

Neg-raising and Positive Polarity: The View from Modals

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This is a preliminary version; all comments are welcome.

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1 Introduction

Among deontic modal verbs, some, e.g. *have to* and *required to*, have obligatory narrow scope under a clausemate negation. Others, i.e. the three deontic modal verbs which are put under the microscope in this article, namely *must*, *should* and *supposed*, seem at first sight to have a rigid scope over a clausemate negation. This asymmetry is all the more puzzling because the two kinds of modals express the same modality, namely the deontic modality, and have the same quantificational force (they are all universal quantifiers).

How can certain verbs achieve wide scope over negation? It is important to answer this question in order to understand the workings of negation in natural language, and to have a better grasp of the architecture of the clause. An immediate hypothesis is that wide scope takers are generated above negation. This article shows that we do not need to postulate a different base-generation position to account for the variation across the aforementioned verbs. In fact, all three wide scope takers (*must*, *should* and *supposed*) are Positive Polarity Items which are able to scope out (I call them ‘mobile PPIs’): they cannot stay in the scope of a clausemate negation, where they are generated, and they raise past the offender, while other PPIs (e.g. *would rather*, *had better*), have no other option but to stay in that position and get anti-licensed.

Establishing an exact typology of verbs according to their behavior with respect to negation requires that we have at our disposal reliable diagnostic tools: it is the main goal of this article to design those tests. Thanks to them, it is possible to tell apart neg-raising—neg-raisers, e.g. *think* and *want*, do not move past negation but achieve semantic wide scope through an excluded middle inference—from PPIhood. This is how the polarity sensitivity of *must*, *should* and *supposed*, can be demonstrated. Another fact is established: *should* has a dual nature, i.e. it is both a neg-raiser and a mobile PPI; and in a certain dialect of English, *supposed* is also a neg-raiser, but a part-time one. The particular conditions under which it allows a neg-raised construal shed some light on the mechanisms of neg-raising itself.

The structure of the article is the following. Section 2 is a detailed exploration of the neg-raising phenomenon. The criteria it supplies are used in section 3 to show that deontic *must* is not a neg-raiser; the section also provides positive tests that show that it is a mobile PPI. The way is paved for the exploration of the more complex modal verb *should*: its dual nature (neg-raiser and mobile PPI) is brought to light in section 4. *Supposed* exhibits, in the dialect of certain speakers, an even more subtle character (5): it is a neg-raiser, but manifests this property only when certain pragmatic conditions are met.

2 Background: Neg-raising

2.1 Homogeneity

The verbs *want* and *think* are said to be neg-raising predicates (NRPs). This means that, when negated, they are preferentially—but not necessarily—interpreted as having semantic scope over negation, as shown in the paraphrases below. By contrast, the predicates *desire* and *be certain* are not NRPs:

- (1) a. John doesn't want to help me.
 - (i) *Paraphrasable as*: John wants not to help me.
 - (ii) *Paraphrasable as*: John doesn't have the desire to help me.
- b. John doesn't desire to help me.
Not paraphrasable as: John desires not to help me.
- (2) a. John doesn't think that he's competent.
 - (i) *Paraphrasable as*: John thinks that he is not competent.
 - (ii) *Paraphrasable as*: John doesn't have the belief that he's competent.
- b. John is not certain that he is competent.
Not paraphrasable as: John is certain that he is not competent.

There is a long history of research on the topic. Early proposals in the generative tradition (under the name of 'Negative Transportation theories', Lakoff 1969) took the near synonymy between e.g. (1a) and (1ai) at face value and held that the wide scope of NR predicates over negation is achieved by syntactic means, i.e. negation in (1a) and (2a) originates in a low base-position (in the embedded clause), at which it is eventually interpreted after reconstruction.

This purely syntactic view is hard-pressed to explain neg-raising with negative quantifiers, e.g. *no one* and *never*:

- (3) a. No one wants to help me.
 - b. *Paraphrasable as*: Everyone wants not to help me.
- (4) a. John never wants to help me.
 - b. *Paraphrasable as*: John always wants not to help me.

(3a) and (4a) are preferentially interpreted as meaning (3b) and (4b) respectively. Here again, it seems that negation is interpreted in the scope of the embedding predicate; what is surprising though is that the paraphrases contain positive universal quantifiers (*every* and *always*). If interpreting negation in the embedded clause is all there is to neg-raising, then the facts are inexplicable. The reason is that if negative quantifiers spell out negation and an existential quantifier (as is now standardly assumed, cf. Jacobs 1980, Ladusaw 1992, Geurts 1996, de Swart 2000, Zeijlstra and Penka 2005, Penka 2007, Iatridou and Sichel 2008 a.o.¹), the reading that the negative transportation hypothesis (i.e. syntactic neg-raising) predicts is inadequate. It is given in (5b) below; (5c) is the paraphrase of the result of reconstructing the entire negative quanti-

¹This hypothesis is inspired by cases of so-called Neg-split reading in Dutch, German and English, cf. Homer 2010a.

fier (negation and the existential quantifier). Not only is the actual reading not derived, but the two readings obtained by reconstruction are simply unavailable.

- (5) a. NEG₁ someone want [t₁ help]
- b. Someone wants not to help me.
- c. (There) wants no one to help me.

The syntactic accounts are therefore insufficient. Semantic alternatives were proposed very early on: the intuition they developed, dating back to Bartsch 1973, is that neg-raising predicates are true either of their complement or of its negation, in other words they give rise to an excluded middle or homogeneity inference. After Heim (2000), Gajewski (2005) proposes that this inference is a lexical presupposition: it is lexical, because only certain predicates are neg-raisers (cf. the difference between *want* and *desire*). I give a semantics for the verb *want* in the spirit of his proposal. First of all, I define $\text{Boul}(x,i,w)$, the set of bouletic alternatives of individual x in world w at time i :²

- (6) When $\#$, $\text{Boul}(x,i,w)$ is a set of triples of $D_e \times D_i \times D_s$:
 $\text{Boul}(x,i,w) = \{ \langle x',i',w' \rangle : \langle x',i',w' \rangle \text{ is compatible with what } x \text{ wants in } w \text{ at } i \}$

The third disjunct in the definedness condition of the following lexical entry is the homogeneity presupposition:

- (7) $\llbracket \text{want} \rrbracket^{c,s} = \lambda p_{eist} \cdot \lambda x_e \cdot \lambda i_i \cdot \lambda w_s \cdot \# \text{ if (i) } \text{Boul}(x,i,w) = \# \text{ or (ii) for some } \langle x',i',w' \rangle \in \text{Boul}(x,i,w), p(x')(i')(w') = \#$
or (iii) it is not the case that either for each $\langle x',i',w' \rangle \in \text{Boul}(x,i,w)$ $p(x')(i')(w') = 1$ or for each $\langle x',i',w' \rangle \in \text{Boul}(x,i,w)$ $p(x')(i')(w') = 0$;
if $\neq \#$, 1 iff for each $\langle x',i',w' \rangle \in \text{Boul}(x,i,w)$ $p(x')(i')(w') = 1$

Adopting this perspective makes the movement of negation useless: under this view negation is base-generated and interpreted in the same clause as the NRP and above it; the neg-raising effect is due to the computation of a homogeneity presupposition in concert with the assertive content of the sentence. Combining the assertive content and the homogeneity presupposition gives the desired result first for non-quantified sentences:

- (8) a. John doesn't want to help me.
- b. (i) *Assertion*: It is not the case that John wants to help me.
- (ii) *Homogeneity presupposition*: John wants to help me or John wants not to help me.
- \therefore John wants not to help me.

²For expository purposes, I present here the excluded middle inference as being a lexical presupposition triggered by an NRP; but I will discuss a possible alternative, cf. section 5.

Turning to sentences with quantified subjects of the form $[[Q(x): R(x)] \text{ want}'(p, x, i, w)]$, each individual x is such that x either wants p or its negation: the presupposition of the predicate is assumed to project universally.³ Under this assumption, we correctly predict the attested (and favored) reading of (9a) given in (9b):⁴

- (9) a. No one wants to help me.
 b. *Paraphrasable as:* Everyone wants not to help me.
 c. *Paraphrasable as:* No one desires to help me.
 d. (i) *Assertion:* It is not the case that there is an x such that x wants to help me.
 (ii) *Projection of the homogeneity presupposition:* For every x , either x wants to help me or x wants not to help me.
 \therefore Everyone wants not to help me.

By the same token, we derive the neg-raised reading of (10a) given in (10b). This *existential wide scope reading*, which is usually absent from discussions of neg-raising, is a hallmark of neg-raisers and will be used as a test in our investigation of the scope of *must*, *should* and *supposed*:

- (10) a. Not everyone wants to help me.
 b. *Paraphrasable as:* There are some people who want not to help me.
 c. *Paraphrasable as:* Not everyone desires to help me.
 d. (i) *Assertion:* It is not the case that everyone wants to help me.
 (ii) *Projection of the homogeneity presupposition:* For every x , either x wants to help me or x wants not to help me.
 \therefore There is some x such that x wants not to help me.

2.2 Cyclicity

A remarkable property of neg-raising predicates is that they can be interpreted as having semantic scope over a superordinate negation, as illustrated below:

- (11) a. I don't think that John wants to help me.
 b. *Paraphrasable as:* I think that John wants not to help me.

This narrow-scope interpretation of a surface superordinate negation is only possible with certain embedding verbs, namely verbs that are themselves neg-raisers, hence the

³See Chemla 2009 for experimental data that show that presuppositions project universally in the nuclear scope of negative universal quantifiers.

⁴Assuming that the homogeneity presupposition holds at all times, we derive the neg-raised reading of (4a)—repeated below—in a parallel fashion:

- (i) a. John never wants to help me.
 b. (i.) *Assertion:* It is not the case that there is a time t at which John wants to help me.
 (ii.) *Projection of the homogeneity presupposition:* Either at all times t John wants to help me at t or at all times t John wants not to help me at t .
 \therefore John always wants not to help me.

name ‘cyclic neg-raising’ for the phenomenon. But not all NRPs lend themselves to cyclic neg-raising. While *think* does, *want* doesn’t.

- (12) a. I don’t want John to think that I’m angry.
b. *Not paraphrasable as:* I want John to think that I’m not angry.

Gajewski (2005), p. 53 ff., convincingly argues that the projection of presuppositions explains the unequal availability of cyclic neg-raising with the desire predicate *want* and with the doxastic predicate *think* (Karttunen 1974 and Heim 1982), and offers the following account. The presuppositions triggered in the complement of a doxastic predicate, e.g. *think*, hold in all the doxastic alternatives that the predicate quantifies over.

For example the definite description *his cello* in (13a) triggers an existence presupposition (=there exists a cello that belongs to Bill):

- (13) a. Bill will sell his cello.
b. *Presupposition:* Bill has a cello.

When (13a) is embedded under *think*, as in (14a), the resulting sentence presupposes that in all of Bill’s doxastic alternatives, Bill has a cello (and it also presupposes that Bill has a cello).

- (14) a. Bill thinks he will sell his cello.
b. *Presupposition:* Bill thinks he has a cello.

The presuppositions triggered in the complement of a desire predicate, e.g. *want*, hold in the *doxastic* alternatives of the subject of the desire predicate, not in her bouletic alternatives. In the case at hand, *Bill wants to sell his cello* presupposes that Bill thinks that he has a cello (and it also presupposes that he has one), not that he wants to have one.

- (15) a. Bill wants to sell his cello.
b. *Presupposition:* Bill thinks he has a cello.
Doesn’t presuppose: Bill wants to have a cello.

In light of these facts, we can now have a better grasp of cyclicity (and lack thereof) with NR predicates: assuming that the excluded middle inference is a presupposition, we expect that it will project differently under *think* and under *want*.

- (16) [I don’t think [John wants [to help me]_γ]_β]_α
a. *Assertion of α:* It is not the case that I think that John has a desire to help me.
b. *Homogeneity presupposition triggered by think in α:*
I think that John has a desire to help me or I think that John doesn’t have a desire to help me.
c. *Homogeneity presupposition triggered by want in β:*
John has a desire to help me or John has a desire not to help me.
d. *Projection of the homogeneity presupposition triggered in β:*

I think that John has a desire to help me or John has a desire not to help me.

(16a) and (16b) together entail (17):

(17) I think that John doesn't have a desire to help me.

(17) and (16d) together entail (18):

(18) I think that John has a desire not to help me.

(18) is the reading of (16) that obtains by cyclic neg-raising, as desired. Now consider what happens if *think* is embedded under *want*:

- (19) [I don't want [John to think [I'm angry]_γ]_β]_α
- a. *Assertion of α*: It is not the case that I want John to think I'm angry.
 - b. *Homogeneity presupposition triggered by want in α*:
I want John to think I'm angry or I want it not to be the case that John thinks I'm angry.
 - c. *Homogeneity presupposition triggered by think in β*:
John thinks I'm angry or John thinks I'm not angry.
 - d. *Projection of the homogeneity presupposition triggered in β*:
I think that John thinks I'm angry or John thinks I'm not angry.

(19a) and (19b) together entail (20):

(20) I want it not to be the case that John thinks I'm angry.

(20) and (19d) do not entail together (21):

(21) I want John to think I'm not angry.

In contradistinction with what happens with a doxastic embedding attitude, the projection of the presupposition triggered in the embedded clause doesn't combine with (20) to yield (21).

2.3 Lack of Neg-raising

The presupposition approach appears to capture the data adequately. There is however a question that needs to be addressed. The neg-raising construal of verbs like *want* and *think* doesn't seem to be necessary. (22a) is felicitous (and (23a) is too) although it doesn't necessarily have the meaning paraphrased in (22b) ((23b) resp.). No presupposition failure seems to occur.

- (22) a. I envy my great-grandparents: unlike many people nowadays they didn't want to spend all their spare time on internet.
b. My great-grandparents wanted not to spend all their spare time on internet.
- (23) *Context*: At a job interview. . .

- a. I don't want to make a lot of money, you know.
- b. I want not to make a lot of money.

It is well-known that presuppositions can be prevented from projecting by being satisfied locally. The only plausible way the homogeneity presupposition could be satisfied in (22a) and (23a) is if it is silently included in the assertive content in the scope of negation (this is what is traditionally called 'local accommodation', cf. Heim 1983):

- (24) #The King of France is bald.
Presupposition: There exists a King of France.
- (25) The King of France is not bald, because there is no King of France.
Presupposition: None.
Accommodation in (25): It is not the case that (there is a King of France and that he is bald), because there is no King of France.
- (26) Bill doesn't think that Sue is here.
Presupposition: Bill thinks either that Sue is here or that Sue is not here.
- (27) Bill doesn't think that Sue is here. He has no opinion.
Hypothetical accommodation in (27): It is not the case that (Bill thinks either that Sue is here or that Sue is not here and that Bill thinks that Sue is here). He has no opinion.

Local accommodation is not very well understood. It is typically invoked to account for lack of projection when the presupposition is explicitly denied in a continuation, as in (25). It could equally well be invoked about (27). But the facts in (22a) and (23a) are not exactly, it seems, of the same nature as those in (25) and (27). If we try to block the projection of the presupposition that there exists a King of France by inserting the sentence that carries it in the same frame in which the homogeneity presupposition fails to project in (22a)-(23a), we still get a presupposition failure:

- (28) a. #Unlike many people, the King of France is not bald.
b. #The King of France is not bald, you know.

This suggests that there could be a difference between the presupposition attached to definite descriptions and the presupposition attached to neg-raisers. Alternatively, one can hypothesize that the homogeneity presupposition is not triggered in (22a)-(23a). It is not clear why this should be so, but we cannot exclude this option absolutely, given that the workings of presupposition 'cancellation' have not been fully elucidated yet. The lack of projection in (22a)-(23a) is reminiscent of what happens with the presupposition trigger *stop*: (29b) is another case where one hesitates between the local accommodation approach and the non-triggering one.

- (29) a. John has stopped smoking.
Presupposition: John used to smoke.
- b. *Context:* John, who I met a minute ago, seems to be a very aggressive person. I wonder why this is so...
Has John stopped smoking or something?
Presupposition: None.

Summary

To sum up, I have presented in this section the main properties of neg-raising predicates and shown that the semantic approach to the phenomenon is more adequate than the syntactic one: a neg-raiser achieves wide scope over negation *while being in the syntactic scope of negation* all along. An analysis in terms of presupposition makes the right predictions about the cyclicity phenomenon. If this analysis is correct, lack of neg-raising in certain cases can be explained either as an instance of local accommodation or as an instance of non-triggering of the homogeneity presupposition. We will draw heavily on this discussion in the rest of the article: we now have criteria to recognize neg-raisers and tell them apart from other wide scope takers, namely mobile PPIs.

3 Deontic *must* is a PPI

In this section, I show that (i.) deontic *must* is a PPI⁵ and that (ii.) it is not a neg-raiser.

In certain configurations, such as (30), deontic *must* necessarily outscopes a clause-mate negation and negative quantifiers.

- (30) a. John mustn't jog. MUST>NEG:*NEG>MUST
b. No one must jog. MUST>NEG:*NEG>MUST

The problem of the scope of *must* has not received much attention in the literature (de Haan 1997). The wide scope of *must* is generally assumed to be absolutely rigid (for Horn (1989), it is somehow lexically encoded). But there are other items which, in certain configurations, can only be interpreted outside of the scope of a clausemate negation or a negative quantifier. The quantifier *some* is one of them:

- (31) When Fred speaks French...
- a. ...Jean-Paul doesn't understand something. SOME>NEG;*NEG>SOME
- b. ...no one understands something. SOME>NEG;*NEG>SOME

Because of this very restriction, *some* is described as being a Positive Polarity Item (Szabolcsi 2004 a.o.). Negative Polarity Items of the *any*-type need to be interpreted in a constituent which is downward-entailing with respect to their position. In Homer 2010a, I show that *some* has the opposite requirement: it needs to be interpreted in a constituent which is not downward-entailing with respect to its position.⁶ If certain items are unable to scope under negation because they are polarity sensitive, it is natural to think that deontic *must* is one of them; the rest of this section establishes that this hypothesis is indeed correct, and it does so through a close comparison with the distributional pattern of a well-known PPI, namely *some*. I also discuss and dismiss the

⁵The claim that $must_{deon}$ is a PPI was first made in Israel 1996 (and more recently in Iatridou and Zeijlstra 2009), but had never been established empirically, as far as I know. The demonstration presented here elaborates on Homer 2010b.

⁶Previous researchers claim that *some* is anti-licensed in Anti-additive environments.

most sensible alternative hypotheses—*must* is base-generated above negation, or *must* is a neg-raising predicate.

In Homer 2010a, I explain that a PPI π^+ is licensed in sentence S only if there is a constituent β of S such that π^+ is not in a downward-entailing (DE) environment in β . Not all constituents are eligible for the checking of licensing, though: for example only the constituents which contain the Pol head are eligible for the licensing of *some* (PolP is a constituent whose specifier is filled with negation when the polarity of the clause is negative). In (31) as well as in (31b), PolP contains a negation which makes the position of the PPI *some* downward-entailing, leading to anti-licensing.

The conditions under which deontic *must* and *some* can be interpreted under a negation are strictly parallel.

3.1 Superordinate Negation

Deontic *must* and *some* can be interpreted under a superordinate negation. Let us first consider *some*:

- (32) It's impossible that John stole something. ✓NEG > SOME

The availability of the narrow scope reading of *something* in (32), in contrast with (31), is easily explained by the principles that I lay out in Homer 2010a (to which the reader is referred for details): in the former, *something* is licensed in an eligible constituent that doesn't contain negation, namely the embedded clause, and this is sufficient since a PPI *must* find at least one constituent in which it is not in a downward-entailing environment. In the latter on the other hand, there is no such constituent, since the smallest possible constituent on which licensing is checked is PolP, and it contains the negation.

Observe that *must* can have a narrow scope interpretation in (33a) but not in (33b):

- (33) a. It's impossible that John *must_{deon}* jog. ✓NEG > MUST
b. John *must_{deon}* not/*must_{deon}*n't jog. *NEG > MUST

This contrast is compatible with an analysis of *must_{deon}* as being a PPI. It poses a challenge to the hypothesis that it is a neg-raiser: although neg-raisers can perfectly take narrow scope under a superordinate negation (like *must_{deon}*) and maybe have to do so under superordinate *impossible* ((34b) is the meaning of (34a) that is predicted to obtain under neg-raising, assuming that the homogeneity presupposition projects universally under the negative world quantifier *impossible*: it doesn't seem to be a natural reading of (34a)), they can be interpreted under a clausemate negation (22a)-(35), unlike *must_{deon}* (33b):

- (34) a. It's impossible that John wants to jog. ✓NEG > WANT
b. In every possible world, John wants not to jog.
(35) John doesn't want to jog. ✓NEG > WANT
Paraphrasable as: John doesn't desire to jog.

What discriminates between the two theoretical options is that *must_{deon}* cannot take wide scope over a superordinate negation when it is embedded under a negated doxastic neg-raiser:

- (36) a. The doctor doesn't think that John *must_{deon}* jog. *MUST>NEG
Not paraphrasable as: The doctor thinks that John is required to not jog.
 b. No one thinks that John *must_{deon}* jog. *MUST>NEG
Not paraphrasable as: Everyone thinks that John is required to not jog.

In this respect, *must_{deon}* stands in sharp contrast with *want*. Recall that *want* can outscope negation when it is embedded under a negated epistemic neg-raiser, e.g. *think* or *believe* (cyclicity).

- (37) a. The doctor doesn't think that John wants to jog.
Paraphrasable as: The doctor thinks that John wants not to jog.
 b. No one thinks that John wants to jog.
Paraphrasable as: Everyone thinks that John wants not to jog.

These facts are inconsistent with the hypothesis that *must_{deon}* is a neg-raiser but substantiate the hypothesis that it is a PPI.

3.2 Rescuing

It is not the case that *some* can never take narrow scope under a clausemate negation. There are at least two conditions under which this scope is possible: either there is another downward-entailing expression outscoping *some* (this is called 'rescuing'), or a quantifier intervenes between *some* and the offending negation (this is known as 'shielding'). First I examine rescuing, with the downward-entailingness inducers *few people*, *impossible* and *only*:

- (38) When Fred speaks French...
 a. ... few people don't understand something. ✓NEG > SOME
 b. ... it's impossible that Jean-Paul doesn't understand something. ✓NEG > SOME
 c. ... only Marie doesn't understand something. ✓NEG > SOME

In each of the above, there is a constituent which is not downward-entailing with respect to the position of *some*: in (38a) for example, the maximal constituent (= main TP) is upward-entailing with respect to *some*, as a result of the composition of two downward-entailing functions. This suffices to license the PPI.

With deontic *must*, similar configurations allow a narrow scope reading of the modal under a clausemate negation.⁷⁸

⁷There is some variation across speakers. Although all English speakers accept narrow scope readings of deontic *must* when the modal is 'shielded' by a quantifier like *every* and *always*, for some speakers, rescuing is very hard if not impossible. The same speakers find rescuing with *some* possible but less than optimal, which might be a clue towards an explanation.

⁸In Homer 2010d, I show that deontic modals (and more generally root modals) create biclausal structures. It is therefore important to use contracted forms of negation in the examples that support the inves-

- (39) a. (Speaking about a five-year-old boy, whose parents are very demanding.)
 –This poor kid does so many chores: he *must_{deon}* empty the dishwasher, feed the dog, clean his bedroom, make his bed...
 –Yes, you’re right, and I’m not sure that he *must_{deon}* n’t rake the leaves too.
 $\checkmark \text{NEG} > \text{NEG} > \text{MUST}_{deon}$
- b. I know that John’s condition imposes drastic precautions, but even then I’m not sure that he *mustn*’t rake the leaves.
 $\checkmark \text{NEG} > \text{MUST}_{deon} > \text{NEG}$
- (40) a. The coroner does nothing that *must_{deon}* n’t be done over again, he is so unbelievably incompetent!
 $\checkmark \text{NEG} > \text{NEG} > \text{MUST}_{deon}$
- b. The coroner is the most competent person I know but this is a free country: he does nothing that *must_{deon}* n’t be done over again.
 $\checkmark \text{NEG} > \text{MUST}_{deon} > \text{NEG}$
- (41) a. Few boys *mustn*’t read this very long book.
 $\checkmark \text{FEW} > \text{NEG} > \text{MUST}_{deon}; \checkmark \text{FEW} > \text{MUST}_{deon} > \text{NEG}$
- b. Only John *mustn*’t read this very long book.
 $\checkmark \text{ONLY} > \text{NEG} > \text{MUST}_{deon}; \checkmark \text{ONLY} > \text{MUST}_{deon} > \text{NEG}$

These facts are incompatible with the hypothesis that *must* is base-generated above negation (also with the hypothesis that *must* necessarily moves past negation for interpretation). The conditions that allow it to stay in its low base-generation position are related to the logical properties of the context (i.e. its monotonicity): rescuing occurs when a constituent where the modal is in an upward-entailing position is made avail-

igation of the relation between *must* and negation. With non contracted forms, the position of negation is uncertain: it can be either in the matrix clause or in the embedded clause, as shown in the logical forms below:

- (i) John *must* not jog.
 a. [...not must [...John jog]]
 b. [...must [...not John jog]]

Since we are interested in the interaction between *must* and clausemate negation, it is important to exclude embedded negations (a point that Iatridou and Zeijlstra (2010) fail to take into account). When negation is contracted, it is interpreted in the main clause. To see this, consider abilitative *could*: this modal is not always interpreted under the negation that it is linearized after. With contracted negation, only the narrow scope of the modal is possible, which indicates that negation is interpreted in the matrix.

- (ii) John *could* not jog.
 a. [...not could [...John jog]]
 b. [...could [...not John jog]]
- (iii) John *couldn*’t jog.
 a. [...not could [...John jog]]
 b. * [...could [...not John jog]]

With deontic *must*, the question of whether negation is in the matrix or in the embedded is hard to answer unless we use contracted forms (in which case we know that it is in the matrix). The position of interpretation of negation is not easily traced on semantic grounds because *must* can outscope a clausemate negation (through movement, as I argue in Homer 2010b).

able (by the composition of two downward-entailing functions).⁹ This suggests that it is a PPI. Furthermore, given that its base position is below negation, we are led to hypothesize that it QRs to move out of the scope of an offending negation (this is what I propose to label ‘escaping’ in Homer 2010b).

3.3 Shielding

Some is said to be shielded from negation when certain quantifiers intervene: in Homer 2010a, I adopt Chierchia’s (2004) proposal that the indirect scalar implicatures that strong scalar terms give rise to in DE environments are monotonicity-breakers (when they are factored into the meaning that is relevant for the licensing of polarity items): as such their intervention is fatal to NPIs, and beneficial to PPIs. *Every* sits at the strong end of the scale <some, every>: it is a strong scalar term. Existential quantifiers such as the NPI *a single person* are weak scalar terms, and as such, they do not trigger an indirect scalar implicature: *a single person* doesn’t shield *some*:

- (42) a. Not everyone understands something. ✓NEG > EVERY > SOME
b. Not a single person understands something. *NEG > A_SINGLE > SOME

Let us take some time to examine *not everyone*. It is unlikely to be a constituent: it is not available in object position (**I saw not everyone*) and it allows Neg-split (which is used as evidence for the analysis of negative quantifiers as comprising sentential negation and an existential quantifier):

- (43) *Context:* Words of wisdom found on a management consultant’s blog.
Although each member is entitled to be on the board, not everybody can be on the board. ✓NEG > CAN > EVERY

Therefore there is reason to think that the constituency of (42a) is as follows (assuming that Pol is lower than T):

- (44) LF: [_{TP} T [_{PolP} not [everyone₂ [something₁ t₂ understand t₁]]]]

Strikingly, the narrow scope reading of *must* under negation is not only possible, it is mandatory, when *every* intervenes:¹⁰

- (45) a. Not everyone must jog. ✓NEG > EVERY > MUST_{deon};
**MUST_{deon}* > NEG > EVERY
b. Not a single person must jog. *NEG > A_SINGLE > MUST_{deon};
✓MUST_{deon} > NEG > A_SINGLE

This strongly suggests that *must* is sensitive to the modification that the presence of *every* brings to the monotonicity of its context, which is a hallmark of a polarity item. Observe that the wide scope reading of *must* is not only possible but mandatory when *everyone* is replaced with the existential weak scalar term *a single person* (45b). This

⁹Remarkably, the intermediate scope of *must* below the two DE expressions is not necessary (this is illustrated in (39b) and (40b)); for a discussion of this fact, see Homer 2010a.

¹⁰For a discussion of this blocked movement, see Homer 2010a.

minimal pair confirms that the lack of wide scope of *must* in (45a) is due to a difference in monotonicity.¹¹

Importantly, we do not observe a reading that obtains with neg-raising predicates under *not every* (cf. (10a) repeated below as (47a)):

- (46) a. Not everyone must jog.
 b. *Not paraphrasable as:* There is some x such that x is required not to jog.
- (47) a. Not everyone wants to help me.
 b. *Paraphrasable as:* There is some x such that x wants not to help me.

Recall that the wide scope existential reading of (47a) given in (47b), typical of neg-raisers, is derived through the addition of an excluded middle inference. It should be available in (46a) if deontic *must* were a neg-raiser too; therefore we have yet another reason to dismiss the hypothesis that deontic *must* is a neg-raiser.

Certain speakers of English allow for the reconstruction of subject *every* under negation; the same speakers can interpret (48b) with *every* taking intermediate scope between the negation and the modal after reconstruction.

- (48) a. Everything isn't expensive. ✓NEG>EVERY
 b. Everything must_{deon}n't be expensive to be worthwhile. ✓NEG>EVERY>MUST_{deon}
 c. [t₁ not everything₁ must [t₁ be₂expensive]]

The universal quantifier over times *always* also shields *some* and *must*, while the existential *ever* doesn't.

- (49) When Fred speaks French...
 a. ...Jean-Paul doesn't always understand something/*anything. ✓NEG > SOME
 b. ...Jean-Paul doesn't ever understand something/ anything. *NEG > SOME
- (50) (Speaking of guitars...)
 a. One mustn't always go with 'new' to get 'good'.¹² ✓NEG>ALWAYS>MUST_{deon}
 b. One mustn't ever go with 'new' to get 'good'. *NEG>EVER>MUST_{deon}; ✓MUST_{deon}>NEG>EVER

¹¹I do not know why a neg-split reading of (45a) is impossible (given that it is possible with the existential modal *can*, cf. (43)). If it were possible, a wide scope reading of *must* would be expected to obtain: once *every* reconstructs, i.e. ceases to intervene, the environment of the modal is negative and escaping has to take place:

(i) [must₂ [not t₁ t₂ every₁ ...]]

The same phenomenon (lack of a neg-split reading), recurs with *supposed*, cf. section 5.

¹²The original example can be found here: <http://forum.saxontheweb.net/showthread.php?21845-Good-clarinet-for-beginning-clarinet-student>.

Lastly, the universal adverb *necessarily* also has this protective effect:

- (51) a. When Fred speaks French, Jean-Paul doesn't necessarily understand something/*anything. $\checkmark\text{NEG}>\text{NECESSARILY}>\text{SOME}$
 b. The show must_{deon} n't necessarily go well, but it must_{deon} go on.¹³ $\checkmark\text{NEG}>\text{NECESSARILY}>\text{MUST}_{deon}$

Summarizing, deontic *must* shares with the PPI *some* three key properties, which suggest that it is itself a PPI:

1. It has narrow scope under a superordinate negation (*must* cannot take wide scope over a superordinate negation; *some* can, presumably through a choice function construal, cf. Reinhart 1997);
2. It can be 'rescued' from a clausemate negation by another DE expression;
3. It is shielded by strong scalar terms.

These facts are inconsistent with the hypothesis that *must* is base-generated above negation (or has to be interpreted in a position higher than negation). The first fact—together with the lack of a wide scope existential reading in (46a)—is incompatible with the hypothesis that it is a neg-raiser.

I have claimed that *must* scopes out to avoid being in a negative environment. It is possible to show that it is indeed in a position higher than negation when it is interpreted with wide scope. We use a quantifier and examine whether it can take scope below *must* and above negation (it is essential to use a contracted negation for the test to show anything, cf. fn. 8; the use of a non-monotonic quantifier is also necessary, see Appendix II, 7.2):

- (52) *Context:* The rules of this bowling game state that exactly one pin must remain standing, no matter which one. . .
 Exactly one pin mustn't be knocked down.
 $\text{MUST}_{deon}>\text{EXACTLY_ONE}>\text{NEG}$

The narrowest scope of *always* is also possible. It obtains when the adverb is generated in the embedded clause (due to the linearization of the modal before negation, only meaning is a reliable guide to tell where the adverb is interpreted):

- (i) You're too credulous. You mustn't always believe what you are told.
 $[_{TP} \text{ must}_1 \text{ not } t_1 [_{TP} \text{ always } \dots]]$

¹³Iatridou and Zeijlstra (2010) object to a similar example in Homer 2010b on the grounds that it is perhaps analyzable as a case of negative concord between the two universal modals *necessarily* and *must*. I fail to see the force of this argument: if negative concord means that only one of the two modals is interpreted, and in the case at hand, only *necessarily* is as the objection goes, the sentence should mean the same as (ia) below, contrary to fact. Rather, it has the meaning of (ib):

- (i) a. It is not necessarily the case that the show goes well.
 b. It is not necessarily the case that the show must go well.

The caveat about the placement of the adverb *always* in fn. 12 (either in the matrix or in the embedded) applies to *necessarily* as well.

Paraphrasable as: It is necessary that there is exactly one pin (no matter which one) that is not knocked down.

The availability of the intermediate scope of *exactly one* (the pins may vary across possible worlds) indicates that the quantifier is sandwiched between the modal and negation. Therefore *must* achieves wide scope by syntactic means. The validity of the test is confirmed by the fact that a non specific reading of the modified indefinite is not available in (53) despite the equivalence between $\Box\neg$ and $\neg\Diamond$:

- (53) Exactly one pin cannot be knocked down.
Not paraphrasable as: It is necessary that there is exactly one pin (no matter which one) that is not knocked down.

It is not possible to derive the intermediate scope reading of (52) using a homogeneity presupposition. The only way for this option to be at least viable would be to reconstruct the subject quantifier into the complement of the modal.¹⁴ The resulting meaning is not even a possible reading of the sentence.

- (54) a. $[t_1 \text{ not must } [[\text{exactly_one pin}]_1 \text{ be_knocked_down}]]$
 b. (i) *Assertion:* It is not the case that it is required that exactly one pin be knocked down.
 (ii) *Hypothetical homogeneity presupposition:* It is required that exactly one pin be knocked down or it is forbidden that exactly one pin be knocked down.
 \therefore It is forbidden that exactly one pin be knocked down.

Summary

To sum up, deontic *must* is a PPI. It achieves wide scope over a clausemate negation by syntactic means: it can be shown that it is interpreted in a syntactic position that is higher than negation whenever it outscopes a clausemate negation. Therefore *must_{deon}* is what I call a mobile PPI, i.e. a PPI which can QR past an offender (the prototypical offender is clausemate negation). The next section investigates *should* and shows, using the criteria that we have under our belt, that it is both a neg-raiser and a mobile PPI.

4 The Dual Nature of *should*

We now have tests to determine whether or not a given predicate is a neg-raiser and other tests to determine whether or not it is a PPI. Using them, I am going to show that

¹⁴Without reconstruction, the meaning that obtains is as follows. It is a possible reading of the sentence, although not the one we are after.

- (i) a. $[[\text{exactly_one pin}] \text{ not must } [\text{be_knocked_down}]]$.
 b. (i) *Assertion:* There is exactly one pin such that it is not required to knock it down.
 (ii) *Hypothetical homogeneity presupposition:* For each pin, it is either required that it be knocked down or it is forbidden that it be knocked down.
 \therefore There is exactly one pin such that it is forbidden to knock it down.

should has a dual nature: it is concomitantly a neg-raiser and a PPI.

4.1 *Should* is a Neg-raiser

To establish that deontic *should* is a neg-raiser, we use the cyclicity test.¹⁵ Recall that a neg-raiser embedded under a negated doxastic neg-raiser can be interpreted as having wide scope over negation (2.2): of the three deontic modals *should*, *have to* and *must*, only *should* gives rise to cyclicity. This is a first step in the demonstration that it is a neg-raiser:

- (55) a. I don't think that John should_{deon} marry Susan.
Paraphrasable as: I think that John shouldn't marry Susan.
 b. I don't think that John has to marry Susan.
Not paraphrasable as: I think that John has to not marry Susan.
 c. I don't think that John must_{deon} marry Susan.
Not paraphrasable as: I think that John must_{deon} n't marry Susan.

We do not know a priori if *should* is a PPI or not. It is conceivable—and actually true in fact—that it is both a neg-raiser and a PPI. If *should* is a PPI, it can unproblematically be interpreted in the scope of a superordinate negation. The cyclicity test can thus apply without risk of interference from the effects of the potential PPIhood of the modal. By the same token, we can neutralize the effects of the putative PPIhood of *should* by placing an intervener under an offending negation. Recall that deontic *must* is a PPI: when it is shielded from negation by a universal quantifier, it doesn't have to raise and in fact, it cannot cf. (45a) on p. 13 and Homer 2010a. In the configuration NEG>EVERY>SHOULD (as well as in NEG>NECESSARILY>SHOULD and NEG>ALWAYS>SHOULD), we predict that the properties of the neg-raiser *should* will shine through. And this is exactly what happens: we observe that the reading of the logical form in (56b) is one where there is an existential quantification outside of the scope of the modal (this is a *de re* reading), just like in (10a) on p. 5. I assume that the presupposition triggered in (56b) is modeled after the homogeneity presupposition that is postulated for *think* and *want*.

- (56) a. Not everyone should get a flu shot.
 b. [not [everyone₁ should [t₁ get_{flu_shot}]]]
 c. (i) *Assertion:* It is not the case that everyone should get a flu shot.
 (ii) *Projection of the homogeneity presupposition:* For every x, either x should get a flu shot or x should not get a flu shot.
 ∴ There is some x such that x should not get a flu shot.
- (57) *Control:*
 a. Not a single person should get a flu shot.
 b. *Only paraphrasable as:* It should be the case that no one gets a flu shot.

¹⁵The claim that *should* is a neg-raiser—and that *must* is not—is not new. It is already made in Horn 1989. Note 37, p. 578 (in the 2001 edition) substantiates the claim with a cyclicity test.

To ascertain whether sentence (56a) does have this wide scope existential reading, we check that it can be coherently inserted in a discourse of this kind:

- (58) —Doctor A: Not everyone should get a flu shot.
 —Doctor B: I totally disagree. It is not true that there are people that we should leave unvaccinated. I’m really shocked, and I can tell you I won’t tolerate any discriminations in this hospital.

Sentence (56a) also has a non neg-raised reading paraphrasable as (59), just like (1a) has the non neg-raised reading (1a_{ii}):

- (59) It is not the case that every *x* is such that *x* should get a flu shot.

4.2 *Should* is a PPI

Is deontic *should* a PPI? Nothing in principle precludes that it is both a neg-raiser and a PPI. And we happen to have a test to decide whether a modal takes syntactic scope over negation, a hallmark of mobile PPIs (not every PPI is able to raise: in the dialects in which *would rather* is a PPI, it is simply unacceptable under a clausemate negation, which indicates that it cannot raise, unlike *must*). We apply the test to the simple case where *should* is in the scope of a clausemate negation.

- (60) *Context*: The rules of this bowling game state that exactly one pin must remain standing, no matter which one. . .
 Exactly one pin shouldn’t be knocked down.
 ✓ SHOULD > EXACTLY_ONE > NEG

The test is positive, therefore we conclude that *should* is a PPI: in the presence of a clausemate negation, it is through raising that it achieves wide scope over negation (unless it is shielded, in which case neg-raising kicks in, cf. (56a)). When *should* is rescued, it can still outscope negation: we know that this is also true of *must* (cf. (39b) and (40b) on p. 12) therefore in the case of *should*, it is difficult to determine whether intermediate scope between two DE expressions, one of which is a clausemate negation as in (61b), is due to neg-raising or to QR of the PPI:

- (61) a. The coroner does nothing that should_{deon}n’t be done over again, he is so unbelievably incompetent! ✓NEG > NEG > SHOULD_{deon}
 b. The coroner is the most competent person I know but this is a free country: he does nothing that should_{deon}n’t be done over again.
 ✓NEG > SHOULD_{deon} > NEG

This property of being a PPI explains why *should* behaves differently from other neg-raisers. Recall that in section 2.3 on p. 7 we observed that neg-raising is optional under a clausemate negation with *want* (62a) (this is also true of *think*). *Should* simply never takes narrow scope under a clausemate negation (62b), except when it is shielded or rescued. Only in those latter two cases is neg-raising possible, but importantly, not necessary (62c). Otherwise neg-raising doesn’t get to apply, because *should* is a PPI which has to QR past an offending negation (and neg-raising requires that the NR

predicate be in the scope of negation). If we assume that *want* and *think* are pure neg-raisers (i.e. not PPIs¹⁶), the discrepancy between them on the one hand and *should* on the other is explained away.

- (62) a. I envy my grandparents: unlike many people nowadays they didn't want to spend all their spare time on internet. (22a)
 b. I envy my kids: unlike me, they should not jog.
Not paraphrasable as: Unlike me, they are not required to jog.
 c. Not everyone should jog.
Paraphrasable as: Not everyone is required to jog. (no neg-raising)
Also paraphrasable as: There is some x such that it is required that x doesn't jog. (neg-raising)

To sum up, deontic *should* appears to be both a neg-raiser and a PPI. Its nature of neg-raiser is manifest only when it appears in a configuration where no polarity violation occurs (i.e. under a superordinate negation or under a shielder like *every*). In the simple case where it is generated in the scope of a clausemate negation, it achieves wide scope through raising, due to its nature of mobile polarity item. The next section compares *must* (a pure PPI) and *should* (a PPI and a neg-raiser at the same time) and shows that *should* is clearly assessor dependent, while the assessor dependence of *must* is more problematic. I submit that this difference opens up new perspectives, and might further our understanding of neg-raising itself.

4.3 Assessor Dependence of *should*

Should is special among deontic modals in that it is assessor dependent (to the best of my knowledge, this claim is new): the modal evaluation it encodes is relativized to some salient individual. For a sentence of the form [should Φ] this individual is the source of the norm with respect to which Φ does or doesn't hold. This assessor is the speaker in a simple unembedded sentence, and it is the subject of the embedding verb when the modal is placed under an attitude verb. To make the dependence conspicuous, I create an infelicity using a continuation which contradicts the assessor dependence.

- (63) a. #Hermann should_{deon} marry Zelda, but I don't have an opinion about this marriage.
 b. Hermann should_{deon} marry Zelda, but you don't have an opinion about this marriage.
 (64) a. #Fred_i thinks that Hermann should_{deon} marry Zelda, but he_i doesn't have an opinion about this marriage.
 b. Fred thinks that Hermann should_{deon} marry Zelda, but I don't have an opinion about this marriage.

¹⁶This hypothesis seems reasonable, since they can be interpreted under a clausemate negation without shielding nor rescuing. In Appendix I (7.1) however, I show that there are some reasons to suspect that *want* is a PPI, but a PPI of a special brand: it can unproblematically stay under a clausemate negation. The reasoning presented in the text is not affected.

- (65) a. #Hermann_i met a woman that he_i should_{deon} marry, but I don't have an opinion about this marriage.
 b. Hermann_i met a woman that he_i should_{deon} marry, but you don't have an opinion about this marriage.

This property sets it apart from two other universal deontic modals, namely *have to*, and—this is of more direct relevance to the present discussion—*must_{deon}*:

- (66) a. Hermann must_{deon} marry Zelda, but I/you don't have an opinion about this marriage.
 b. Hermann has to marry Zelda, but I/you don't have an opinion about this marriage.
 (67) a. Fred_i thinks that Hermann must_{deon} marry Zelda, but he_i/I do(es)n't have an opinion about this marriage.
 b. Fred_i thinks that Hermann has to marry Zelda, but he_i/I do(es)n't have an opinion about this marriage.
 (68) a. Hermann_i met a woman that he_i must_{deon} marry, but I don't have an opinion about this marriage.
 b. Hermann_i met a woman that he_i has to marry, but I don't have an opinion about this marriage.

The behavior of *should_{deon}* bears a striking resemblance to that of epistemic modals, e.g. *might_{epis}* and *must_{epis}* (unlike the facts about *should_{deon}*, the following observations are well-known):

- (69) a. #The key might_{epis} be in the drawer, but it's not.
 b. #The key might_{epis} be in the drawer, but I think it's not.
 c. The key might_{epis} be in the drawer, but you think it's not.
 (70) a. #Fred_i thinks that the key might_{epis} be in the drawer, but he_i thinks it's not.
 b. Fred thinks that the key might_{epis} be in the drawer, but I think it's not.
 (71) a. #Fred met a woman who might_{epis} be French, but she's not.
 b. #Fred met a woman who might_{epis} be French, but I think she's not.
 c. Fred met a woman who might_{epis} be French, but you think she's not.

Epistemic modals are standardly described as being assessor dependent (MacFarlane 2003, Moltmann 2005, Egan et al. 2005, Stephenson 2007), i.e. their accessibility relation is not only relativized to a world of evaluation, but also to an individual, whose belief state in the world of evaluation determines which possible worlds are accessible. In order to derive the identity between the assessor of an epistemic modal and the author of the context (either the matrix context or the embedded context), I assume that the assessor is realized in syntax as a PRO (I stipulate that *might_{epis}* and *must_{epis}* select for a PRO as opposed to any other kind of variable).¹⁷

¹⁷See Stephenson 2007 for a technically different implementation of the same idea.

Let us see how this works with *might_{epis}*. For unembedded *might_{epis}*, we need to bind the assessor variable: this requires a binder at the top of the matrix clause.¹⁸ I posit that matrix clauses are headed by a silent complementizer which acts as a binder of individuals, times and worlds: the bound variables are mapped to the author (c_a), the time (c_t) and the world (c_w) of context c respectively (a context is a triple of an author, a time of thought or utterance and a world of thought or utterance).

- (72) a. $\llbracket [C_{k,l,m} S] \rrbracket^{c,s} = \lambda x_e. \lambda i_i. \lambda w_s. \llbracket S \rrbracket^{c,s[x_k \rightarrow x][i_l \rightarrow i][w_m \rightarrow w]}$
 b. It is raining.
 c. $[C_{1,2,3} w_3 i_2 \text{rain}]$
 d. $\llbracket (72c) \rrbracket^{c,s} \neq \#$;
 $=1$ iff it is raining in c_w at c_t .

To define *might*, we need to use epistemic alternatives: the epistemic alternatives of an individual x at time i in world w are the set of pairs $\langle i', t' \rangle$ compatible with x 's beliefs in w at i .

- (73) When $\neq \#$, $\text{Ep}(x, i, w)$ is a set of pairs of $D_i \times D_s$:
 $\text{Ep}(x, i, w) = \{ \langle i', w' \rangle : \langle i', w' \rangle \text{ is compatible with what } x \text{ believes in } w \text{ at } i \}$
- (74) $\llbracket \text{might} \rrbracket^{c,s} = \lambda p_{ist}. \lambda x_e. \lambda i_i. \lambda w_s. \#$ iff (i) $\text{Ep}(x, i, w) = \#$ or (ii) for some $\langle i', w' \rangle \in \text{Ep}(x, i, w)$, $p(i')(w') = \#$;
 1 iff $\neq \#$ and for some $\langle i', w' \rangle \in \text{Ep}(x, i, w)$,
 $p(i')(w') = 1$

Recall that we stipulate that the individual argument of *might* is a PRO. We can now derive the meaning of a simple unembedded sentence. (75a) is true in context c if and only if at least one of the author of c 's epistemic alternatives is such that it is raining at this alternative.

- (75) a. It might be raining.
 b. $[C_{1,2,3} w_3 i_2 \text{PRO}_1 \text{might} [\lambda_4 \lambda_5 w_5 i_4 \text{rain}]]$
 c. $\llbracket (75b) \rrbracket^{c,s} \neq \#$;
 $=1$ iff for some $\langle i', w' \rangle \in \text{Ep}(c_a, c_t, c_w)$, it is raining in w' at i' .

Let us now consider a case of embedding under *think*. We need to define first the set of doxastic alternatives of x at i in w $\text{Bel}(x, i, w)$ (it is important that doxastic alternatives be triples with an individual coordinate because we want to ensure that the assessor of embedded *might* is interpreted *de se*):

- (76) When $\neq \#$, $\text{Bel}(x, i, w)$ is a set of triples of $D_e \times D_i \times D_s$:
 $\text{Bel}(x, i, w) = \{ \langle x', i', w' \rangle : \langle x', i', w' \rangle \text{ is compatible with what } x \text{ believes in } w \text{ at } i \}$

I assume that the complementizer of the embedded clause acts as a binder (just like the covert complementizer at the top of a matrix clause):

¹⁸I use an extensional system with indexed abstractors over variables which are syntactically represented, à la Percus 2000.

- (77) $\llbracket [\text{think that}_{k,l,m} F] \rrbracket^{c,s} = \llbracket \text{think} \rrbracket^{c,s} (\lambda x_e. \lambda i_i. \lambda w_s. \llbracket F \rrbracket^{c,s[x_k \rightarrow x][i_i \rightarrow i][w_m \rightarrow w]})$
- (78) $\llbracket \text{think} \rrbracket^{c,s} = \lambda p_{eist}. \lambda x_e. \lambda i_i. \lambda w_s. \#$ iff (i) $\text{Bel}(x,i,w) = \#$ or (ii) for some $\langle x', i', w' \rangle \in \text{Bel}(x,i,w)$, $p(x')(i')(w') = \#$ or (iii) it is not the case that either for each $\langle x', i', w' \rangle \in \text{Bel}(x,i,w)$ $p(x')(i')(w') = 1$ or for each $\langle x', i', w' \rangle \in \text{Bel}(x,i,w)$ $p(x')(i')(w') = 0$;
 1 iff $\neq \#$ and for each $\langle x', i', w' \rangle \in \text{Bel}(x,i,w)$, $p(x')(i')(w') = 1$
- (79) a. Fred thinks that it might be raining.
 b. $[C_{1,2,3} w_3 i_2 \text{ Fred thinks } [\text{that}_{4,5,6} w_6 i_5 \text{ PRO}_4 \text{ might } [\lambda_7 \lambda_8 w_8 i_7 \text{ rain}]]]$
 c. $\llbracket (79b) \rrbracket^{c,s} \neq \#$;
 $= 1$ iff for each $\langle x', i', w' \rangle \in \text{Bel}(f, c_t, c_w)$,
 $\llbracket [w_6 i_5 \text{ PRO}_4 \text{ might } [\lambda_7 \lambda_8 w_8 i_7 \text{ rain}]] \rrbracket^{c,s[x_4 \rightarrow x'][i_5 \rightarrow i'] [w_6 \rightarrow w']}$,
 iff for each $\langle x', i', w' \rangle \in \text{Bel}(f, c_t, c_w)$,
 there is some $\langle i'', w'' \rangle \in \text{Ep}(x', i', w')$ s.t. it is raining in w'' at i'' .

I propose to apply a similar treatment to deontic *should*. I assume that the modal base associated with this modal is made up of $\langle \text{time}, \text{world} \rangle$ pairs compatible with what some individual deems right (in a moral or legal sense¹⁹). This individual is the authority whose point of view is critical in determining what counts as the norm. The individual argument of *should*_{deon} is a PRO. First of all, we define the relevant kind of deontic alternatives:

- (80) When $\neq \#$, $\text{Sh}(x,i,w)$ is a set of pairs of $D_i \times D_s$:
 $\text{Sh}(x,i,w) = \{ \langle i', w' \rangle : \langle i', w' \rangle \text{ is compatible with what is right according to } x \text{ in } w \text{ at } i \}$
- (81) $\llbracket \text{should} \rrbracket^{c,s} = \lambda p_{ist}. \lambda x_e. \lambda i_i. \lambda w_s. \#$ iff (i) $\text{Sh}(x,i,w) = \#$ or (ii) for some $\langle i', w' \rangle \in \text{Sh}(x,i,w)$, $p(i')(w') = \#$;
 1 iff $\neq \#$ and for each $\langle i', w' \rangle \in \text{Sh}(x,i,w)$, $p(i')(w') = 1$ ²⁰
- (82) a. John should leave.
 b. $[C_{1,2,3} w_3 i_2 \text{ PRO}_1 \text{ should } [\lambda_4 \lambda_5 w_5 i_4 \text{ John leave}]]$
 c. $\llbracket (82b) \rrbracket^{c,s} \neq \#$;
 $= 1$ iff for each $\langle i', w' \rangle \in \text{Sh}(c_a, c_t, c_w)$, John leaves in w' at i' .
- (83) a. Fred thinks that John should leave.
 b. $[C_{1,2,3} w_3 i_2 \text{ Fred thinks } [\text{that}_{4,5,6} w_6 i_5 \text{ PRO}_4 \text{ should } [\lambda_7 \lambda_8 w_8 i_7 \text{ John leave}]]]$
 c. $\llbracket (83b) \rrbracket^{c,s} \neq \#$;
 $= 1$ iff for each $\langle x', i', w' \rangle \in \text{Bel}(f, c_t, c_w)$, $\llbracket [w_6 i_5 \text{ PRO}_4 \text{ should } [\lambda_7 \lambda_8 w_8 i_7 \text{ John leave}]] \rrbracket^{c,s[x_4 \rightarrow x'][i_5 \rightarrow i'] [w_6 \rightarrow w']}$,
 iff for each $\langle x', i', w' \rangle \in \text{Bel}(f, c_t, c_w)$,

¹⁹This is an obvious oversimplification of the meaning of *should*. For an interesting proposal and for a review of previous attempts, I refer the reader to Copley 2006.

for each $\langle i'', w'' \rangle \in \text{Sh}(x', i', w')$ John leaves in w'' at i'' .

In the case of *must_{deon}*, the presence of an assessor argument is uncertain. We have seen that neither the author nor the addressee of the context has to be an authority in that case. It is possible that an assessor argument exists however, but is unspecified. We need further data to adjudicate on this issue. My assumption in the semantics I give for *must_{deon}* is that it does have an assessor argument.

First, I define the relevant set of deontic alternatives (the same treatment would apply to *have_{deon}* to mutatis mutandis):

- (84) When $\neq \#$, $\text{Mu}(x, i, w)$ is a set of pairs of $D_i \times D_s$:
 $\text{Mu}(x, i, w) = \{ \langle i', w' \rangle : \langle i', w' \rangle \text{ is compatible with what is right according to } x \text{ in } w \text{ at } i \}$
- (85) $\llbracket \text{must} \rrbracket^{c,s} = \lambda p_{ist}. \lambda x_e. \lambda i_i. \lambda w_s. \# \text{ iff (i) } \text{Mu}(x, i, w) = \# \text{ or (ii) for some } \langle i', w' \rangle \in \text{Mu}(x, i, w), p(i')(w') = \#;$
 $1 \text{ iff } \neq \# \text{ and for each } \langle i', w' \rangle \in \text{Mu}(x, i, w), p(i')(w') = 1$
- (86) a. John must leave.
b. $[C_{1,2,3} w_3 i_2 \text{pro}_4 \text{must} [\lambda_4 \lambda_5 w_5 i_4 \text{John leave}]]$
c. $\llbracket (86b) \rrbracket^{c,s} \neq \#;$
 $= 1 \text{ iff for each } \langle i', w' \rangle \in \text{Mu}(s(4), c_t, c_w), \text{John leaves in } w' \text{ at } i'.$

The observations that we have made so far converge towards a generalization (in the form of a necessary, non sufficient, condition):

- (87) **Generalization:** Only assessor dependent predicates are neg-raisers.

The following list of neg-raising predicates provided in Horn 1978 conforms with the generalization (caveat: *supposed* is in fact a special case as we will see shortly).

- (88) [OPINION] think, believe, expect, suppose, imagine, reckon
[PERCEPTION] seem, appear, look like, sound like, feel like
[PROBABILITY] probable, likely, figure to
[INTENTION/VOLITION] want, intend, choose, plan
[JUDGMENT/OBLIGATION] supposed to, ought, should, desirable, advise

All these predicates can be analyzed as having accessibility relations relativized to an individual (for the predicates that are not raising verbs, the assessor is always the individual denoted by the subject). However assessor dependence is by no means sufficient. We know this independently of the consideration of modals. Other assessor dependent predicates, e.g. *certain*, *guess*, *hope* etc. are not neg-raisers. And among modal verbs, besides deontic *must* (for which the evidence about its assessor dependence is insufficient) there are uncontroversial assessor dependent predicates that are not neg-raisers. This is true of epistemic *must* in American English (in this dialect, (89) is actually felt to be deviant).

- (89) $\#I \text{ don't think that John must}_{epis} \text{ be very intelligent.}$ [American English]
Not paraphrasable as: I think that it is very likely that John is not very intel-

ligent.

In British English however, *must_{deon}* is a neg-raiser, and thanks to the cyclicity of neg-raising, the sentence is felicitous when neg-raising is applied to the embedding verb and to *must* (similarly in my dialect of French, *devoir_{epis}* is a neg-raiser while *devoir_{deon}* is not).

- (90) I don't think that John *must_{epis}* be very intelligent. [British English]
Paraphrasable as: I think that it is very likely that John is not very intelligent.

And even in British English, no existential epistemic predicate is a neg-raiser and some universal ones are not (this is also true of American English):

- (91) a. I don't think that John might be very intelligent.
Not paraphrasable as: It think that it is possible that John is not very intelligent.
b. #I don't think that John has_{epis} to be very intelligent.
Not paraphrasable as: I think that it is very likely that John is not very intelligent.

Notice that the generalization is not so easy to falsify: one needs to find a neg-raising predicate which unequivocally lacks an assessor argument and we know, from the inspection of *must_{deon}*, that showing the absence of this argument is difficult.

Summary

To sum up, we have established in this section that deontic *should* is both a neg-raiser and a PPI, and shown that it is assessor dependent.

In the next section, I explore the neg-raising properties of the deontic modal *supposed* in two dialects of English. This predicate is enlightening because in both dialects it is assessor dependent but it is a neg-raiser only in one of them (in that dialect neg-raising is only possible under certain pragmatic conditions, hence the label of 'part-time neg-raiser').

5 *Supposed_{deon}*: A PPI and a Part-time Neg-raiser

Supposed_{deon}, like *must_{deon}* and *should_{deon}*, takes obligatory wide scope over a clause-mate negation (unless a strong scalar term intervenes).

- (92) a. John is not supposed to jog. *NEG>SUPPOSED; SUPPOSED>NEG
b. No one is supposed to jog. *NEG>SUPPOSED; SUPPOSED>NEG
c. You're never supposed to jog. *NEVER>SUPPOSED; SUPPOSED>NEVER

There are two dialects to consider, dialect A and dialect B.

5.1 Dialect A: A Pure PPI

In A, *supposed* is not a neg-raiser (this is why it is a ‘pure’ PPI: it has a simple nature). It fails the cyclicity test:

- (93) I don’t think that John is supposed to jog. [Dialect A]
Not paraphrasable as: I think that it is necessary that John doesn’t jog.

It also doesn’t allow a wide scope existential reading when it appears under *not every* (this is a *shielding* configuration in which neg-raising of predicates that are both NRPs and PPIs can occur: compare with *should* in (56a)):

- (94) Not everyone is supposed to get a flu shot. [Dialect A]
 NEG>EVERY>SUPPOSED; *SUPPOSED>NEG>EVERY
Not paraphrasable as: There are some people who are such that it is necessary that they don’t get a flu shot.

The fact that the wide scope of *supposed* w.r.t. negation is impossible in (94) suggests, together with the necessary wide scope in (92a)-(92c) above and (95) below that it is a PPI.²¹

- (95) Not a single person is supposed to jog. [Dialect A and B]
 *NEG>SUPPOSED; SUPPOSED>NEG

This hypothesis is confirmed by the fact that it can take narrow scope under a clause-mate negation when this negation is itself outscoped by another one (this is a case of rescuing).

- (96) *Context: Same as in (39).* [Dialect A and B]
 I’m not sure that John is not supposed to rake the leaves too.
 ✓NEG > NEG > SUPPOSED

Furthermore, a quantifier subject can take intermediate scope between the modal and a clausemate negation (in that order), suggesting that the modal undergoes QR (this movement is blocked in case of shielding (94) and obligatory otherwise (95)):

²¹If *supposed* is, as I claim, a PPI, this fact is at variance with a theory like Iatridou and Zeijlstra’s (2010). For these authors, all English modals raise to T (head movement) and then reconstruct for interpretation, unless they are prevented from doing so for reasons of polarity sensitivity. According to them, in (ia) the modal reconstructs obligatorily and gets interpreted in its final position; in (ib) this reconstruction movement is blocked because the landing position is in the scope of an offending clausemate negation.

- (i) a. John cannot smoke.
 b. John mustn’t smoke.

This view holds that the linearization of the modal before the negative marker is an indication that at some level of representation the modal takes scope over negation: in the case of *supposed*, wide scope of the modal occurs while the modal is linearized after negation, a fact that the theory is not suited to explain. The view that modals achieve wide scope through head-movement also poses a compositionality problem (I thank Rajesh Bhatt for pointing this out to me). Assuming that modals head-move to T, functional application cannot combine a modal and T, since T has the right type to take as argument a constituent γ which contains the modal prior to movement. In the unlikely event that the modal and γ happen to be of the same type, the result of combining T and the modal cannot have the appropriate type to combine with γ .

- (97) *Context*: The rules of this bowling game state that exactly one pin must remain standing, no matter which one. . .
 Exactly one pin is not supposed to be knocked down. [Dialect A and B]
 ✓SUPPOSED>EXACTLY_ONE>NEG

5.2 Dialect B: A Part-time Neg-raiser

In Dialect B, *supposed* is a PPI and a neg-raiser (but we will see that it is only a ‘part-time’ neg-raiser). First of all, it can be rescued (96) and it takes syntactic scope over a clausemate negation (it passes the test in (97)), which shows that it is a PPI. But under certain conditions it allows a wide scope existential reading with universal quantifiers intervening under negation, and it passes the cyclicity test, which are two hallmarks of NRPs. What are these conditions? Consider the following paradigms:

- (98) a. Not everyone is supposed to win the lottery. [Dialect A and B]
Not paraphrasable as: There are some people for whom it is necessary that they do not win the lottery.
 b. Not everyone is supposed to jog. [Dialect B only]
Paraphrasable as: There are some people for whom it is necessary that they do not jog.
 c. Not everyone is supposed to get a flu shot. [Dialect B only]
Paraphrasable as: There are some people for whom it is necessary that they do not get a flu shot.
- (99) a. I don’t think that you’re supposed to win the lottery. [Dialect A and B]
Not paraphrasable as: I think that it is necessary that you do not win the lottery.
 b. I don’t think that you’re supposed to jog. [Dialect B only]
Paraphrasable as: I think that it is necessary that you do not jog.
 c. I don’t think that you’re supposed to get a flu shot. [Dialect B only]
Paraphrasable as: I think that it is necessary that you do not get a flu shot.

The typical neg-raising behavior is only observed in [_S not supposed to *p*] if a command about the proposition expressed by *p* is plausible in the context of utterance of *S*. Speakers of dialect B explain that they have the intuition that the existence of some agency—who passes a judgment about the proposition denoted by *p*—is postulated. In the case at hand, it is easy to imagine that (98b)-(98c) and (99b)-(99c) are uttered against the background of a doctor’s recommendation: jogging can be detrimental to some people, those at risk of a heart failure for example, and some people are intolerant of flu shots. In (98a) and (99a), it is hard to conceive of an agency issuing a similar command about winning the lottery.

This suggests that *supposed* is likely to be assessor dependent: some individual’s point of view matters. It is clear that the assessor, if she exists, need not be the author nor the addressee of the context; this can be shown using our continuation test (the results are the same in Dialect A and Dialect B):

- (100) a. Hermann is supposed_{deon} to marry Zelda, but I/you don't have an opinion about this marriage.
 b. Fred_i thinks that Hermann is supposed_{deon} to marry Zelda, but he_i/I do(es)n't have an opinion about this marriage.

The following contrast suggests not only that an assessor associated with *supposed* exists, but that it is actually assumed *not* to be the author of the context:

- (101) *Context*: —A: Why do you take all those vitamins?...
 a. —B: #My doctor thinks that I'm supposed to take vitamins. [Dialect A and B]
 b. —B': My doctor thinks that I should take vitamins.

While (101b) is natural, (101a) is odd because the doctor should be the authority judging whether vitamins are good or bad for the speaker, but the sentence implies that he is not. The passive form of *supposed* might play a role in explaining the difference between *should* and *supposed* with regard to the identity of the assessor. I assume that the latter is an obligatorily passivized ECM predicate, and I submit that its external argument (the assessor argument), is, just like with other verbs in the passive, arbitrary PRO (Collins 2005) (or a silent non specific SOMEONE, cf. Kayne's (2008) analysis of unaccusative verbs). The same reason, whatever it is, that explains why the external argument of a verb in a short passive is by default interpreted as being non-coreferential with the speaker (102), also explains the preferential anti-author orientedness of *supposed*.

- (102) This book was written in 2002.

In the same connection, when asked to compare the following four sentences, consultants have a strong intuition that in (103d) an individual other than the speaker (=the author of the context) is the judge of the necessity for the speaker to leave the party.

- (103) *Context*: At a party at 2 a.m....
 a. I must go now.
 b. I have to go now.
 c. I should go now.
 d. I'm supposed to go now.

I propose the following lexical entry for *supposed_{deon}* and provide an example below (I stipulate that the external argument of *supposed* is PRO_{arb}):

- (104) When $\neq \#$, $Su(x, i, w)$ is a set of pairs of $D_i \times D_s$:
 $Su(x, i, w) = \{ \langle i', w' \rangle : \langle i', w' \rangle \text{ is compatible with what is right according to } x \text{ in } w \text{ at } i \}$
- (105) $\llbracket \text{supposed} \rrbracket^{c,s} = \lambda p_{ist}. \lambda x_e. \lambda i_i. \lambda w_s. \# \text{ iff (i) } Su(x, i, w) = \# \text{ or (ii) for some } \langle i', w' \rangle \in Su(x, i, w), p(i')(w') = \#;$
 $1 \text{ iff } \neq \# \text{ and for each } \langle i', w' \rangle \in Su(x, i, w), p(i')(w') = 1$

- (106) a. John is supposed to leave.
 b. $[C_{1,2,3} w_3 i_2 \text{PRO}_{arb} \text{supposed} [\lambda_4 \lambda_5 w_5 i_4 \text{John leave}]]$
 c. $\llbracket (106b) \rrbracket^{c,s} \neq \#$;
 $=1$ iff for each $\langle i', w' \rangle \in \text{Su}(\llbracket \text{PRO}_{arb} \rrbracket, c_t, c_w)$, John leaves
 in w' at i' .

5.3 Hypotheses about the Source of Neg-raising

Being a part-time neg-raiser (in Dialect B), *supposed* offers some insights in the triggering of the neg-raising phenomenon, but I must say that no firm conclusion emerges yet from the data that I have collected. Neg-raising with *supposed* in Dialect B appears to be conditional on the accessibility of a plausible point of view, and it conforms with our Generalization (87). But it is important to notice that *supposed* seems to be assessor dependent in Dialect A as well, although in that dialect it is not an NRP. Therefore generalization (87), which is a necessary condition, is corroborated, but a number of questions are left open, in particular: why isn't *supposed* a neg-raiser at all in certain dialects (namely Dialect A)? I think that an appropriate answer to this question is beyond the scope of this article. But the examination of modal predicates confirms an intuition shared by some (notably by Horn (1989)) that strength is of the essence: it seems that the non neg-raiser *must_{deon}* is in some sense stronger than the neg-raiser *should_{deon}*, and that *have_{epis} to* is stronger than *must_{epis}* (in British English the latter is a neg-raiser but the former is not). In the same connection, the command in (107c) and (107d) below is intuitively weak to the point that it can be bypassed without jeopardizing the achievement of the goal, namely running the marathon: in (107a) and (107b) on the other hand, the rule is unavoidable. I notice that the divide between the two pairs is also a divide between neg-raisers and non neg-raisers.

- (107) *Context: If you want to run the marathon. . .*
 a. You must train every day.
 b. You have to train every day.
 c. You should train every day.
 d. You're supposed to train every day.

Unfortunately, I cannot say anything more substantial than that at this point.

The other key question is of course: why is *supposed* only a part-time neg-raiser? Here I will content myself with presenting the various hypotheses that can be entertained, given our current understanding of neg-raising and of presupposition. In preamble, I think that the comparison between *should* and *supposed* is useful: these modals are very close in meaning as well as in their argument structure. But neg-raising is always possible with *should* (unless it is shielded), while it is sometimes impossible with *supposed*.

- (108) a. Not everyone is supposed to be a millionaire. [Dialect B]
 Unless appropriate context, not paraphrasable as: There is some individual x such that it is necessary that x is not a millionaire.
 b. Not everyone should be a millionaire. [Dialect A and B]

Paraphrasable as: There is some individual x such that it is necessary that x is not a millionaire.

If we assume, after Gajewski (2005), that neg-raising is always due to a homogeneity presupposition, we are led to postulate that the homogeneity presupposition triggered by *supposed* doesn't project in (98a), (99a) and (108a). This means either (i.) that it is not triggered or (ii.) that it is triggered but accommodated locally. We have seen a case where adjudicating between the two options is difficult (29b); but here, the comparison between *should* and *supposed* is not in favor of the first option: it is not clear at all why the presupposition of the latter would fail to be triggered more easily than that of the former. The second option is perhaps less mysterious: one could imagine that the presupposition of *supposed* is easily accommodated in contexts where no individual seems to have an opinion about the proposition expressed by the complement of the modal (this is how a presupposition failure is avoided); this is maybe more difficult to imagine about the author of the context. There are other grammatical facts about which the opinionatedness of the speaker is invoked: the derivation of scalar implicatures in the Gricean framework relies on this assumption. The proponents of this line (Russell 2006, Geurts 2009b) also assume that the opinionatedness of the subject of (certain) embedding verbs accounts for implicatures triggered in the scope of those verbs. Here is an example: it is the assumption that the speaker believes that George is opinionated that allows the derivation of a conversational inference in the scope of an intensional operator in (109) (B_S stands for 'the speaker believes that' and B_G for 'George believes that').

- (109) George believes that some of his advisors are crooks.
- a. *Implicature:* $B_S \neg B_G$ [all of G's advisors are crooks]
 - b. *Assumption:* $B_S B_G$ [all of G's advisors are crooks] \vee $B_S B_G \neg$ [all of G's advisors are crooks]
 - c. $\therefore B_S B_G \neg$ [all of G's advisors are crooks] [Geurts 2009a, p. 34]

Although the assumption that subjects of attitude verbs are opinionated is not needed in the rival framework, namely the grammatical view (Chierchia et al. 2008), which claims that embedded implicatures exist and derive them using exhaustifying operators, it is not excluded either.

If the opinionatedness of certain distinguished individuals is part of the background assumptions of the participants in a conversation, it is at least plausible that an asymmetry between assessors (authors of contexts are always assumed to be opinionated, others are not) can explain why the presupposition of *supposed*, whose assessor is some unspecified individual, is easily accommodated (to avoid a presupposition failure) while that of *should*, whose assessor is the author of the context, is satisfied in every context of utterance (and therefore projects unproblematically). The contrast between the two sentences (108a)-(108b) would stem from the fact that local accommodation is forced in the former for want of an obvious opinionated assessor (unless the sentence is uttered in a context where someone is assumed to know the conditions for being a suitable millionaire) but unnecessary in the latter (the speaker is assumed to know what the conditions for being a good millionaire are).

Having said this however, it seems that the facts could just as well be derived without even invoking a homogeneity *presupposition*. It seems that the assumptions about the opinionatedness of the assessors of NR predicates are redundant with the homogeneity presupposition and that the latter need not be postulated. There is one glitch, however: we already know that certain predicates are clearly assessor dependent (and have the author of the context as their assessor) but fail to be neg-raisers (e.g. epistemic modals in American English). Therefore whoever wants to pursue the line that the triggering of neg-raising with *supposed* is entirely pragmatic (no lexical presupposition is needed) and proposes to extend this view to all known neg-raisers, must explain why the typology of NRPs is as it is. This leads us back to the first puzzle above (p. 28).

6 Conclusion

This article offers a case study of the scopal properties of three deontic modal verbs with respect to negation. It shows that *must*, *should* and *supposed* are mobile PPIs and that *should* is also a neg-raiser (while *supposed* exhibits the neg-raising behavior only in certain dialects and provided that the opinionatedness of some individual is assumed in the context of utterance). The typology is presented in Table 1.

	Is a PPI	Can QR	Is a Neg-raiser
<i>must</i> _{deon}	yes	yes	no
<i>should</i> _{deon}	yes	yes	yes
<i>supposed</i> _{deon}	yes	yes	English _A : no English _B : yes
<i>have</i> _{deon} <i>to</i>	no	no	no

Table 1: Properties of Some Modals

The next step is to explain this typology. There are a number of new questions that this investigation raises. The most evident questions are: why are certain verbs PPIs while others are not? And why are certain verbs neg-raisers while others are not? Also crucial is the question of the movement of verbs: QR is only postulated about individual quantifiers, not about world quantifiers. What part of a modal moves? And where to? I hope to have laid the foundations for this new research program.

7 Appendix

7.1 Appendix I: Does *want* Have a Dual Nature Too?

In Homer 2010a, I show that the licensing of polarity items is environment-based. I propose the following licensing condition:

- (110) **Licensing Condition of Polarity Items:** A PI π is licensed in sentence S only if it is contained in at least one eligible constituent A of S which has the monotonicity properties required by π w.r.t. the position of π and all other PIs in A are licensed within A .

As I explained on p. 10, the smallest possible constituent upon which the licensing of *some* is checked (this is what in Homer 2010a I call the smallest possible domain of *some*) is PolP. We showed that this is also the case of deontic *must*.

7.1.1 French Deontic *devoir*

In French as well, there is a universal deontic modal which takes scope over a clause-mate negation, namely *devoir*. But it can also be interpreted below it (Homer 2010b).

- (111) *Marc ne doit_{deon} pas parler à Léa.*
 Marc NEG must NEG talk to Léa
 ‘Marc mustn’t talk to Léa.’ or ‘Marc doesn’t have to talk to Léa.’

It can be shown that *devoir_{deon}* can QR past a clausemate negation, because a subject quantifier can be sandwiched between the two. This is a hallmark of mobile PPIs:

- (112) *Context:* The rules of this bowling game state that exactly one pin must remain standing, no matter which one. . .
Exactement une de ces quilles ne doit_{deon} pas être renversée.
 exactly one of those pins NEG must.PRES NEG be knocked-down
 ‘Exactly one of those pins mustn’t be knocked down.’
 DEVOIR_{deon} > EXACTLY_ONE > NEG

Since the narrow scope of *devoir_{deon}* is always possible, a number of tests that we used to show that *must* can have narrow scope under a clausemate negation (and is therefore a probable mobile PPI rather than an item base-generated higher than negation) are uninformative in French. There is one important exception. We can show that *devoir_{deon}*, just like *must_{deon}*, can be forced to take narrow scope when it is shielded (we have observed that QR of *must* is blocked under *not every* (46a) on p. 14). We use the universal quantifier *toujours* ‘always’ and ensure that it is in the matrix clause together with negation and *devoir_{deon}*, by substituting a pronoun for the embedded clause (right dislocation): the only possible reading is one in which the modal has scope under negation:

- (113) *Jean ne le doit_{deon} pas toujours, m’ aider.*
 Jean NEG it must.PRES NEG always, me help
 ‘Jean is not always required to help me.’ (only reading)
 NEG > ALWAYS > DEVOIR_{deon}; *DEVOIR_{deon} > NEG > ALWAYS

By the criteria that we have used in this article, *devoir_{deon}* is thus a PPI. What is mysterious is why it can be interpreted under a clausemate negation: this is a very unusual behavior for a PPI. Using the theory developed in Homer 2010a, we can explain away this mystery if we stipulate that the smallest possible domain of *devoir_{deon}* doesn’t con-

tain negation (suppose that it is the VP that the modal heads). If this is so, when the licensing is checked on VP, the PPI is licensed (and doesn't need to 'escape'). But we have shown in Homer 2010a that licensing is liberal, so to speak: a PI need not be licensed on the first eligible constituent (going bottom-up) in which it is acceptable. This means that when *devoir_{deon}* is interpreted above a clausemate negation, its licensing has taken place in a larger constituent which encompasses negation (in this constituent escaping is necessary). I illustrate the two options with two different LFs below (for simplicity, I assume that *devoir_{deon}* is anti-licensed by DEness; the label $\boxed{\text{YP}} \blacktriangleright x$ used in the representation of logical forms indicates that YP is UE w.r.t. the position where the bearer of index x is interpreted; $\boxed{\text{YP}} \blacktriangleright x$ indicates that YP is DE w.r.t. the position where the bearer of index x is interpreted):

- (114) Jean ne doit pas parler.
 a. *Paraphrasable as*: Jean is not required to talk. (LF (115a))
 b. *Paraphrasable as*: Jean mustn't talk. (LF (115b))
- (115) a. $\boxed{\text{TP}} \blacktriangleright 1$ Jean₂ T $\boxed{\text{XP}} \blacktriangleright 1$ $\boxed{\text{PolP}} \blacktriangleright 1$ **pas** $\boxed{\text{VP}} \blacktriangleright 1$ *devoir_{deon1}* $\boxed{\text{TP}} t_2$
 parler]]]]
 b. $\boxed{\text{TP}} \blacktriangleright 1$ Jean₂ T $\boxed{\text{XP}} \blacktriangleright 1$ *devoir_{deon1}* $\boxed{\text{PolP}}$ **pas** $\boxed{\text{VP}} t_1$ $\boxed{\text{TP}} t_2$ parler]]]]]

7.1.2 Vouloir and want

Armed with the hypothesis that certain PPIs can be interpreted under a clausemate negation, we can now turn to *vouloir* 'want' and its English counterpart. Some facts strongly suggest that it can take syntactic scope above negation. First, an *exactly*-numeral can be sandwiched between it and negation (in both languages), as shown by the non specific reading that obtains in (116).²²

- (116) *Context*: N. Sarkozy wants to cut public spending drastically: 60% of the civil servants who retire this year will not be replaced.
Le président ne veut pas remplacer exactement 30 000 fonctionnaires.
 the president NEG wants NEG replace exactly 30,000 civil servants
 'The president doesn't want to replace exactly 30,000 civil servants.'
 VOULOIR > EXACTLY_30000 > NEG

As we know, this reading cannot be achieved by the semantic route of a homogeneity presupposition, and is a test for (mobile) PPIs.

Second, *vouloir* can outscope the presupposition trigger *plus* 'anymore'. If we assume, as seems reasonable, that *plus* is a negation (which as such sits in the same position as *pas*) carrying the presupposition that the proposition denoted by the clause in its syntactic scope used to hold, its presupposition tells us what lies in its c-command domain. The following sentence is ambiguous, but its most natural reading is one in which it is not assumed that the speaker ever had a desire to be called an idiot (it also

²²The position of the negative marker *ne* is crucial: it indicates where negation is interpreted. When it precedes a verb, negation *pas/plus* is a clausemate of this verb. Therefore negation is interpreted in the matrix in (116).

has the less natural reading whereby it is assumed that the speaker used to want to be considered an idiot):

- (117) a. *Je ne veux plus qu' on me traite d' imbécile.*
 I NEG want anymore that one me treats of idiot
'I no longer want to be called an idiot.' VOULOIR > PLUS
 b. *Paraphrasable as:* I want it to be the case that I am no longer called an idiot.

Compare with another neg-raiser, *penser* 'think':

- (118) a. *Je ne pense plus qu' on me traite d' imbécile.*
 I NEG think anymore that one me treats of idiot
'I no longer think that I am called an idiot.' *PENSER > PLUS
 b. *Not paraphrasable as:* I think that I am no longer called an idiot.

This time, the only possible reading is one in which it is assumed that the speaker used to think that he was called an idiot (ergo *plus* outscopes *penser*). Similarly in English:

- (119) a. Consumers no longer want to be kept in the dark about food.
 WANT > NO_LONGER
 b. Consumers no longer think they're kept in the dark about food.
 *THINK > NO_LONGER

The absence of *vouloir*/*want* from the presupposition of *plus/no longer* bears witness to its syntactic scope over negation: we can hypothesize that it is a mobile PPI which raises past negation when its licensing is checked on a constituent that contains negation, but its smallest possible domain doesn't encompass it (i.e. its licensing can be checked on VP). Neg-raising cannot explain that it is sometimes not part of the presupposition of *plus/no longer*: when an NRP achieves wide scope through homogeneity, it still lies in the syntactic scope of negation (p. 4). There is therefore some evidence that *vouloir* and *want* are mobile PPIs, whose smallest possible domain doesn't include negation (since they can always be interpreted with narrow scope under it).

If this is correct, do we have to jettison the analysis that we gave for *want* in 2? Did we misanalyze the wide scope of *want* over a clausemate negation as an effect of semantic neg-raising? No, wide scope through neg-raising is still an option open to *want*; but it is not the only one. In unembedded clauses, non-shielded *want* can achieve wide scope in two different ways: either through QR when its licensing is checked on a constituent at least as large as PolP, or through the semantic route of neg-raising. When it achieves wide scope over a superordinate negation (2.2), it is only through neg-raising (i.e. the semantic route); and when an existential wide scope reading obtains under *not every* (as in (10a) on p. 5), it is also only through neg-raising. Cyclicity and existential wide scope are unequivocal indicators that *want* is indeed a neg-raiser.

However reaching a final verdict about the PPIhood of *want* is difficult, and I must defer to future research a complete exploration of its properties. What encourages me to exert caution is the fact that the *no longer* test is not fully conclusive. In effect, under *no longer* (which, as seems reasonable, we can analyze as comprising sentential negation in the form of *no*) deontic *must* doesn't have to raise, and, judging from the

data I have collected so far, cannot:

- (120) You no longer must jog.
 $\checkmark \text{NO_LONGER} > \text{MUST}_{\text{deon}}; * \text{MUST}_{\text{deon}} > \text{NO_LONGER}$

This in turn suggests that *must* is shielded by *longer*, maybe by the presupposition it triggers (cf. Homer 2010c, on presuppositions as monotonicity-breakers). If this is so, the putative PPI *want* is expected to be shielded as well if the meaning relevant to its licensing incorporates the presupposition of *longer*, which means that it shouldn't be allowed to QR (because shielded mobile PPIs cannot raise, per the Principle of Laziness, cf. Homer 2010a). All these hypotheses need to be checked before adjudicating on the case of *want*.

7.2 Appendix II: Intermediate Scope or Split Scope?

Abels and Martí (2010) propose a unified analysis of the split scope readings that negative indefinites, comparative quantifiers and numerals give rise to across intensional verbs such as *must* and *can*. In this theory (inspired by Sauerland 1998, 2004), quantifiers are quantifiers over choice functions of type $\langle \langle \text{et}, \text{e} \rangle, \text{t} \rangle, \text{t} \rangle$; in split readings, they bind a choice function variable which the trace that they leave behind after movement; this trace combines with the noun phrase restriction in the scope of the intensional verb. This way, the narrow scope reading of the indefinite in (121a) can be derived as a split scope reading involving a choice function. Importantly, the choice function has to be parameterized (so that the choice of ties varies from world to world; this amounts to Skolemization); to simplify our entries, the modal is treated as a universal quantifier over possible worlds and the modal base is specified by the accessibility relation *Acc*.

- (121) a. You must wear a tie.
 b. $\llbracket (121a) \rrbracket^{c,s} = 1$ iff $\exists f \text{ CF}(f) \wedge \forall w' \text{ Acc}(c_w) \text{ you_wear}'(f(w'), \text{tie}')$ in w'

Recall that we used a quantifier over individuals with intermediate scope between *must* and negation to show that *must* is syntactically higher than negation when it is interpreted as having wide scope over it (52). With certain quantifiers, Abels and Martí's (2010) analysis in terms of choice functions can derive an intermediate scope reading without giving *must* syntactic scope over negation and without giving the quantifier over individuals intermediate syntactic scope between the modal and negation.

7.2.1 Split Scope with Simple Indefinites

Consider the case of a simple indefinite:

- (122) *Context:* The rules of this bowling game state that exactly one pin must remain standing, no matter which one...
 A pin mustn't be knocked down. $\checkmark \text{MUST} > \text{A} > \text{NEG}$

Suppose that a choice function variable combines with the restriction below the modal and below negation. *Must* takes semantic scope over negation; whether *must* is syntac-

tically higher than negation (as claimed in 3) or achieves wide scope through a homogeneity presupposition doesn't change the prediction. In both cases, the semantics of (122) will be as follows under the split scope analysis (which means that if this analysis is correct for the key sentence (52), p. 15, it deprives us of our argument in favor of the syntactic wide scope of *must*):

$$(123) \quad \llbracket (122) \rrbracket^{c,s} = \exists f [CF(f) \wedge \forall w' \in Acc(c_w) [\neg \text{knock_down}'(f(w'), \text{pin}')]]$$

This is correct, as can be checked intuitively in Table 2: the first row describes the state of affairs across possible worlds; the next rows describe the choice functions and their outputs. I box the outputs of the CFs if they happen to be pins that are not knocked down in the worlds under consideration. And there happens to be a choice function, namely f_1 , which in every possible world w' picks the pin that is not knocked down in w' . This means that the intermediate scope of a plain indefinite is not an argument in favor of the syntactic scope of *must* over negation: it is possible to achieve the reading through a homogeneity presupposition and a choice function variable bound across the modal.

	w ₁	w ₂	w ₃	w ₄	w ₅	w _n
pins that stay up:	p ₁	p ₂	p ₃	p ₄	p ₅	p ₄
output of f_1 :	p₁	p₂	p₃	p₄	p₅	p₄
output of f_2 :	p₁	p ₁	p ₁	p ₅	p₅	p ₁
...						

Table 2: Simple Indefinite

7.2.2 No Split Scope with *exactly*-numerals

Things are very different with *exactly*-numerals: their intermediate scope between *must* and negation is not amenable to the analysis in terms of split scope. Consider first a non negated sentence. Analyzing *exactly n* as 'at least n and no more than n', the choice function approach fails to derive the narrow scope reading of the *exactly*-numeral in a sentence like (124).

$$(124) \quad \text{Exactly one of those 6 people must come. } \checkmark \text{MUST} > \text{EXACTLY_ONE}$$

The predicted truth-conditions are as follows:²³

$$(125) \quad \llbracket (124) \rrbracket^{c,s} = \exists f [CF(f) \wedge \text{dom}(f) = \{p \mid \exists X \in p \mid |X| = 1\}] \wedge \\ \forall p \in \text{dom}(f) \rightarrow |f(p)| \geq 1 \wedge$$

²³The first restriction (' $\text{dom}(f) = \{p \mid \exists X \in p \mid |X| = 1\}$ ') says that in the domain of the choice function, all properties are such that you can find at least one member in them which has one atomic individual; the second restriction ' $\forall p \in \text{dom}(f) \rightarrow |f(p)| \geq 1$ ' says that all properties in the domain of the choice function are such that the output of the application of the choice function to the property has one or more atoms.

$$\begin{aligned}
& \forall w' \in \text{Acc}(c_w) [\text{come}'(f(w'), \text{person}')]] \wedge \\
& \neg \exists g [\text{CF}(g) \wedge \text{dom}(g) = \{p \mid \exists X \in p \ |X| > 1\} \wedge \\
& \forall p \ p \in \text{dom}(g) \rightarrow |g(p)| > 1 \wedge \\
& \forall w' \in \text{Acc}(c_w) [\text{come}'(g(w'), \text{person}')]]]
\end{aligned}$$

In the situation described in the first row of Table 3, the narrow scope reading of (124) is intuitively false: it is not the case that in every possible world w' exactly one person comes in w' . But the split scope reading given in (125) is true in that situation: there exists a function, namely f_1 , which outputs individuals with at least one atom in them, such that in all possible world w' it picks a person that comes in w' ; and there is no function g which outputs individuals with more than one atom in them such that in every possible world w' g picks an individual that comes in w' (this is because in the worlds w_1 through w_5 exactly one individual comes: in those worlds in which exactly one person comes, the output of a function which selects plural individuals only cannot be in the extension of the property $(\lambda x. x \text{ come})$).

	w_1	w_2	w_3	w_4	w_5	w_n
people that come:	p_1	p_2	p_3	p_4	p_5	$p_1, p_2, p_3, p_4, p_5, p_6$
output of f_1 :	$\boxed{p_1}$	$\boxed{p_2}$	$\boxed{p_3}$	$\boxed{p_4}$	$\boxed{p_5}$	$\boxed{p_4}$
output of f_2 :	$\boxed{p_1}, p_2$	$p_1, \boxed{p_2}$	$p_1, \boxed{p_3}$	$p_1, \boxed{p_4}$	$p_1, \boxed{p_5}$	$\boxed{p_1}, \boxed{p_2}$
...						

Table 3: ‘Exactly One Must’

The problem carries over to the cases that interest us directly, i.e. intermediate scope of *exactly*-numerals in negative sentences.

(126) Exactly one pin mustn’t be knocked down. $\checkmark \text{MUST} > \text{EXACTLY_ONE} > \text{NEG}$

Regardless of the source of the wide scope of the modal (QR or homogeneity presupposition), the truth-conditions under the split scope hypothesis are as follows:

$$\begin{aligned}
(127) \quad \llbracket (126) \rrbracket^{c,s} = & \exists f [\text{CF}(f) \wedge \text{dom}(f) = \{p \mid \exists X \in p \ |X| = 1\} \wedge \\
& \forall p \ p \in \text{dom}(f) \rightarrow |f(p)| \geq 1 \wedge \\
& \forall w' \in \text{Acc}(c_w) [\neg \text{knock_down}'(f(w'), \text{pin}')]] \wedge \\
& \neg \exists g [\text{CF}(g) \wedge \text{dom}(g) = \{p \mid \exists X \in p \ |X| > 1\} \wedge \\
& \forall p \ p \in \text{dom}(g) \rightarrow |g(p)| > 1 \wedge \\
& \forall w' \in \text{Acc}(c_w) [\neg \text{knock_down}'(g(w'), \text{pin}')]]]
\end{aligned}$$

In the situation described in the first row of Table 4, the intermediate reading of the numeral in (126) is intuitively false but the split scope reading given in (127) is true (this is because there is at least one world, namely w_1 , in which the plural output of any function that only outputs plural individuals fails to stay up).

	w ₁	w ₂	w ₃	w ₄	w ₅	w _n
pins that stay up:	p ₁	p ₂	p ₃	p ₄	p ₅	p ₁ , p ₂ , p ₃ , p ₄ , p ₅ , p ₆
output of f ₁ :	p₁	p₂	p₃	p₄	p₅	p₄
output of f ₂ :	p₁ , p ₂	p ₁ , p₂	p ₁ , p₃	p ₁ , p₄	p ₁ , p₅	p₁ , p₂
...						

Table 4: ‘Exactly One Mustn’t’

Exactly-numerals are not amenable to the split scope analysis. It is possible to derive intermediate scope of a quantifier between a modal and negation as a reflection of split scope in concert with a homogeneity presupposition when the quantifier is a simple indefinite (7.2.1), but not when it is an *exactly*-numeral. As a result, it is crucial to use *exactly*-numerals in the ‘pin’ test: only then does the test show that the modal is syntactically higher than negation and is therefore a potential mobile PPI.

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