Polarity.* PhD Dissertation, MIT.

Linebarger, M. (1987): 'Negative Polarity and Grammatical Representation.' In *Linguistics and Philosophy 10*: 325–387.

May, R. (1985): *Logical Form: Its Structure and Derivation*. Cambridge, MA: The MIT Press.

Penka, D. & A. von Stechow (2001): Negative Indefinita unter Modalverben. In R. Müller & M. Reis (eds), *Modalität und Modalverben im Deutschen*, 263-286. Hamburg: Helmut Buske Verlag.

Penka, D. (2010): *Negative Indefinites*. Oxford: Oxford University Press.

Postal, P. (2000): 'An introduction to the grammar of *squat*.' Ms. NYU.

Progovac, L. (1992): 'Negative Polarity: A Semantico-Syntactic Approach.' In *Lingua 86*: 271-299.

Progovac, L. (1993): 'Negative Polarity: Downward Entailment and Binding.' In *Linguistics and Philosophy* 16: 149-180.

Progovac, L. (1994): *Negative and Positive Polarity: A Binding Approach*. Cambridge Studies in Linguistics 68. Cambridge: Cambridge University Press.

Rooth, M. (1985): *Association with Focus*. PhD Dissertation, University of Massachusetts, Amherst.

Rullman, H. (1995): 'Geen eenheid.' In *Tabu 25*: 194-197.

Szabolcsi, A. (2004): 'Positive polarity-Negative polarity.' In *Natural Language and Linguistic Theory 22*: 409-452.

Travis, L. (1984): *Parameters and Effects of Word Order Variation*. PhD Dissertation, MIT.

Neeleman, A. & H. Van de Koot (2002): 'The Configurational Matrix.' In *Linguistic Inquiry 33*: 529-574.

Wagner, M. (2006): 'Association by movement: evidence from NPI-licensing.' *Natural Language Semantics 14*: 297–324.

van der Wouden, T. (1994): *Negative contexts.* PhD Dissertation. University of Groningen..

Wurmbrand, S. (1999: 'Modal verbs must be raising verbs.' In S. Bird, A. Carnie, J. Haugen & P. Norquest (eds.), *Proceedings of the 18th West Coast Conference on Formal Linguistics (WCCFL 18),* 599–612. Somerville, MA: Cascadilla Press.

Zeijlstra, H. (2004): *Sentential negation and Negative Concord*. PhD Dissertation, university of Amsterdam.

Zeijlstra, H. (2011): 'On the syntactically complex status of negative indefinites.' In *Journal of Comparative Germanic Linguistics 14*: 111-138.

[1] Note that, under special intonation, though, these constructions can also have a reading where the negation takes scope under the modal. (1b) would then mean that John is allowed not to leave. This reading, however, is not the regular interpretation of this construction and may well be associated with constituent negation.

[2] Giannakidou (1998) takes *chriazete* to be an NPI. However, she has since agreed (p.c.) that it is not.

[3] Dutch *moeten* ('must') does not scope over negation in all dialects; in most southern and eastern varieties it scopes under negation (as in German).

[4] Dutch speakers for whom *moeten* ('must') scopes over negation in main clauses generally also allow the inverse reading in subordinate clauses to, i.e. (5)b can be ambiguous (see section 4.1 for more discussion).

[5] Data from Rajesh Bhatt p.c. in von Fintel and Iatridou 2007

[6] Are NPI Deontic modals a proper subset of the universal ones? For the languages we have investigated, this is definitely the case but what about other languages? Van der Auwera 2001 discusses one possible counterexample: Russian 'nel'zja',which consists of negation *ne* followed

by the existential modal 'l'zja'. Van de Auwera says that this modal element requires the presence of negation and always scopes under it and the native speakers we consulted agreed with this. Is it an NPI then? Our Russian speakers also told us that nothing can intervene between negation and 'l'zja', not even the past tense marker, which can intervene between negation and other modals. Apparently, if one forcibly tries to insert past tense 'byl' between negation and 'l'zja', the result is like trying to infix something in a word. This means that 'l'zja' is not an NPI but 'nel'zja' is a word, much like English 'impossible' consists of negation attached to a low scoping existential modal, with the difference that 'l'zja', unlike 'possible' is not a word on its own.

[7] Note that NPI *need* differs from *need to* in lacking the marker *to*, as well as inflectional morphology and in that it linearly precedes negation:

i. He need(*s) not leave

ii. He needs to leave

iii. He does not need to leave

[8] PPIs are elements that cannot appear in the (immediate) scope of an anti-additive operator or the larger class of Downward Entailing operators.

[9] Though see Krifka (1995) for a dissenting view, according to which English *some* is not a PPI.

[10] Anti-additive functions are a subset of D(ownward) E(ntailing) functions. A function f is anti-additive iff $f(X\vee Y) \Leftrightarrow f(X)\wedge f(Y)$. The left-to-right direction is automatic for DE functions: the set of things which are either X-s or Y-s is a superset of the set of X-s and the set of Y-s, so if inferences to subsets are guaranteed, as they are with DE operators, then $f(X\vee Y) \Rightarrow f(X)\wedge f(Y)$. What is crucial for anti-additivity, and is *not* true for all DE functions, is the other direction, $f(X)\wedge f(Y) \Rightarrow f(X\vee Y)$.

No professor is anti-additive because *No professor drinks and no professor smokes* ⇒ *No professor drinks or smokes*. On the other hand, *at most one professor* is not anti-additive, though it is DE: if *At most one professor drinks and every professor smokes*, it does not follow that necessarily *At most one professor drinks or smokes* (we are interested only in the reading where *at most one* scopes over disjunction). It may be that one professor drinks, and another one smokes, in which case it is not true that *At most one professor drinks or smokes.*

[11] Homer (2010), who has independently and for different reasons reached the conclusion that English *must* is a PPI already provided a series of additional arguments, adopting the diagnostics provided by Szabolcsi (2004), which show that *must* indeed is a PPI.

[12] Based on an example by R. Scwarzchild (p.c. to Szabolcsi)

[13] Note that the application of this criterion is not universal, as one could have guessed already from the fact that the Dutch (14) is OK, unlike the English (17). In Dutch and German V2 constructions verbs can be focused from a lower negation. In non-V2 cases, precedence conditions similar to what we saw for English apply (cf. Jacobs 1980 and others). In sections 3 and 4 we will come back to the V2 vs. non-V2 distinction.

[14] The condition that focus must be c-commanded by its licenser at S-structure has been challenged for licensing by *even* (Roots 1985) and *only* (Wagner 2006), and by Beaver & Clark (2008) for negation as well, as pointed out to us by Maziar Toosarvandani (p.c.). Under those approaches a c-command constraint between negation and a contrastive focus is not expected. However, in the case of must, it turns out that such c-commands constraints are attested.

[15] Note that this is similar to the Immediate Scope Constraint that states that NPIs are banned from contexts where another element takes scope in between the NPI and its licenser (cf. Linebarger 1980, 1987).

[16] Though to get this reading in example (23B) it is prefered to use the NPI *hoeven* instead of *moeten*.

[17] A function f is anti-morphic iff it is anti-additive ($f(X \lor Y) \Leftrightarrow f(X) \land f(Y)$) and anti-multiplicative ($f(X \land Y) \Leftrightarrow f(X) \lor f(Y)$). An anti-morphic function is an even stronger restriction than being anti-additive, and basically the only operator which is anti-morphic is the classical negation.

The paradigm in the examples contains three "levels" of being negative: sentential negation is anti-morphic, *nobody* is anti-additive, and *few people* is simply downward entailing.

[18] Although sometimes the status of *not every NP* has been disputed as a proper NPI licensing context (as one anonymous eviewer pointed out to us), *not every NP* patterns with the other non-anti-additive, downward-entailing contexts. Homer (2012a), following Horn (1989), takes the differences between *must* and *should* in the scope of negative universals like 'not everyone' to be due to the fact that *should*, but not *must*, is a neg -raiser as well. However, this analysis faces two problems. First, it would predict that the example with *should* is fine with both readings, whereas the example with *must* is not ambiguous. But the reverse is the case: the example with *must* is ambiguous and the example with *should* is not. Second, as the reviewer points out, applying Gajewski's (2007) analysis of NEG-raising, does not yield the reading of (30a) in which *should* outscopes the negative subject, but rather a reading that says that some student should not leave. In other words, treating *should* as a neg-raiser does not produce the desired result on its own, unless one in addition reconstructs 'every NP' as well.

[19] Taken from Homer 2010: 22b

[20] The verb 'prepi' is in a small class of verbs for which there is no perfective/imperfective distinction.

[21] See also Homer (2012b) for a discussion and an account of these facts.

[22] Homer (2012a) argues that, just as with the examples with *should* and *must* in 2.4, that *should* takes scope over the negation and *must* does not, due to *should* being a neg-raiser and *must* not. Again, this predicts that *should* is still fine under negation (since for Homer its PPI-hood it is not different from *must*), contrary to fact. Homer (2012a: 18) presents one example where *should* can appear under two negations:

(i) The coroner does nothing that shouldn't be done over again, he is so unbelievably incompetent.

However, this may quite likely be a case of contrastive negation, given that it is an instance of double negation, and double negation generally gives rise to contrastive focus readings (cf. Liberman & Sag 1974, Corblin et al. 2004).

[23] Sometimes, it is not really clear whether a modal like *must* scopes under negation because it appears in a Baker-Szabolcsi type of context, or whether the negation is clause-external at LF, One example, due to Eric Potsdam (p.c.) concerns biased negative questions, such as *Mustn't he leave?* Here, the modal is interpreted below negation, but it remains unclear whether this is due to the fact that polar questions may license NPIs and therefore together with the negation form a Baker-Szabolcsi context, or whether a high negation in a biased negative question must receive a clause-external interpretation and for that reason allows *must* in its scope.

[24] This example is a bit harder to judge, since the complex *tha eprepe* (would must) can also be taken to indicate counterfactual *prepi*, and in that case *prepi* may appear under the scope of negation. This ambiguity also appears in Dutch.

[25] The commonly adopted assumption that modals that can appear in I° only come in tensed form is based on the fact that such modals lack infinitival and participial forms.

[26] See Ladusaw 1992 and de Swart 1998 where a similar possibility is proposed. Generally speaking, NPIs are required to be roofed by some negative operator at the level of LF. Most NPIs are subject to a surface constraint as well (i.e. the NPI must appear under its licenser at surface position, cf. Ladusaw 1979), but this constraint is known to have exceptions, e.g. sentences with modal NPIs (see de Swart 1998). In all these exceptional cases, though, the NPI still needs to be roofed by negation at LF.

[27] Unless one stipulated that overt head-movement happens only at PF but there is additional covert head-movement, which, being covert, would only feed LF. We cannot exclude this option here but will not pursue it further.

[28] The idea that head-movement takes place only at PF is attributed to Chomsky, but this attribution may be overstated. Certainly, Chomsky claims that movement of inflectional categories is semantically empty but leaves open the movement from T-to-C as being semantically interpretable. Other considerations that pushed the head-movement-at-PF-only hypothesis is the concern that head-movement appears to be counter-cyclic (Chomsky), that it helps solve a particular problem in pseudo-gapping (Boeckx and Stjepanović 2001) and that it helps the understanding of synthetic compounds in English (Harley 2004).

[29] This is not to say that there may not be variation across languages with respect to the necessity or optionality of this type of reconstruction, the way there is in other domains (Diesing 1992 and many others).

[30] See also Homer (2010, 2012a) who assumes that PPI *must* scopes out by QR.

[31] Here is how the full semantic composition would go:

[[67]] = [[PPI-modal]]$_i$ ([[not]]((w$_i$ [[John left]]))) =

[λq. for all w' in W', q at w']$_i$ ([λp.NOT(p)] (w$_i$ [λw. J. left at w])) =

[λq. for all w' in W', q at w']$_i$ ([λp.NOT(p)] ([J. left at w$_i$])) =

[λq. for all w' in W', q at w']$_i$ (NOT([J. left at w$_i$])) =

[λq. for all w' in W', q at w'] λw$_i$(NOT([J. left at w$_i$])) =

for all w' in W', λw$_i$(NOT([J. left at w$_i$]))(w') =

for all w' in W', NOT(J. left at w')

For a sentence like (63), this composition will give "In all worlds compatible with what should happen, John does not leave". Negation indeed is semantically in the scope of the modal.

[32] Homer presents various reasons as to why a neg-raising analysis cannot apply to account for the scopal interaction between negation and *must*, one of them being that it would then be expected that *must* may outscope extra-clausal negation, contrary to fact.

[33] Modals do not cause Immediate Scope Violations, as pointed out by von Fintel and Iatridou 2007:

i. You don't have to bring anything to the party (¬>modal>NPI)

They would, therefore, not be expected to rescue the PPI from the harmful effects of negation.

[34] Again ignoring the intonation that goes with constituent negation on the VP.

[35] Thanks to Paola Menendez-Benito for discussion of the Spanish judgments

[36] As one reviewer points out, in (84) and (88), the modal *may* does not count as an intervener, just as it does not count as an intervener for NPI licensing (see footnote 33). That is, it does not protect the PPI from negation.

[37] We are not committed to a lexical ambiguity analysis of *devoir*. Other reasons could also be responsible for the two scopes of *devoir* with respect to negation (e.g. more liberal constraints on reconstruction).

[38] We note that in this sense reconstruction is different from A or A-Bar reconstruction, where it is optional unless forced or forbidden.

[39] Note that this is a somewhat different (though of course related) question from the one about the proper characterization of the licensing environment, which we will not address here.

[40] For a detailed overview of the different views on the nature of negative and positive polarity, cf. Giannakidou (2010).

[41] English *some* is a notable exception to the observation that PPIs generally denote high end points of scales; it rather denotes a low end point. This is actually the reason why Krifka (1995) does not take *some* to be a PPI (see footnote 9), though he acknowledges that its distribution is similar to that of what he takes to be real PPIs.

[42] Too see this, take English NPI *any* as an example.

(i)   *I read any book

In (i) *any*, as an NPI, obligatorily introduces scalar and domain alternatives. Because it contains an NPI, (i) needs to be exhaustified. This has as result that all stronger propositions containing scalar alternatives and all propositions containing domain alternatives are false. And this, in turn, leads to the contradiction that makes (i) bad. This is how. Suppose there are three books in the world: a blue book, a green book and a red book. Then (95) asserts that I read a blue, a green or a red book. But since {blue book, green book} is a subdomain of the domain of quantification of

any book it must be introduced as an alternative to *any book*. Now "*I read a blue or a green book*" is a stronger sentence than "*I read a blue, a green or a red book*" (as it is true in fewer situations). Therefore the obligatory exhaustification makes it so that (i) also asserts that I did not read a blue or a green book. And since {blue book}, {green book} and {red book} are subdomains of "*any book*" as well, (i) also entails "*I didn't read a blue book*" and "*I didn't read a green book*" and "*I didn't read a red book*". But if all these three statements are true, they contradict (i), which, given that *any* is an existential quantifier, entails that I must have read (at least) a blue, a green or a red book. It is this contradiction that is the source of the unacceptability of (i) according to Chierchia (2006), following Krifka (1995); For a discussion of why certain contradictory statements are ungrammatical, see Gajewski (2002) and Fox & Hackl (2006).
[43] Again, to see this, take (i):

(i)   a.   (according to the law,) John must leave

        b. $\forall$w[the law is satisfied in w] [John leaves in w]

Now, think of a model where the only relevant worlds are w1, w2 and w3. Saying that each of w1, w2 and w3 is a world where John leaves provides a stronger statement than saying that John only leaves in a subdomain of these worlds, for instance in w1 and w2 only. Therefore, no problem arises when the PPI *must* is uttered in a positive context.

However, once *must* is put under negation, things change dramatically. Take (ii):

(ii)   John must not leave.

Now the question arises as to which takes widest scope, the modal or negation. Let us start with the case in which the modal scopes under negation, and moreover, both scope under the required exhaustifier:

(iii)   EXH > NEG > MUST

Interpreting (ii) with the scopal order of (iii) has as result that the set {w1, w2, w3} is not a subset of the set of worlds where John leaves, since the universal quantifier of word variables is under the scope of negation. At the same time, all alternative expressions of this assertion are stronger: for instance, saying that {w1, w2} is not a subset of the set of worlds where John leaves makes a stronger statement than the original assertion. Therefore, the proposition that {w1, w2} is not a subset of the set of worlds where John leaves must be negated, which in turn entails that w1 and w2 are worlds where John leaves. Since the same mechanism applies to all subdomains of {w1, w2, w3}, including {w1}, {w2} and {w3}, interpreting the modal under the scope of negation with the strengthening operator applying above it yields a contradiction.

This contradiction disappears once the modal takes scope above negation again, as in (iv), since expressions of the form "must (not (p))" are stronger than their alternatives and will therefore not be contradicted by negated stronger alternatives.

(iv)   EXH > MUST > NEG

In this way the PPI-hood of modals like *must* can be captured in terms of Chierchia's analysis (and mutatis mutandis in Krifka's terms too).

[44] There may, in fact, be a way to rule out the existence of universal quantifier PPIs in general. Under Chierchia's analysis a high scale element can only act as a PPI if a covert exhaustifier applies both to the negation and the high-scale element. However, nothing a priori forces the exhaustifier to take scope from a position higher than negation. So where the universal in (ia) is expected to exhibit PPI-like behavior, the one in (ib) is not:

(i) a. $EXH > NEG > \forall$

  b. $NEG > EXH > \forall$

For Chierchia (p.c.) the fact that an exhaustifier can always scope in between the negation and a universal might be the reason that one may not attest plain universal PPIs (that is universal PPIs quantifying over individuals). But the question that arises then is as to why modal PPIs cannot appear in a negative clause with the exhaustifier intervening between the negation and the modal.

One solution that comes to mind is that this difference is due to the syntax of (PPI) modals. Recall that in all our examples of PPI modals, the modal precedes the negation or forms a unit with the verb. If the exhaustifier must, in turn, be above the modal, in languages where the modal precedes the negation, EXH must always outscope the modal and the negation, If, furthermore, we assume that in languages where the negation and the modal form a morphological unit at surface structure it is impossible that the exhaustifier intervenes between the negation and the modal, also in those languages EXH always outscope the modal and the negation too. Note that reconstructing the modal puts it under $EXH > NEG$, which renders the contradiction again.

(ii)   EXH John must not leave

A prediction that this makes is that in languages where modal PPIs may occur below negation at surface structure, PPI modals should be allowed to occur under negation. This may indeed be the case. Take the following Dutch examples (repeated from section 1):

(ii)   a.   Hans moet niet vertrekken $> \neg$ Dutch

          Hans must NEG leave

          'Hans musn't leave'

        b.   ... dat Hans niet moet vertrekken $> \neg; \neg >$

          ... that Hans NEG must leave

          '... that Hans musn't leave'

As addressed in fn 3, only in subordinate clauses Dutch *moeten* may also scope below negation. This follows once it is adopted that the exhaustifier may freely be included before or after negation:

(iii)   a.   ... dat Hans EXH niet moet vertrekken $> \neg$

        b.   ... dat Hans niet EXH moet vertrekken $\neg >$

In main clauses, however, the exhaustifier can never be included below negation, since the modal is higher than negation and the exhaustifier must appear above the modal.

However, before any more substantial conclusions are drawn, it should be know first what the exact conditions are where the exhaustifier may be included.

[45] The only existential NPI modal that we know of is epistemic *can't*. Note that in the domain of epistemics also *may* has its own behavior. Epistemic *may* behaves like a PPI, deontic *may* like a neutral modal.

[46] Note that while this is a question for Chierchia it is perhaps less of a question for Krifka, since he may take these elements to be the modal counterparts of elements like *some*, which are low-scale elements that are generally speaking banned from negative contexts too. For Krifka elements like *some* are not PPIs in the regular, scalar sense, but rather plain indefinites that are "fossilized" for wide scope with respect to negation. How such a fossilization mechanism exactly works and whether such mechanism may actually exist in the first place is not clear, but if such a mechanism does exist, it may actually naturally extend to universal NPI modals.

[47] Den Dikken (2006) adopts the essence of Postal's analysis, but recasts it within terms proposed by Chomsky (1995 etc): some NPIs carry an uninterpretable negative feature that must be checked against a negative head in the clause. Independently, and for different reasons, Neeleman and Van de Koot (2002) and Herburger and Mauck (2007) reached this conclusion as well.

[48] But see Herburger and Mauck (2007) for a version of the syntactic approach that aims at accounting for this fact.

[49] Note that this applies less straightforwardly to PPI modals. English *must* is only anti-licensed in anti-additive contexts, but can be rescued if the anti-additive context that anti-licenses must is in the scope of any embedded downward entailing context.

[50] The idea that certain downward entailing operators contain a decomposable negation is not new. For negative indefinites it has been suggested by Jacobs (1980), Rullman (1995), Penka (2010), Zeijlstra (2011) among others. For *only* it has been argued by Von Fintel & Iatridou (2007). Whether decomposability into a separate negation is a common property of those contexts that license modal NPIs is subject of further study.

[51] It should be noted, though, that contracted *mustn't* only receives a deontic interpretation.

[52] For some speakers of Dutch, though, *kunnen* 'can' is slightly dispreferred with a deontic reading).