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Modals, negation and movement: a reassessment

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This article addresses the question of how root necessity modals are able to take scope over negative operators. Previous work has argued that wide scope readings are derived by syntactic movement of the modal over negation. We argue against this view. Reviewing facts from a number of different languages, we show that the availability of wide scope readings is not conditioned by the clause structure in which the modal is embedded, and we show that deriving the wide scope readings in the full range of configurations where they are found requires a number of complications for the movement rules involved. We discuss other issues for deriving the correct interpretations for modals in various negative constructions, and we outline an recent in-situ account of the modal facts (Jeretič 2021a) which avoids the complications that beset the syntactic account.

1 Introduction

Cross-linguistically, many necessity modal auxiliaries like English *must* take apparent scope above sentential negation, even though they seem to originate below negation syntactically.

(1)   You must not leave.   □ > ¬

This wide scope interpretation has largely been viewed as a result of syntactic movement of the modal above negation, driven by its positive polarity. For Iatridou & Zeijlstra (2013), the movement that facilitates the wide scope reading is head movement – specifically movement of the modals to T in the case of English as in (1) – and their analysis furnishes an argument for the existence of semantically non-vacuous head movement (Lechner 2007; Roberts 2010; Hartman 2011, in disagreement with Chomsky 2001; Hall 2015). For Homer (2011), the movement in question is phrasal movement of some predicate-sized constituent, and the analyses there provides an argument for allowing a wider range of non-vacuous predicate fronting rules than is evidenced by word order (cf. Kayne 1998, and see Poole 2017 for a different outlook).

Both analyses rely on the movement in question being covert in at least a subset of cases, since there are languages where word order facts seem to indicate uncontroversially that the modal is syntactically below negation. Iatridou & Zeijlstra (2013: 530) note that this is the case for Greek, where negation is encoded by a preverbal particle; they propose that the wide scope reading is derived by covert head movement of the modal to a position above negation.

(2)   Dhen prepi na to kanume afto.
        NEG   must NA it do   this
        'We must not do this'   □ > ¬

Thinking of the literature on the scope of DPs, a question that arises in this context is whether the wide scope reading here needs to be derived by covert movement, or whether there are other non-movement mechanisms that might do a better job. It is now quite widely accepted that apparent wide scope interpretations for indefinites, including wh-in-situ, is not derived by covert movement, but rather in-situ scoping mechanisms such as choice functions (Reinhart 1997), at least in some cases (see e.g. Homer & Bhatt 2019 on indefinites, Kotek 2016 on wh-in-situ). This position is strongly motivated by the fact that wide scope readings of indefinites seem to be free of the structural restrictions that normally inhibit movement of DPs, such as island constraints (Fodor & Sag 1982).

(3)   John overheard the rumor that a student of mine was called before the dean. ∃ > *overheard*

Accounting for facts such as (3) with covert movement requires a total rethink of what we know about islands, while an alternative which uses in-situ mechanisms avoids this problem.[1]

In this article we argue that the (apparent) wide scope with necessity modals is not determined by syntactic movement, but rather by in-situ scoping mechanisms. The argument is of a similar tenor to the argument for wide scope indefinites, except our dataset is a comparative one. We show that the wide scope readings of necessity modals are found in a wide range of clause structures across languages, and we see that the clause structure parameters that normally impact upon movement of heads and predicates do not impact upon modal scope. Attention to the details of the analyses reveals a number of difficulties in implementing the movements syntactically, seen most clearly in the case of Iatridou and Zeijlstra's well-developed head movement analysis. Along the way we discuss additional issues for deriving the correct interpretations for modals in various negative constructions, and we conclude that the broader body of facts weighs against a syntactic account. In concluding, we outline a recent in-situ account of the modal facts (Jeretič 2021a), where wide scope interpretations are achieved by a type of semantic enrichment derived in a grammatical framework for scalar implicatures (Fox 2007; Bar-Lev & Fox 2020), which allows us to avoid the pitfalls of the syntactic accounts.

2 Necessity modals as Positive Polarity Items

The starting point for Iatridou & Zeijlstra (2013) (henceforth I&Z) and Homer (2011) is the observation that root modals (i.e. non-epistemic modals) vary with respect to whether they scope above or below sentential negation, with some intriguing asymmetries between possibility and necessity modals. On the one hand, possibility modals always scope below negation; this is shown by (4) for English, but the same seems to hold across languages in general. On the other hand, necessity modals are a mixed bag: *must* obligatorily scopes above negation, *have to* scopes below negation if it is present, and *need* (in its non-inflecting, bare VP-selecting form) actually *requires* negation or some other similarly downward entailing operator to take scope over it.

(4)   John can't leave. $*\Diamond > \neg; \neg > \Diamond$

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[1] It has become commonplace to accept changes to the semantic theory (instead of allowing island-escaping QR), and to then consider what other predictions the revised semantic theory makes (see e.g. Abels & Martí 2010 for the use of choice functions to capture aspects of modal-quantifier interactions). But this is not accepted by all authors (see e.g. Schwarz 2001; Heim 2011, 30–32), and recent comparative work has investigated whether languages differ in whether facts such as (3) hold of their systems of indefinites (see e.g. Dawson 2020). We should also mention that some authors have argued for allowing both QR and in-situ mechanisms to determine the scope of indefinites, such as Homer & Bhatt (2019).

(5)   a.   John mustn't leave.   □ > ¬; *¬ > □

          b.   John doesn't have to leave.   *□ > ¬; ¬ > □

          c.   John need*(n't) leave.   *□ > ¬; ¬ > □

I&Z show that similar facts hold across languages, where some necessity modals scope above negation (with examples from English, Greek, Dutch, Hindi) but all possibility modals, and other necessity modals, scope below.[2] The fact that possibility modals and some necessity modals always scope below negation suggests that root modals have a uniform clause-internal first-merge position below negation, a position that I&Z and Homer take, and that we will assume (see Jeretič 2021a: Ch5.2 for arguments).[3] The variation with necessity modals is then tied to essentially lexical properties of the individual modals. I&Z follow van der Wouden (1994; 2001) by taking the negation-sensitivity of *need*-type modals to indicate that they are negative polarity items, much like quantificational determiners such as *any*. This position is supported by the fact that *need* and its kin are licensed not just in the scope of negation, but in the same range of non-upward-entailing contexts that license NPI determiners, such as in the scope of *only NP* and the complement of negative verbs like *doubt* (see van der Wouden 2001 for many more environments, for *need* and its equivalents in Dutch and German).

(6)   a.   Only God need know.   (I&Z, p560)

          b.   I doubt you need worry about this.

If some necessity modals are NPIs, we might expect others to be positive polarity items (PPIs). I&Z and Homer argue that this expectation is met by modals that scope above negation, such as *must*, which are generated below negation but cannot take scope there due to their polarity sensitivity, and therefore have to move above negation, where they can (following similar claims by Israel 1996). Just like with PPIs like *some*, PPI-hood is taken to be a lexical property of these modals, and additional syntactic mechanisms are taken to be at play when the PPI manages to outscope negation. Support for the PPI analysis comes from the fact that *must* can scope below negation in the same kind of circumstances where other PPIs can, i.e. when the anti-licensing effect of a local negation is neutralized. For example, if the clause containing the negation and the PPI is embedded in a downward entailing context, the environment of a PPI's base position is globally upward-entailing, and thus it is not anti-licensed and may scope in-situ below negation. We can observe this effect in the contrast between (7a) and (7b): in (7a), *some* originates below negation, an anti-additive environment, where it is anti-licensed, forcing it to QR above negation. In contrast, in (7b), the same clause containing negation and *some* is embedded under *only*,

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[2] Jeretič (2021a) confirms this generalization, with data from French, Ecuadorian Siona, Spanish, Slovenian, Ewe, Turkish, Swedish and languages present in De Haan (1997), a typology of the interaction of modals and negation.

[3] This position contrasts with that of epistemic modals, which are merged higher, above sentential negation, as argued by Hacquard (2006). Indeed, epistemic modals often outscope negation, such as English epistemic possibility *might*.

a Strawson downward-entailing environment. Therefore, *some* may stay in-situ, as its global (Strawson) upward-entailing environment does not anti-license it.
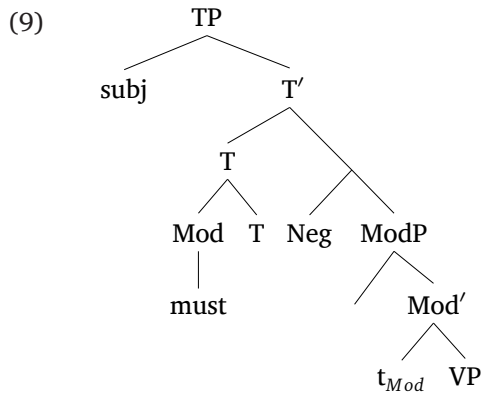
(7) a. Sue hasn't seen someone.   someone > ¬; *¬ > someone
     b. Only Sue hasn't seen someone.   someone > ¬; ¬ > someone

The same pattern is observed with root necessity modals, in that the modal generally scopes above negation, as in (8a), but may scope below it if embedded under an additional negative operator, as shown in (8b).[4]

(8) a. Sue must not leave.   □ > ¬; *¬ > □
     b. Only Sue must not leave.   □ > ¬; ¬ > □

I&Z and Homer show that the same pattern can be replicated for these modals for other types of PPI-like behaviour, such as the effects of shielding, contrastive focus and clause boundaries. I&Z and Homer establish the PPI-hood of modals like *must* in a similar fashion, and both argue that they must undergo LF movement above negation to avoid ungrammaticality below it. However, their proposals differ in the nature of the movement of the modal.

I&Z argue that these modals undergo interpretable head movement, as follows. In English, *must* precedes negation, and so I&Z follow Pollock (1989) and many others in assuming that it has undergone head movement from first-merge position below negation (call this ModP) to a higher head position, namely T.

(9)

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              TP
            /    \
         subj     T′
                 /  \
                T    \
              /  \    \
           Mod   T  Neg  ModP
            |            /  \
          must          /    Mod′
                             /  \
                          t_Mod  VP
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It is this instance of head movement, they claim, that is responsible for allowing the PPI modal to scope above negation, and since it is scope-extending head movement, it cannot plausibly be analysed in terms of PF movement or any other such terms. The fact that other modals such as

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[4] As I&Z argue, modal PPIs can be of different strengths, and different dialects of English assign different strengths to *must*; the facts shown here are for 'weak' *must*, which can scope below negation when the clause is embedded in any DE environment.

can scope below negation even when they precede it is attributed to obligatory reconstruction of the raised modal. Thus I&Z propose that modals reconstruct obligatorily by default, unless it gives rise to semantic anomaly. The fact that *must* can in fact scope below negation in the contexts described above is to be expected, since reconstruction would not lead to anomaly in these cases. In short, the polarity sensitivity pattern implicates two distinct scope positions for *must*, and these can readily be understood as the head and the tail of the movement chain. This furnishes I&Z with an elegant argument in favor of semantically active head movement (cf. Lechner 2007, Hartman 2011).

Homer, on the other hand, assumes that modals do not undergo LF movement by default. However, if a modal is a PPI and originates in a negative polarity environment, it will move to escape it. In contrast with I&Z, it does so by phrasal movement of the ModP. We come back to what such phrasal movement might entail, and the problems it raises, in section 4.3.

As a final point, we want to highlight the fact that wide scope necessity modals come in a variety of types. We first note that there is variation in the obligatoriness of apparent scope taking: some take obligatory wide scope with respect to negation (like English *must* or French *falloir*), some take optional wide scope (like French *devoir*) – Homer (2015) argues that the second type is due to an ability of the PPI to locally satisfy its polarity requirements (and thus optionally remain under negation). This distinction is irrelevant to the point in our paper, since we argue against syntactic movement of modals for any wide scope behavior, whether obligatory or optional (and we may show examples of either type). Second, a more relevant distinction for our purposes is that some modals scope above negation more robustly than others. This has led some authors to consider purely semantic analyses of these modals' wide scope behavior, where the modal stays *in situ* below negation. In particular, 'weak necessity modals', which include English *should*, have the distinctive property that they obligatorily scope above sentential negation, even when that negation is extra-clausal, as shown in example (10a) (in a configuration known as 'cyclic neg-raising'). This contrasts with *must*, which scopes below extra-clausal negation, at least by default, as shown in (10b).

(10) a. I don't think you should go.   □ > ¬; *¬ > □
      b. I don't think you must go. $^?$□ > ¬; ¬ > □

In this configuration, it is more difficult to argue that the wide scope interpretation of *should* is a result of movement, as it would entail crossing a clause boundary, which is not typical of other known head movement phenomena. I&Z largely ignore this data point, although they do discuss how *must* and *should* vary in their behavior elsewhere.[5] Homer (2011; 2015) on the

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[5] I&Z claim that *should* and *must* differ in PPI 'strength', i.e. how strong their licensing conditions are, as is observed for NPIs (Zwarts 1998 and subsequent literature) and other PPIs (Szabolcsi 2004). However, PI strength is a semantic

other hand accounts for it, and while he falls short of saying that *should* doesn't ever move,[6] he claims that in a sentence like (10a), *should* stays in situ and achieves its wide scope semantically, derived from an excluded middle presupposition just like neg-raising predicates *think* and *want* do (following Gajewski 2007). The claim that *should* is a semantic neg-raiser was also made earlier by Horn (1978; 1989), where *should* qualifies as 'mid-scalar', a property that Horn claims can be ascribed to all neg-raisers (which, crucially, does not apply to *must*, an 'end-of-scale' item). We therefore acknowledge that weak necessity modals have been argued to belong to the natural class of semantic neg-raisers like *think* and thus receive their wide scope interpretation via purely semantic means. This claim has not been made for strong necessity modals like *must*, which have only received an analysis as PPIs undergoing movement, which explicitly sets them apart from weak necessity modals (a difference clearly noted by both Horn (1978; 1989) and Homer (2011; 2015)).

In this paper, we hope to convince that not only weak necessity modals, but also strong necessity modals do not undergo syntactic movement. Therefore, to make this point strongly, our arguments will be based on data from necessity modals which pattern like *must* under negated *think* in (10b). Each point we make against movement of modals of the *must* type can also be made of modals of the *should* type, but we ignore the latter, since such modals are already likely to achieve their wide scope interpretation through means other than movement.

3 The pervasiveness of wide scope for modals

If wide scope for strong necessity modals is determined by verb raising, either by syntactic head movement or some sort of VP remnant movement, then we should expect to see the availability of modal scope interacting with changes in clause structure which are known to interact with verb raising crosslinguistically. In this section, we see that this expectation is not met, as wide scope is available in a number of configurations where there is no independent evidence to believe that the modal verb has raised to a position above the modal, or that it would even be possible to do so. We consider three classes of configurations: (i) where negation is a preverbal particle in the clausal spine; (ii) where negation is encoded by some higher operator, in Spec,TP or higher; (iii) where the modal is embedded under another auxiliary.

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property, which is sensitive to the difference between anti-additive and downward-entailing environments, but cannot track the difference between a clausemate negation's environment and that of an extra-clausal one. In fact, as far as we can tell, there is no NPI or other PPI pair which exhibits a contrast under negated *think* as *should* and *must* do in (10). This is a reason to be skeptical of treating the difference between these two classes of modals as replicating the difference between PPIs of different strength, which then leads us to question the claim that they are both PPIs in the first place.

[6] Homer claims it must be able to move in because it also passes a diagnostic for movement called the 'pin test'; see section 4.4 for our take on this test. Furthermore, it goes without saying that this 'double life' is theoretically questionable and gives another reason to be skeptical of Homer's analysis.

3.1 Preverbal sentential negation

The movement analysis of wide scope for modals is particularly well-suited to English, since there are good reasons to believe English modals are in a higher position than their base-generated position: they typically scope below negation, which is taken to be below T, but they show up in T, above negation. However when we look at a wider range of facts from other languages, we see that the position of sentential negation seems not to matter, as root necessity modals may take scope over negation from various positions. We review a number of different subcases here.

First, there are languages in which the modal verb seems to stay particularly low, such as Russian and Slovenian. In Russian, verbs do not seem to exhibit V-to-T movement, since the finite verb follows adverbs (Bailyn 1995[7]), and negation also precedes the verb. The root necessity modal *dolžn-*[8] still can scope over negation, even though it seems not to raise over it, as shown in (11).[9] The same is true for Slovenian, given in (12), which also has preverbal negation and is claimed to lack V-to-T on the basis of adverb order facts (Ilc & Sheppard 2003).[10]

(11) Ty ne   dolžna ostavat'sja.
      you NEG must   stay
      'You must/need not stay'   □ > ¬,¬ > □ (Russian)

(12) Ne   morm   it.
      NEG   must.1SG go
      'I mustn't go'   □ > ¬ (Slovenian)

Then, there are languages such as Norwegian and Swedish, in which negation is a phrasal adverb (see e.g. Holmberg & Platzack 1995, 17) and the finite verb precedes it in main clauses but follows it in embedded clauses, due to the clause type-dependence of V2. Norwegian has a necessity modal *må* which translates as "must" and which scopes over clausemate negation in

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[7] The claim that Russian lacks V-to-T movement is contended by Koeneman & Zeijlstra (2014), who claim that adverbs are adjoined to TP in Russian; on their analysis, the finite verb may be in T and the fact that *ne* precedes the verb is explained by *ne* being a head which V adjoins to and pied-pipes on its way to T. But allowing adverb adjunction to target different projections crosslinguistically undermines the diagnostic power of adverbs, and it would warrant a complete reassessment of the empirical base of the claim that verb movement exists at all. Absent such a reassessment, with some triangulating factor to determine which adverb facts are diagnostic of V-to-T and which are not, it is difficult to assess this claim.

[8] This modal is an adjectival predicate, with some non-standard properties (e.g. it appears before the copula in the past and future, as opposed to typical predicative adjectives). Its non-verbal status does not affect our point, and if anything, it supports it, since adjectives are not known to undergo movement. The same scope facts are replicated for necessity modals *nado* and *nužno*, also claimed to be adjectival but with an expletive subject (Jeretič 2021a).

[9] The Russian data was provided to us by Masha Esipova.

[10] The Slovenian data was provided to us by Zala Mojca Jerman Kuželički. See Jeretič (2021a) for a more complete set of data and analysis of this modal.

main and embedded clauses, irrespective of its position.[11] We provide an embedded example involving a relative clause, since these strongly resist embedded V2.

(13) a. Du   må   ikke dra.
          you must NEG eat
          'You must not leave'   □ > ¬ (Norwegian)

      b. Dette er personen   som ikke må   dra
          this is person.the REL NEG must leave
          'This is the person who must not leave'   □ > ¬ (Norwegian)

It seems not to matter for the scope of the modal in Norwegian or Russian that the modal verb stays low.

There are also languages in which the verb does seem to raise and negation seems to be situated in a higher head position which still precedes the verb. Greek, which we saw in the introduction, is one such language, and Spanish and Italian are similar. These languages show independent evidence for V-to-T movement, since the finite verb precedes adverbs (see e.g. Belletti 1990), but sentential negation is a preverbal negative marker. *Must*-type modals scope over this preverbal negative marker in these languages too.[12]

(14) No   debes   salir.
      NEG must.2SG go.out
      'You must not go out'   □ > ¬ (Spanish)

(15) Non devi   uscire.
      NEG must.2SG go.out
      'You must not go out'   □ > ¬ (Italian)

We note that overt verb raising past negation is consistently impossible in these languages and their varieties, even though they allow verb raising to C in the absence of negation (see Zanuttini 1997 for extensive discussion).

A somewhat different kind of high preverbal negation is to be found in the Celtic languages, such as Scottish Gaelic, in which sentential negation is expressed not with a clause-internal operator but instead with a complementizer which precedes the verb and all other material within

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[11] The Norwegian data was provided to us by Øystein Vangsnes. He notes that (13a) gets the ¬ > □ reading if the modal is stressed, which is in line with the observations in I&Z. The □ > ¬ reading for (13a) is especially clear when the negation contracts onto the preceding modal auxiliary.

[12] The Spanish data reflect the judgments of the first author, who is a native speaker. The Italian data were provided to us by Stanislao Zompì.

the TP.[13] Although most modal expressions involve non-verbal predication in this language, it has a verbal deontic necessity item *feumaidh/fheum*[14] which translates as "must" and which occurs in T like other lexical verbs. This modal's scope with respect to a higher negation is subject to variation: while most speakers only get a reading where the modal scopes below negation, for some speakers the modal scopes above negation.[15]

(16) a. Feumaidh mi falbh.
          must.IND I leave.INF
          'I must leave'   (Scottish Gaelic)

      b. Chan   fheum   mi falbh.
          COMP.NEG must.DEP I leave.INF
          'I must not leave'   %□ > ¬ (Scottish Gaelic)

The fact that the modal may take wide scope with respect to negation, at least for some speakers, is quite surprising in light of the fact that no other quantifiers may outscope negation; for instance, universal quantifiers, whether in the subject or object position, may only take narrow scope.[16]

(17) a. Chan   fhaca   a h-uile duine e.
          COMP.NEG see.PST-DEP every   person him
          'Not everyone saw him'   ¬ > ∀, *∀ > ¬ (Scottish Gaelic)

      b. Chan   fhaca   e a h-uile duine.
          COMP.NEG see.PST-DEP he every   person
          'He didn't see everyone'   ¬ > ∀, *∀ > ¬ (Scottish Gaelic)

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[13] See McCloskey (1996) for extensive arguments in favour of analysing these initial negative elements as complementizers in Irish. The argumentation extends to the equivalent elements in Scottish Gaelic.

[14] The morphological alternation here is between the "independent" form *feumaidh*, which occurs in matrix clauses and under relative complementizers, and the "dependent" form *fheum*, which occurs under most other embedding complementizers, including negation. This is an alternation that we see in Goidelic with all verbs, and indeed it is an indicator of the verbal status of this modal, as non-verbal predicates (including the other modal ones) do not show such an alternation.

[15] There is a bit of murkiness to this observation. De Haan (1997) claims that the Scottish Gaelic must-type modal scopes over negation; he cites MacAulay (1992) for the observation, and also notes that he has gathered his own data confirming this observation via the 'GAELIC-L' internet list. But the MacAulay (1992) citation seems to be incorrect, as there (p. 188) is actually reported that *chan fheum* translates as "need not", with the modal scoping below negation. In our own consultation with speakers, most confirm Macaulay's observation, but some speakers report that they have the "must not" reading reported by De Haan's informants. In addition, Gille-chrìost MacGill-Eòin (p.c.) informs us that in Manx Gaelic, a closely related language in the Goidelic family, the cognate modal element *shegin/ negin* is interpreted above negation. We conclude, then, that the scope of these modals is subject to dialectal variation in this language family. This variability is redolent of the variation we see for Dutch *moeten* which is noted by I&Z (p. 530 fn.3). We leave ascertaining the nature of this variability to future research. We thank Donald Morrison and Gillebrìde MacMillan for help with the Scottish Gaelic data.

[16] A reviewer notes that facts such as these might be accounted for independently by constraints affecting the interaction of universal quantifiers and negation, such as those proposed by Mayr & Spector (2011).

Comparable facts are to be found in other languages with high negation as well, such as Tongugbe Ewe.[17] Ewe has bipartite clausal negative which is composed of a preverbal negative particle *m-* and a clause-final negative marker *o* (Collins et al. 2018). There are reasons to believe that the sentence-final component of negation is as high as the CP-layer: it is in complementary distribution with other overt complementizers, it obligatorily occurs to the right of TP-level adjuncts such as time adverbials, and negation obligatorily take scope over quantificational subjects, for instance universal quantifiers, which precede the preverbal component of the bipartite negation.

(18) a. Amesiame me-yi   o.
          Everyone   NEG-go NEG
          'Not everyone went'   ¬ > ∀, *∀ > ¬ (Tongugbe Ewe)

      b. M-ehiã   be   m-adzo   o.
          NEG-need COMP PROSP-go NEG
          'I don't need to go'   ¬ > □, *□ > ¬ (Tongugbe Ewe)

We conclude (as do Collins et al. 2018) that the second part of this bipartite negative marking ought to as high as the CP-layer, and thus just as high as the negative complementizer in Scottish Gaelic.[18] At the very least, the semantic scope of the bipartite negation is high enough in the clause to scope over the subject, and so the situation is comparable to that which we saw with Scottish Gaelic (and also what we see with Russian, Italian, Greek and Spanish, as discussed in section 3.2 below). To come back to the interaction with modal scope: in Tongugbe Ewe, deontic necessity is encoded by a form of *be* followed by a finite clausal complement, and this modal takes wide scope with respect to the matrix-level negation, as we see in (19).

(19) a. Ele be   m-adzo.
          be   COMP PROSP-go
          'I must go'   (Tongugbe Ewe)

      b. M-ele   be   m-adzo   o.
          NEG-be COMP PROSP-go NEG
          'I must not go'   □ > ¬ (Tongugbe Ewe)

To summarize, we find that root necessity modals outscope negative heads that precede them in a wide range of languages, in a variety of structural configurations. This includes cases where the

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[17] All of the Tongugbe Ewe data was provided to us by Selikem Gotah.

[18] Whether or not this negative element is base-generated or moved to its pronounced right-peripheral position is tricky to determine, as is whether the semantic scope of the negation is encoded by one part of the negation or the other. Collins et al. (2018) argue that *o* is moved to its clause-final position, and they posit that the two parts of the bipartite negation are two separate pronunciations of a single moved NEG operator. This analysis is in the context of the theory of negation of Collins & Postal (2014), which involves a substantial reassessment of the received wisdom on what corresponds to a base-generated negative operator, and one of the claims that their work defends is that negative operators often originate within polarity item DPs.

verb is particularly low, as in Russian and Norwegian, and where negation is particularly high, as in Scottish Gaelic and Ewe.

Zooming out and taking a broader typological view, we are not aware of any generalizations regarding the kinds of clause structures which are conducive to wide scope root necessity modals. The availability of such modals seems to be somewhat arbitrary: Russian and Slovenian have such modals, but Bosnian-Croatian-Serbian does not; standard Dutch has one, but northeastern Dutch does not (see I&Z p. 530 fn.3); some Scottish Gaelic speakers have one, but others do not. The syntax of sentential negation seems not to be a relevant conditioning factor, since modals can scope over higher and lower sentential negatives, whether they have head status (as with Russian, Greek and Scottish Gaelic) and ones which have phrasal adverb status (as with Norwegian). The availability of wide scope seems to be a lexical property of individual modals, and subject to lexical variation. This makes the tie between movement and the extension of a modal's scope look tenuous, in particular in light of the fact that negation, in particular head negation, typically blocks verb raising across languages (Zanuttini 1997, Zeijlstra 2004). Cases such as English seem to show us that there is no absolute ban on raising verbs past negation, at least at PF, but it is clear that we would expect some interaction between the crosslinguistic syntax of negation and modal scope if their interaction was in fact syntactically determined.

3.2 High negative operators

In this section we present data that show that wide scope of the modal is available with a variety of negative operators which are in a position higher than sentential negation: negative quantifiers in preverbal position, high covert negative operators in negative concord languages, negative inversion constructions and negative coordinators.

First, consider negative subjects. Iatridou & Sichel (2011) show that NegDPs in subject positions interact scopally with root modals in exactly the same way as sentential negatives in English. Thus possibility and necessity modals *can, may*, *have to*, *need to* scope below both subject NegDPs and *-n't,* while necessity modals *must, should* and *ought to* scope over them both (*must* can also scope below, at least for some speakers, as reported in Iatridou & Zeijlstra (2013)[19]). The same facts hold in a number of the languages with NegDPs and wide scope necessity modals, such as French,[20] Norwegian, Dutch,[21] where the wide scope of the necessity modal is available.

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[19] This reading is irrelevant to the current discussion, since we are interested in the availability of the wide scope reading. We provide a possible solution to the variable availability of the narrow scope reading of the modal when we introduce the alternative analysis of wide scope necessity modals in section 5.

[20] The French data here and throughout reflects the native speaker judgments of the first author.

[21] As already mentioned and I&Z point out, the wide scope of necessity modal *moeten* is subject to variation. The judgments reported here are for those varieties in which *moeten* scopes above sentential negation.

The examples below illustrate this fact (a narrow scope interpretation also seems to be available in all languages).

(20)   a.   No one {can/has to/may/need} leave.   ¬ > mod

        b.   No one {must/should/ought to} leave.   ˇmod > ¬

(21)   a.   Personne ne   doit y   aller.
              nobody   NEG must there go
              'Nobody must go'   ˇ□ > ¬ (French)

        b.   Ingen   må   dra.
              Nobody must leave.
              'Nobody must leave'   ˇ□ > ¬ (Norwegian)

        c.   Niemand moet vertrekken.
              Nobody   must leave.
              'Nobody must leave'   ˇ□ > ¬ (Dutch; Zeijlstra 2022, p232)

Iatridou and Sichel argue that these facts follow from an approach to NegDPs where the scope of their negative component is determined by the same syntactic element as sentential negation. We do not get into the details here, but they predict that the scope of NegDPs will always be identical to that of sentential negation, and so it accounts for their generalization straightforwardly, and without recourse to reconstructing semantically negative determiners (which they show to have numerous problems, arguing against Lasnik 1999).

Our contention here is that it is not correct to say that NegDPs always have the same scope as sentential negation, as there are cases involving operators other than modal verbs where we see differences between the two negatives. Consider the case of *probably*, a 'high' adverb which is shown by Nilsen (2004) to be a PPI. In non-negative clauses, *probably* can occur before or after the finite auxiliary (after is typically preferred), but in negative clauses with *-n't* it can only occur before the sentential negation.

(22)   a.   She will probably lose.

        b.   She probably will lose.

(23)   a.   She probably won't lose.

        b. *She won't probably lose.

If NegDP subjects scoped in the same position as sentential negation, we would predict that *probably* should be possible in a pre-verbal position but following a NegDP. However this is not borne out, as (24a) shows, and the contrast with (24b) makes clear that there is no unexpected lexical incompatibility between negation and *probably,* and they can appear in the reverse order,

with its corresponding semantic scope.[22] (24c) shows that the ungrammaticality of (24a) is not due to *probably* appearing after a quantifier.

(24)   a. *Nobody probably will lose.
        b. Probably nobody will lose.
        c. Everybody/Somebody probably will lose.

Similar facts obtain in French with *sûrement*, with the difference that it always occurs after the finite verb.

(25)   a. Elle ne   va   sûrement pas perdre.
            she NEG will probably NEG lose
            'She probably won't lose'   (French)

        b. *Personne ne   va   sûrement perdre.
            Nobody   NEG will probably lose

These facts indicate that the negation of NegDPs is not identical to sentential negation, but rather is higher, presumably as high as the subject position. This result dovetails with proposals in Zeijlstra (2011) and Collins & Postal (2014), who argue for NegDPs as semantically negative elements which encode negative scope from the subject position, rather than non-negative indefinites with special licensing conditions.

    Evidence for a high position of negation with subject negative DPs is found more transparently in non-strict negative concord languages, like Spanish and Italian. These languages allow a negative DP in a preverbal position without an accompanying overt sentential negative, as opposed to postverbal DPs which must co-occur with one. To account for this pattern, Zeijlstra (2004) and Penka (2011) argue that in such languages, postverbal NegDPs must be licensed by the overt sentential negation, but preverbal NegDPs can't because they are not c-commanded by it, so a covert negative operator is merged in a higher position to license them. We observe that the availability of wide scope of necessity modals is not affected by this higher merge position for

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[22] The same point can also be made with NPI adverbials, in particular *ever*. Like *probably*, *ever* seems to be able to occur both before and after the finite auxiliary, so long as it has an appropriate licensor, for instance a superordinate negation. It can occur in this position with a clausemate NegDP subject too, but not sentential negation, once more indicating the two do not have identical scope.

(i)   a.   I don't think he ever has been known for being tactful.
        b.   I don't think he has ever been known for being tactful.

(ii)   Nobody in my family ever has been known for being tactful.

(iii) *He ever hasn't been known for being tactful.

The force of this argument is tempered by the fact that the pre-verbal position for the adverb is sometimes dispreferred, and so this may be a substantial contributing factor in the judgment of the crucial example (iii).

semantic negation. Indeed it is available whether the subject NegDP is before the verb (without sentential negation, as in (26)) or after the verb (with sentential negation, as in (27)).

(26) a. Nadie debe ir.
          nobody must go
          'Nobody must go'   ✓□ > ¬ (Spanish)

      b. Nessuno deve uscire.
          nobody   must go.out
          'Nobody must go out'   ✓□ > ¬ (Italian)

(27) a. No debe ir nadie.
          NEG must go nobody
          'Nobody must go'   ✓□ > ¬ (Spanish)

      b. Non deve uscire nessuno.
          neg must go.out nobody
          'Nobody must go out'   ✓□ > ¬ (Italian)

In strict negative concord languages, the sentential negation marker must co-occur with any negative DP, whether preverbal or postverbal. Zeijlstra (2004) captures this fact by saying that the semantic locus of negation in strict negative concord languages is always a covert operator in the left periphery. Indeed Zeijlstra (2004) shows that strict and non-strict negative concord languages differ with respect to the scope of overt sentential negation, where in strict negative concord languages, it obligatorily scopes over a wider range of quantifiers in subject position. Nevertheless, in these languages, wide scope of necessity modals is observed; we show examples again with preverbal NegDPs, as these are arguably the ones which most clearly have a high covert negation (although if Zeijlstra is right the argument extends to any negation-containing sentence in these languages). The following demonstrates this with data from Russian (28a), Greek (28b)[23] and Ewe (28c).

(28) a. Nikto   ne   dolžen uxodit'.
          nobody.DAT NEG must   leave
          'Nobody must leave'   ✓□ > ¬ (Russian)

      b. Kanenas den prepi na to kani afto.
          nobody   NEG must   NA it do   this
          'Nobody must do this'   ✓□ > ¬ (Greek)

      c. M-ele   be   ameaɖeke ne-yi   o.
          NEG-be COMP nobody   JUS-go NEG
          'Nobody must go'   ✓□ > ¬ (Tongugbe Ewe)

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[23] The Greek example in (28b) is due to Maria Kouneli.

Thus, for all these NegDP configurations, if I&Z are right in accounting for the data in terms of covert movement, the relevant movement rule must be able to move the modals quite high, as high as the upper regions of the left periphery.

Another construction where negation takes high scope is negative inversion in English (see Emonds 1976; Haegeman 2000; Collins & Postal 2014). The fact that negation takes particularly high scope in negative inversion is shown by the following examples. (29) demonstrates that the fronted negative operator licenses subject NPIs, and the triplet in (30) shows that *because*-clauses may outscope sentential negation and NegDP subjects, but not fronted negative operators in negative inversion.

(29)   At no point did anyone think to inform me of the plans.

(30)   a.   I didn't leave because it started raining. $\neg >$ because, because $> \neg$
        b.   Nobody left because it started raining. $\neg >$ because, because $> \neg$
        c.   At no point did I leave because it started raining. $\neg >$ because, *because $> \neg$[24]

The high scope of negation in negative inversion is discussed in more detail in Potsdam (2013). Potsdam observes that quantificational arguments are actually unable to take scope over the negation of negative inversion constructions, on the basis of data such as (31). He also shows that the same holds for inverted negation in negative imperatives and negative questions, and concludes that inverted negation generally takes wide scope in CP or FocP.

(31)   Only this semester didn't John fail at least one student.

$$\neg > \text{AT LEAST } 1, *\text{AT LEAST } 1 > \neg$$

However, as Francis (2017) notes, *must* is surprisingly still able to scope above negation, in contrast with other scope-taking elements.

(32)   At no point must the server's feet move in front of the baseline on the court prior to hitting their serve.[25] $\check{}\Box > \neg$

Therefore, if the modal undergoes head movement – specifically, some covert step of head movement to a higher position than its landing site after T-to-C movement – it must do so to a projection above the FocP or CP, depending on the analysis, and such a movement must be forbidden for phrasal categories such as *because*-clauses, which must scope below negation in this construction.

Finally, consider negative connectives, i.e. *neither…nor* and its equivalent in other languages. We observe that wide-scoping modals such as English *must*, French *devoir* can produce a wide scope interpretation when present in negative coordinations.

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[24] This reading does become possible if there is a big pause before *because*, but no such pause is required for (30a)–(30b).
[25] https://www.rulesofsport.com/sports/tennis.html.

(33) a. Coronavirus knows no international borders, neither must its eventual cure.[26]   ✓□ > ¬

b. Tu ne   peux   ni   ne   dois   sortir.
   you NEG can.2SG nor NEG must.2SG go.out
   'You cannot nor must go out'   ✓□ > ¬ (French)

These facts are especially problematic for a movement account of the modal's wide scope. We show in particular that a widespread analysis of *neither..nor* as a negative disjunction is strikingly incompatible with modal movement to derive its wide scope. To see this, consider how negative coordinations are analyzed. For two propositions p and q, the meaning of a negative coordination can be decomposed as one of two truth-conditionally equivalent possibilities: a conjunction of negative elements $(\neg p) \wedge (\neg q)$, or a negation of a disjunction $\neg(p \vee q)$. Most prominent analyses of negative coordinations involve a negated disjunction (Gonzalez (2020) for French, Gajić 2016 for BCS and Jeretič 2018; 2022a for Turkish). In such an analysis, for the modal to outscope negation, it must raise above the entire coordination, resulting in an LF of the type $\Box\neg(p \vee q)$. This LF, however, does not correspond to the intended reading, since the modal only applies to one of the disjuncts; there is no way of achieving the desired reading by any movement of the modal, whether it be head movement or something else. Otherwise, if negative coordinations were conjunctions, contra the claims in the above-cited papers, we would have to assume a final LF of the type $(\neg p) \wedge (\Box\neg q)$, which is in violation of the Law of Coordination of the Likes, and raises issues on how close does negation have to be to the conjunction to license the *neither..nor* coordination. Note that the alternative approach presented in section 5, in contrast, naturally accounts for the wide scope interpretation of the modal in a negative coordination, regardless of its underlying semantics.

For all of the cases described in this section, deriving wide scope via head movement requires movement of the modal to some position above TP or higher. In all cases, this movement must be covert, since the negative operators are higher than the overt position of the modal. In the case of Negative Inversion, the modal's surface position is already a derived one, yet is expected to scope below negation, so the modal would have to undergo further covert movement above it. As for negative connectives, the wide scope interpretation is particularly problematic for a movement account, as it is logically incompatible with the common analysis of negative connectives as disjunctions; otherwise, under the already less popular conjunctive analysis of negative coordinations, a movement account of modal scope leads to adopting a number of shaky assumptions.

3.3 Embedded modals

A question that does not arise with English *must,* but which can be asked using data from other languages, is whether a *must*-type root necessity modal may scope over a clausemate negation even

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[26] https://www.theguardian.com/commentisfree/2020/apr/18/coronavirus-knows-no-international-borders-neither-must-its-eventual-cure.

if it is embedded under another auxiliary. In this section we show that modals in such configurations still scope over negation, even though the modal is c-commanded by another verbal head.

First, consider the case of French. In simple cases, French verbs move to T (Pollock 1989). French has several necessity modals that can take scope above negation. In particular, *falloir* takes obligatory wide scope, as shown in (34) (similar facts and arguments presented in this section hold for *devoir*, that takes optional wide scope).

(34). Il   ne   faut pas fumer ici.
       EXPL NEG must NEG smoke here
       'One must not smoke here'

Following an analysis of the I&Z type, the wide scope of *falloir* is achieved by head movement of the modal to T, above the negation marker *pas* (though still below the second, optional negation marker *ne*). However, we show that these modals can also be used in constructions that clearly don't have movement to T, i.e. in infinitival constructions, as in (35a), and in compound tenses, as in (35c). Wide scope of the modal is still available in these cases, despite the lack of overt head movement.[27]

(35) a. Ne   pas falloir   fumer, c'est normal.
          NEG NEG must.INF   smoke it's normal
          'Being required not to smoke is normal.' $\check{} \Box > \neg$

      b. Il   ne va pas falloir   parler.
          EXPL NEG go NEG must.INF   talk
          'We will have to not talk.' $\check{} \Box > \neg$

      c. Il   n' aurait   pas fallu   fumer.
          EXPL NEG have.SUBJ   NEG must.PTCP smoke
          'You shouldn't have smoked.' $\check{} \Box > \neg$

The strong challenge here comes from (35b) and (35c),[28] where the modals are dominated by another auxiliary; if we were deriving the wide scope by head movement, this would require quite an unusual type of non-local head movement that is not recognisable from French grammar.

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[27] The perfective *passé composé* is a compound tense in French that only allows narrow scope, as in 'il n'a pas fallu', and could initially appear to be compelling evidence for head movement correlating with wide scope. However, as argued in Jeretič (2021a; b), this narrow scope is due to the effect of the perfective semantics, instead of the lack of head movement. One argument for this is that a similar lack of wide scope is observed in the archaic perfective *passé simple* 'il ne fallut pas', which does exhibit head movement as in the present tense. Furthermore, the availability of wide scope in compound tenses as shown above lends support to such a non-syntactic analysis, and is enough to make our point.

[28] There are, however, reasons to think that the wide scope in the counterfactual sentence (35c) is has a difference source from the one in present tense. Indeed, this construction is robustly neg-raising, i.e. the wide scope is obligatory under extra-clausal negation. And furthermore, it is known that counterfactual marking induces neg-raising behavior, see Agha & Jeretič (2022). The same point cannot be made, however, for the future-marked modal in (35b).

Before we move on, we will show that modals that are embedded under another auxiliary in this manner can scope over higher negations in other languages as well. As discussed in the previous section, Spanish tensed verbs undergo V-to-T, as they appear before adverbs, despite appearing after negation. However, they appear after adverbs when in their nonfinite forms, e.g. the near future, (36a), and conditional, (36b). As in French, these involve a finite verb in T which embeds the modal. Despite the fact that T is filled and the modal is embedded well below NegP, the modal can still take scope over negation.

(36)   a.   No   habría   debido   separarme de   ella.
               NEG have.COND.1SG must.PTCP break.up   from her
               'I shouldn't have broken up with her' $\checkmark \Box > \neg$

        b.   No   vas   a   tener   que salir   hoy.
               NEG go.2SG to have.INF to   go.out today
               'You will be required not to go out today' $\checkmark \Box > \neg$

Dutch modals also have non-finite forms that can be embedded under other auxiliaries. (37a) shows cases where the necessity modal *moeten* is embedded under *zullen* 'will' and *had* 'had' (past perfect). In these cases, the modal scopes over negation, just like it does in simpler cases where it is finite.[29]

(37)   a.   Jan zal   niet moeten   vertrekken.
               Jan will not   must.INF leave.INF
               'Jan will have to not leave' $\checkmark \Box > \neg$

        b.   Jan had niet moeten   vertrekken.
               Jan had not   must.INF leave.INF
               'Jan shouldn't have left' $\checkmark \Box > \neg$

Finally, there is actually a case to be found in English, namely *supposed (to)*. As noted by Homer (2011), *supposed to* is a necessity modal which takes wide scope with respect to negation, despite always occurring below it.[30]

(38)   You're not supposed to leave. $\Box > \neg$

The argument from *supposed* requires a bit more argumentation than the other cases reviewed so far, since one might claim that the locus of the construction's modal force is the *be* which

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[29] These Dutch examples and judgments were provided to us by Maxime Tulling and Jeroen van Craenenbroeck.

[30] *Supposed* has been labeled a neg-raiser (Horn 1978; 1989; Collins & Postal 2014). Homer 2011 analyzes it as both a neg-raiser and PPI, on a par with English *should*, which I&Z analyze as a PPI. As far as this paper is concerned, it falls within its purview, because it is not a robust neg-raiser, since the narrow scope of *supposed* is available under extra-clausal negation as in 'I don't think you're supposed to go'.

it typically occurs with; such an analysis might lean on comparison with the modal *is to* construction (as in *John is to be here by five*), which also scopes over negation (I&Z p. 530). But we can provide support for the claim the locus of modal force in this construction is *supposed* by considering examples such as (39), where the *supposed* occurs without a verb in a small clause construction but still contributes the same modal interpretation and still scopes over negation.

(39)   Italy, of course, remains in lock-down with people not supposed to leave their homes and there's little knowledge of snow conditions presently.[31]   ˇ□ > ¬

Given that *supposed* is embedded under a finite *be* in T in examples such as (38), it would seem to pose the same sort of challenge as the other case.[32]

4 The challenge for movement accounts

How, then, can modals outscope negation in all of the different structures we have seen? In this section we present the head movement-based analysis of I&Z. Recall that in their discussion of Greek, I&Z suggest that the modal undergoes *covert head movement* to some head position above negation, from which it can scope. They give the informal LF in (40) for such a derivation.

(40)   [PPI-modal$_i$ [not [t$_i$ [vP]]]]
         [<<s,t>,t> [<t,t> [s [<s,t>]]]]

For languages in which NegP is above ModP but below TP, like Russian, the modal would need to covertly raise to TP, and the analysis would be much like what was schematized in (9) for English, except that the head movement in question is covert. The analysis of Norwegian would be broadly similar: in V2 clauses, the modal would either take scope in C or in T, while in embedded clauses the verb would need to raise to one of these head positions covertly.[33] In languages in which the verb raises past adverbs but not negation, like Greek, we assume that the NegP projection which hosts the overt negative head is above TP, following Zanuttini (1997).

    I&Z do not commit to a specific implementation of head movement, nor do they commit to details on the clause structures or phrase structures for negation involved. In what follows

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[31] Example from https://www.snow-forecast.com/whiteroom/world-snow-roundup-131/. Accessed on August 9th 2020.

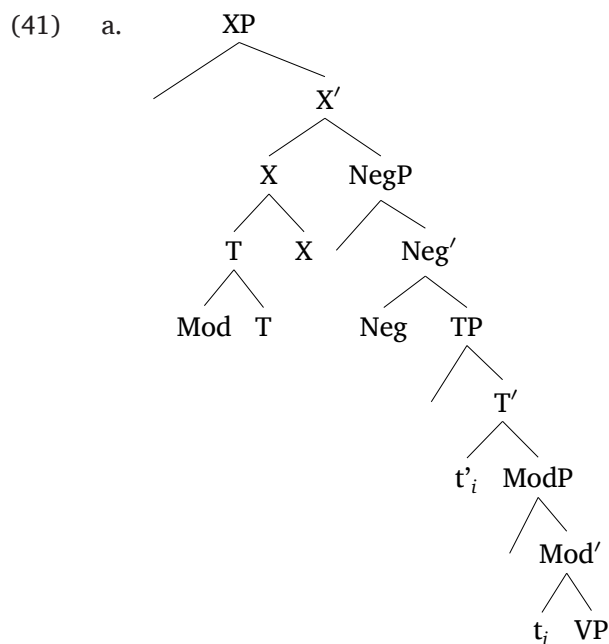[32] We would like to suggest that the small clause data strengthens our case somewhat, since it demonstrates that the relevant readings can be obtained in an environment which is typically taken to lack the functional structure of full clauses (cf. Moulton 2013). The syntactic account relies on there being functional projections to which the modal moves to take wide scope, so we would need to say that such projections are available even in small clauses, despite the lack of any other tense or aspectual projections in these clauses.

[33] It is an open question if V-to-C in mainland Scandinavian stops at T; see Arregi & Pietraszko (2021) for a discussion.
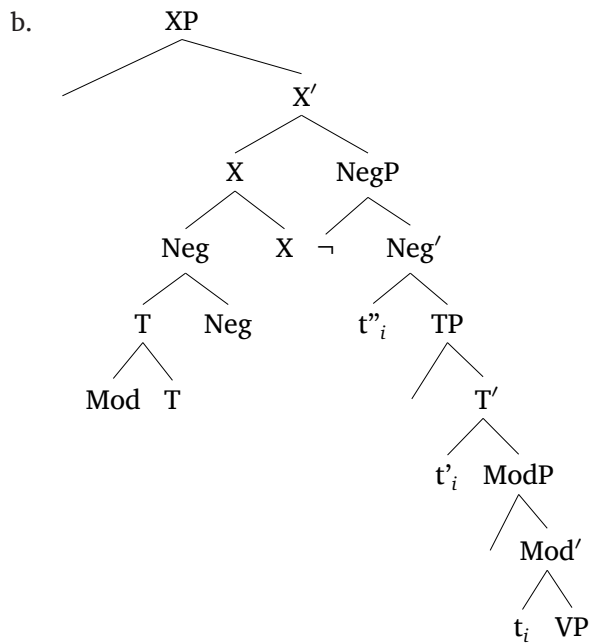
we flesh out some specific implementations, and assess the theoretical issues that arise when it comes to dealing with the data discussed above. First, we discuss implementations in terms of classical head movement, spelling out how this might work for two specific clause structure analyses. Second, we discuss how one might account for the scope facts in terms of the alternative approach to head movement in Matushansky (2006), where it is analysed as an instance of head-to-specifier movement. Finally, we discuss the phrasal movement account in Homer (2011).

4.1 Classical head movement

Let us first consider the case of classical head-to-head movement (for a recent defense see Roberts 2010). We will consider two implementations with fairly conventional phrase structure: (i) the modal raises covertly over the NegP to some higher (semantically vacuous) head X, skipping the Neg head completely, as shown for finite modals in (41a); (ii) the semantically interpreted negation is a phrasal specifier of NegP and the modal moves through its semantically vacuous head to a higher (also vacuous) X position, as shown in (41b) for finite modals.[34]

(41) a.

```
              XP
             /  \
                 X′
                /   \
              X      NegP
             / \     /   \
            T   X   Neg′
           / \      /   \
         Mod  T   Neg    TP
                          \
                           T′
                          /  \
                       t′_i   ModP
                               \
                                Mod′
                               /   \
                             t_i    VP
```

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[34] A third option is that the modal moves to adjoin to the NegP head and then takes scope over it from this position, on the assumption that adjoined elements c-command their host constituents (as in e.g. Kayne 1994). This does not seem to be compatible with the syntax-semantics mapping assumed by I&Z, where negation first composes with the VP/ModP from which the modal has raised, and it is not clear how one could get the modal to compose with the negation appropriately in the complex head formed by head movement, as noted by Homer (2015).

b.

```
                    XP
                   /  \
                      X′
                     /  \
                    X    NegP
                   / \   /   \
                 Neg  X  ¬   Neg′
                 / \        /    \
                T  Neg    t″_i    TP
               / \         |    \
             Mod  T        |     T′
                          /      / \
                        t′_i   ModP
                               /    \
                              Mod′
                              /  \
                            t_i   VP
```

These diagrams involve the high NegP above TP, and so would be applicable to Spanish and Greek. For languages such Scottish Gaelic, negation would be in some higher C position immediately above the highest head in the inflectional layer (cf. Bennett et al. 2019 on Irish), and there would need to be covert head movement to some X which would be a higher complementizer in the CP layer.

For both of the analyses above, we must assume some type of interpretable covert head movement of the modal. One immediate problem with this is that there is little to no empirical evidence for covert head movement independent of the proposal at hand. Covert head movement features prominently in early Minimalist work such as Chomsky (1995), but there was little in the way of empirical motivation for this component of the theory, and none of this was retained in subsequent developments of the framework (e.g. Chomsky 2001). Arguably, the burden of proof for covert head movement should be set particularly high, since there is as much demand for the elimination of covert movement as there is for the elimination of head movement (see e.g. Chomsky 1995; Kayne 1998). Moreover the addition to the theory of technology such as Agree (Chomsky 2001), which does much of what covert movement did in early Minimalism,[35] renders covert head movement suspiciously redundant. In addition, a related problem is that covert head movement of modals, so construed in line with I&Z's proposal, would be markedly different from QR of DPs, since DPs can often QR for no reason other than to take wide scope (Fox 2000),

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[35] See for instance Bobaljik (2002), where cases of subject-verb agreement with postverbal subjects are analysed in terms of covert phrasal movement of the subject to Spec,TP (plus reconstruction).

while covert head movement would only be permitted to rescue a polarity clash. Recall that the default for non-PPI modals is to scope below negation obligatorily, so allowing optional covert head movement of modals (without obligatory reconstruction) would lead to overgeneration. It's not clear why covert head movement would differ from covert phrasal movement in this way.

A related empirical problem comes directly from the case of Scottish Gaelic in particular. Recall from section 3.1 that sentential negation in Scottish Gaelic is encoded by a negative complementizer, and that in at least some varieties the root necessity modal may scope over this negative element. The analyses above would necessitate an analysis where the modal moves covertly to some position above this negative complementizer. The trouble with this is that this instance of covert movement would need to be unique in the language, as other quantifiers are not able to scope over sentential negation, as shown in the sentences in (17), where universal quantifiers in subject and object positions scope below negation, even though QR is otherwise available (for object > subject scope). Similar facts are found in Ewe, as shown in (18), which also has a particularly high syntactic negation.

These facts are arguably part of a more general pattern, discussed in section 3.2, whereby negation in the CP-domain obligatorily takes scope over QPs in the clause that the C embeds (Potsdam 2013). Accounting for data in I&Z's terms would require us to say that covert head movement is able to target some position above the CP-negation, but covert phrasal movement is not. This is a further step in the direction of a disunified analysis of quantificational scope-taking, and it is not clear what it would derive from.

An additional problem for the structures in (41a)–(41b) is that they involve multiple violations of the Head Movement Constraint (Travis 1984). First, consider the structure in (41a): the HMC is violated in this structure because the modal crosses Neg without adjoining to it. It is shown by Zanuttini (1997) and Zeijlstra (2004) that negation of the Greek/Italian type is a head in the clausal spine; in this respect, it is different from the negation of languages such as Norwegian, which behaves like a phrasal category (i.e. an adverb) with respect to a number of other independent diagnostics. One of the head-like properties that negation shows in these languages is that it blocks (overt) verb raising to C, for instance in questions or imperatives where the verb would normally raise in the absence of negation (see especially Zanuttini 1997 on these issues). Such facts are expected in the context of the HMC. Given the analysis of Greek/Italian negation as a head, and the fact that verbs (including modal verbs) do not move overtly past negation in any case in these languages, the claim that the modal moves over covertly on an analysis such as (41a) is somewhat surprising.

The analysis in (41b) avoids the HMC problem that troubles (41a), but does so at the cost of an empirically unsuccessful account of the syntax of negation, since it involves analysing the overt negative element as a phrasal specifier. As noted above, Zanuttini (1997) and Zeijlstra (2004) provide a number of empirical arguments for analysing the overt negators in Greek/

Italian type languages as heads, distinguishing them from the adverb-like negatives of languages such as Norwegian and Dutch. These properties would need to be reconsidered one-by-one if we were to adopt the analysis in (41b). In addition, Zeijlstra (2004; 2008) argues that the availability of negative concord across languages can be accounted for, and indeed explained, on the basis of the division of languages into head negation vs non-head negation languages (i.e. Italian vs Dutch). By adopting the analysis in (41b), we would have to give up on this as well, since it would effectively collapse this distinction.

The HMC problems only multiply once we consider the specifics of the embedded modal cases discussed in section 3.3. In all cases, the modal occurs in some low position below negations of different kinds (high negation in Spanish, most likely low negation in the others), and so in order for these modals to scope over negation they must be undergoing covert head movement to some higher head position above the NegP projections. (42) shows how this might work for French, where T is occupied by an auxiliary such as *avoir*, which has moved from some lower position where it embeds a constituent containing the modal (which we represent as ModP here).[36] Spanish would be broadly similar.

(42)
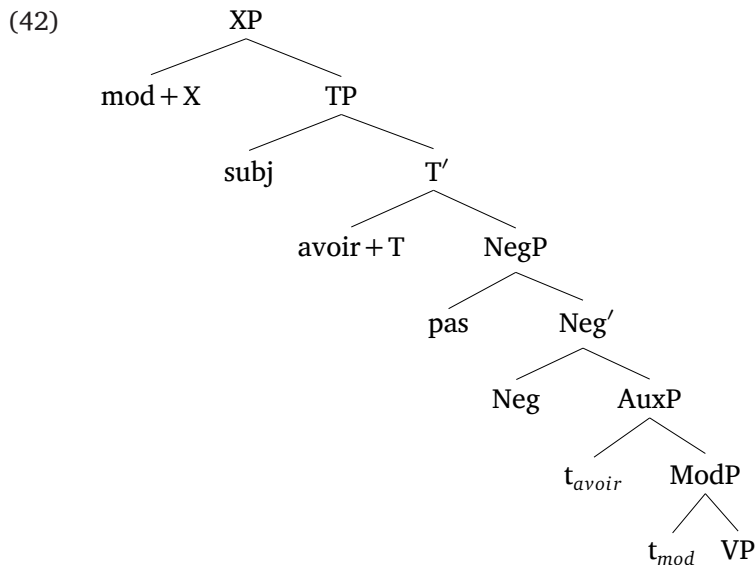
Movement of the modal incurs at least two violations of the HMC: one by crossing the base-generated position of the auxiliary, and one by crossing T. The landing site for movement of the modal must be some higher head position, since T is filled by *avoir*. In addition, the identity of the X projection is not evident, and it is unclear whether we would expect it to always be available, for instance in cases like (39), where there is no apparent TP layer at all.

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[36] For simplicity we are ignoring Pollock's (1989) split IP, which breaks up the tense/inflection domain into two projections.

These considerations taken together, (42) looks like quite an unlikely analysis for the wide scope reading of the modal. A similar cluster of problems besets the analyses for the data from Spanish, French and English, and adopting a version of the analysis in (41b), where the modal raises through negation, would not improve matters, since the modal would still need to cross both the higher auxiliary's trace and its derived position where it is adjoined to T. Stepping back from the technicalities for a moment, it seems fair to say that the kind of head movement that is required to derive (42) would be quite unlike anything else that is familiar from the overt syntax of these languages. Its status is suspicious at best.

A potential way out in the case of the embedded modal data is to confront the HMC head-on (Harizanov & Gribanova 2017), in light of cases in other languages where it seems not to apply. One class of cases which is particularly relevant is the so-called *long head movement* (LHM) construction, where we see a participle moving over a local auxiliary to some higher position in the same clause (see e.g. Rivero 1991; 1994). LHM is found in southern and western Slavic, Balkan languages and in Old Romance, and it is illustrated for Bulgarian in the following example, in which the participle occurs to the left of the auxiliary.

(43)   Procel e   knigata.
        read   has book.DEF
        'He has read the book'   (Bulgarian; Rivero 1991)

A possible analysis of the embedded modal facts is to say that the covert syntax of these modals is the same as the overt syntax of LHM, with the only difference being in patterns of pronunciation.

While this line of reasoning is familiar, and in principle capable of accounting for some of the data, it is still limited, since LHM is much more restricted than whatever mechanisms are involved in providing embedded modals with wide scope. One restriction on LHM is that it only applies in finite matrix clauses, much like V2 movement in Germanic (Rivero 1991). If wide scope for modals was derived by LHM, then we would incorrectly predict no wide scope in the French example (35a), in which the modal occurs in a non-finite embedded subject clause, as well as English (39). The insensitivity of the availability of these modals' wide scope to clause structure, unexpected if derived by movement, echoes the more general cross-linguistic and cross-structural pattern we uncovered in the previous section. A second restriction that often applies to LHM, which is particularly relevant here, is that it is often blocked by negation. Rivero (1991) discusses this at length and shows that in languages such as Bulgarian, LHM is impossible in negative clauses.

(44)   a. *Procel ne   sum knigata.
           read   NEG   has book.DEF

b. *Ne   procel sum knigata.
   NEG read   has   book.DEF
   'He hasn't read the book'   (Bulgarian; Rivero 1991)

This restriction does not apply to all LHM languages however, as Slovak differs from Bulgarian in allowing LHM in negative clauses if the negative marker attaches to the fronted participle.

(45).   Ne-napísal   som   list.
        NEG-written have.1SG letter
        'I have not written a letter'   (Slovak; Rivero 1991)

Rivero shows that the possibility of LHM in negative clauses correlates with the type of negation, such that it is impossible in languages with 'high' negation (where NegP occurs above TP, Zanuttini 1991, Zanuttini 1997) but possible in languages with 'low' negation ('English-type' languages, according to Rivero). These are the kinds of interactions between negation and head movement that we might expect to find, but we did not find any such interactions in our overview of wide-scoping modals in the previous section, and so this makes LHM and modal scope seem quite distinct. In particular, it is hard to see how invoking covert LHM would derive wide scope for the embedded modals in Spanish, given that it is a 'high' negation language. We conclude, then, that invoking LHM of the Slavic/Balkan type is unlikely to provide us with a means by which to understand the ability of embedded modals to scope over clausemate negatives, and so the problems outlined above still stand.

Of course, it is possible to draw another, perhaps more nihilistic conclusion from the LHM phenomenon, namely, that the HMC is not a real restriction on syntax at all, and that any argument for or against specific analyses of head positions that is built on the HMC is doomed from the start. This would strip our argument in this section of much of its potency, and so we should acknowledge it. But any move in that direction would leave unaccounted for a great number of restrictions on rules that affect heads, and it would ultimately constitute an abandonment of much of the empirical base of syntactic theories of head movement, thus making it look decidedly less syntactic. This doesn't seem to be a productive move for defenders of syntactic head movement to make.

Finally, one could consider the possibility that only *overt* head movement is subject to the HMC, while covert movement is not so restricted. This strikes us as undesirable, for at least two reasons. First, if anything we would expect the covert version of head movement to be the more restricted one, given that covert phrasal movement seems to be more restricted than overt phrasal movement. Second, if we assume that there is no postsyntactic LF-movement but rather that covert operations simply involve pronouncing the lower copy of a movement chain, as is quite typical in contemporary work (see e.g. Bobaljik & Wurmbrand 2012), then this proposal

would suggest that the HMC is not syntactic in nature, but rather it would be a PF-phenomenon. But if this is the case, then the case for a syntactic analysis of head movement would be weakened significantly, only lending support to non-syntactic alternatives.

In summary, the data reviewed in section 3 is difficult to account for in terms of an account where modal scope is determined by classical head movement. Simply put, if the scope of modals is determined by syntax, then it should interact with syntax in a meaningful way. This is not what we see crosslinguistically.

4.2 Head movement a la Matushansky (2006)

Although our primary target in this paper is classical head movement of the head-head adjunction type, another implementation of head movement to discuss is the one in Matushansky (2006). Matushansky's proposal is intended to solve the various theoretical problems with classical head movement that were raised by Chomsky (2001). Although it has proven somewhat influential in certain areas of the literature (see e.g. Jenks 2014, Kramer 2014, Harizanov 2014; 2019), as far as we know it has not been subjected to many detailed critiques.

The starting point for Matushansky's article is the list of problems identified by Chomsky (2001) as motivating the move towards a non-syntactic account of head movement. First, there is the claim that is always semantically vacuous, the claim that we are engaged with assessing here. Second, in the context of Chomsky's probe-goal framework, there is the question of how one can force a probe to attract just a head X and not the XP that it heads; this seems to require introducing some diacritic for distinguishing heads and phrases, an unwelcome move in the context of Chomsky's theory. We can call this the Attraction Problem. Third, Chomsky lists a bunch of other properties of head movement which seem to distinguish it from phrasal movement and which, for Chomsky, render head movement's theoretical status particularly suspect.

(46)   a.   It is an adjunction rule
       b.   It is countercyclic, i.e. it violates the Extension Condition
       c.   Moved heads don't c-command their traces
       d.   Identification of head-trace chains is problematic "as there is no reasonable notion of occurrence" (p. 38)
       e.   It is subject to a much stricter locality condition (the HMC)
       f.   It is not successive-cyclic but rather "snowballing"

These problems are also discussed insightfully by Roberts (2011) and Dékány (2018).

Matushansky's proposal aims to address most of these problems by analysing head movement as an instance of very local head-to-specifier movement which is combined regularly with the morphological readjustment rule of *m-merger* (Marantz 1988). On this analysis, which is situated in the Distributed Morphology framework (Halle & Marantz 1993), the syntax derives structures
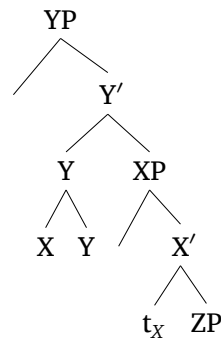
such as (47a), where X moves to the specifier of an immediately dominating YP, and then when the structure is spelled out, here conceived as shipping the structure from syntax to a distinct morphological component, the m-merger rule readjusts the terminals to produce the structure in (47b), where X and Y form a complex head which will feed Vocabulary Insertion.
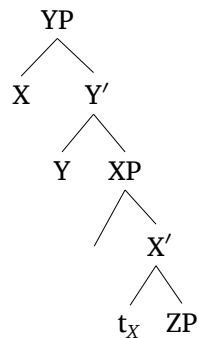
(47)   a.   b.

This analysis immediately solves the c-command problem and the countercyclicity problem, and it captures the "snowballing" property of head movement (it passes through and picks up all other heads on its way to its final landing site) by positing that spellout and thus m-merger apply at every maximal projection. As for the Attraction Problem, Matushansky analyses head movement as being driven by an uninterpretable c-selection feature on the attracting head, X above, and it attracts just the head of the lower projection YP because this is the minimal element that it can attract and satisfy the attractor's requirements. Matushansky argues that phrasal movement is simply an instance of pied-piping, which applies when moving only the head is unavailable, and she claims that this holds whenever the attracting X and the attracted Y are not in an immediately local relation, due to a condition which she calls the Transparence Condition (p. 48):

(48)   *Transparence Condition*
       A head ceases to be accessible once another head starts to project.

This predicts that head movement and phrasal movement should always be in complementary distribution, and it predicts that head movement will always be strictly local, as required by the HMC. Note finally that Matushansky's approach requires that every maximal projection be a phase, since m-merger is cast as a morphological operation which applies after every step of head movement, and so every maximal projection will need to be sent to spellout in order to ensure that m-merger applies to every step of head movement.

   How could Matushansky's account be used to account for the modal scope data? Matushansky does not discuss covert head movement in her paper. The desired outcome is one where Matushansky-style head movement may apply freely and unconstrained by locality when

it is covert. Syntactic and morphological restrictions conspire to derive the locality of head movement in this account – in particular, the combination of the c-selection trigger and the obligatory application of m-merger in each maximal projection – so it makes sense to look to the morphological component of this analysis as a means by which to set covert head movement free, since covert movement ought not to feed morphological operations.
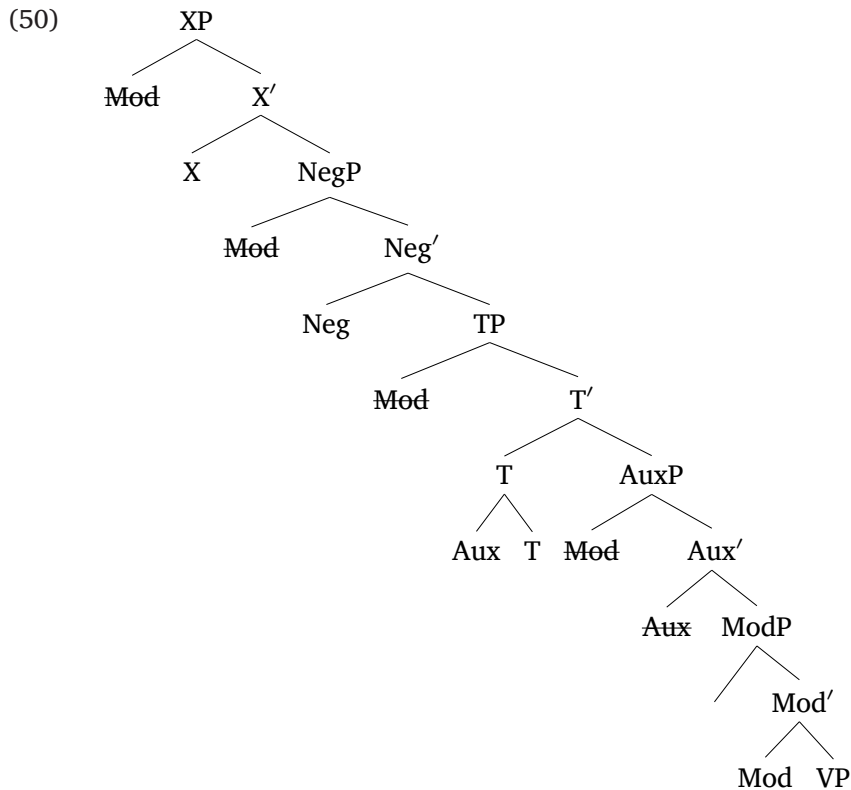
The analysis does not predict that head movement should be completely free, because the Transparence Condition ensures that pied-piping will occur in any case where a probe attempts to attract a head X when it is contained in its XP. However, if the head X is first extracted covertly to the specifier of the immediately dominating YP, and m-merger fails to apply, then that X should be visible to any attracting head above. Thus in (49), if Z or B bear a [uX] probe (which is not necessarily a c-selection feature) then they should be able to attract X, unconstrained by the Transparence Condition, since X has been extracted from XP and thus its accessibility is not at stake.[37] But given that every phrase is a phase on this account, movement to BP would need to proceed via ZP, since B could only find elements at the edge of the ZP phase.

(49)
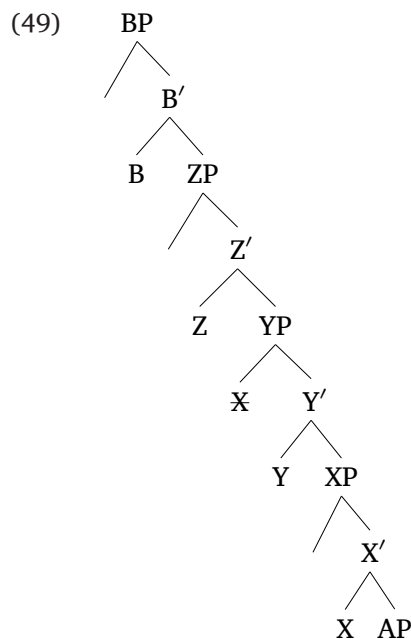
Thus to derive long-distance head movement of X to Spec,BP, there would need to be three features implicated: a c-selectional feature that attracts X from within XP, an "edge" feature which attracts X to a non-terminal landing site, and a feature which attracts X to its (criterial)

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[37] The exact formulation of the Transparence Condition in (48) seems to rule out extraction a head from a specifier as in (49), since a head embedded in the specifier of another head's projection would be inaccessible. For the sake of getting this analysis off the ground we are choosing to interpret (48) as only rendering heads inaccessible when they are within their own maximal projections, which is the primary function of the condition in Matushansky's proposal.

scope position. Although it is somewhat baroque, a derivation of this kind ought to get the desired result: moving modals covertly would be free of HMC restrictions. Thus the difficult case of Spanish embedded modals could be derived from a (simplified) structure such as (50), where the modal moves covertly via all available specifier positions all the way to Spec,XP, a position above the high NegP projection.

(50)

```
                    XP
                  /    \
               Mod      X′
                      /    \
                    X       NegP
                          /    \
                       Mod      Neg′
                              /    \
                           Neg      TP
                                  /    \
                               Mod      T′
                                      /    \
                                    T       AuxP
                                  / \      /    \
                               Aux  T   Mod      Aux′
                                              /    \
                                           Aux      ModP
                                                      \
                                                      Mod′
                                                     /    \
                                                  Mod      VP
```

Here we review reasons to be skeptical about this analysis of covert head movement in particular, and Matushansky's theory in general.

Most of the problems that we see come from the assumption that every phrase must be a phase, which is necessary to avoid allowing overt head movement to derive widespread excorporation. The claim that every phrase is a phase is shared by much work in Nanosyntax (Starke 2009; Baunaz et al. 2018), and is also adopted in other work (Bošković 2002, Müller 2010). However a sustained and careful argument against this outlook is developed by Abels (2012: ch.2), who shows that there are various empirical phenomena which suggest that movement paths are *punctuated* (stopping off at some but not all projections) rather than *uniform* (stopping off at every projection). One example comes from reconstruction in Norwegian. Abels shows (p. 27–29) that there are fewer scope reconstruction possibilities for moved subjects than one would expect if moved subjects could stop off at various positions in the clause on their way

to Spec,TP. Pairs such as (51)–(52) demonstrate this: while (51) allows for a reading where the subject scopes below the adverb *sannsynligvis* "probably", but above the modal *må* "must", such an intermediate scope reading is not allowed in (52), where the subject binds into the PP which occurs between the two elements; rather, the subject must take wide scope if it binds into the PP. If movement paths were uniform, then there ought to be some intermediate trace position t'' to which the subject can be reconstructed, which would derive the relevant reading.

(51)   … at   noen gutter sannsynligvis t' må   ha t dratt til Roma
           that some boys   probably   must have   gone to Rome
       "that some boys probably must have gone to Rome."

(52)   … at   noen gutter sannsynligvis t'' mot   sin   vilje t' må   ha t dratt til Roma
           that some boys   probably   against REFL will   must have   gone to Rome
       "that some boys probably must have gone to Rome against their will."

Other arguments against the every-phrase-is-a-phase outlook are to be found in Fox & Pesetsky (2005), Richards (2011), Bošković (2014) (see also van Urk 2020 on the matter of identifying positive evidence for phase domains). Matushansky's theory runs counter to this broad tradition in work on phases, and the rethinking of how to handle locality phenomena that are normally captured in terms of punctuated movement paths is far from trivial.

     Another problem comes up when we consider how Matushansky's theory captures the "snowballing" character of head movement. Consider (47) again, and in particular the next stage of the derivation where another head A is merged, shown below.

(53)
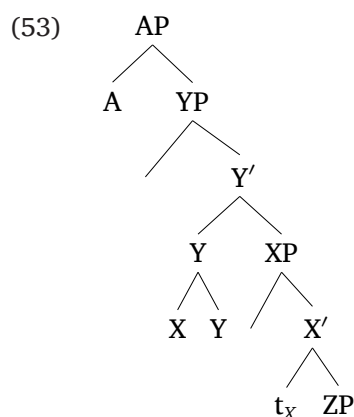
It is vital for Matushansky that m-merger applies to the moved head X and its host Y prior to merge of a next-higher head A, because if that doesn't happen, A will only attract Y (the head it c-selects) and X will not be pied-piped with it, deriving something akin to excorporation. What this means is that spellout must make X-Y into a syntactically opaque complex head prior to any

further syntactic operations applying, and so m-merger/spellout must feed syntax. This requires an "interleaving" of cycles of syntax and morphology which seems to be in direct violation of basic principles of modularity (see Preminger 2020 for critical discussion). In addition, it is not clear what kind of theory of phases is assumed to make this work. In the derivation of (53) the YP must have been spelled out prior to A merging. But it is widely assumed that when a domain is spelled out, its internal content cannot be affected by any subsequent syntactic operations (see e.g. Collins & Stabler 2016, 67); in the words of Uriagereka (1999), the spelled-out domain is "like a giant lexical compound" (p. 256). How can the internal contents of that domain be accessible to A? And even if the domain can somehow remain accessible and A can trigger copying of Y into Spec,AP, how can some subpart of that domain, the lower copy of Y, then be deleted following movement, if it has already been spelled out as part of the YP domain? There is a deep conflict here, one which seems to require a total rethink of how phases and spellout work. The combination of this problem, the modularity issue and the empirical problems with the every-phrase-is-a-phase outlook seems to us to be reason enough to reject the Matushansky approach to head movement.

This outlook also creates problems for the analysis of modals in particular. Recall that the outlook defended in I&Z was one where head movement of a modal would only be semantically non-vacuous if it had an effect on interpretation, for instance if it was to take a PPI-modal out of the scope of a c-commanding negation. This was necessary to capture the fact that non-PPI root modals typically scoped below negation unambiguously, across many languages. The claim in I&Z's analysis was that any instance of modal head movement which did not have such an effect on movement would obligatorily undergo total reconstruction; we can understand this as involving deletion of the interpretable features of the higher copy which would feed semantic interpretation, subject to economy considerations (cf. Nunes 2004). But given the every-phrase-is-a-phase model, deriving a structure such as (50) would require multiple instances of modal movement which would have no effect on the interpretation of the PPI modal, and which would obligatorily reconstruct going by I&Z's reasoning. Thus reconstructing the first step of movement from XP to Spec,YP would result in the head copy X failing to bear any of the semantic features which would be responsible for deriving semantically non-vacuous movement, and so any subsequent operation that targets and copies that X will also be semantically vacuous. It is not clear, then, how successive-cyclic head movement could be semantically non-vacuous in this system if it did not have an effect on interpretation at each cycle (as is required for covert phrasal movement by Fox 2000).[38]

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[38] The same problem would arise for cases of overt head movement too in fact, such as movement of modals in Greek to T. Recall that Greek has verb-raising to T, as evidenced by adverb ordering facts, and it is also a high negation language in Zanuttini's (1997) sense, since sentential negation occurs to the left of the raised verb. For the modal to scope over negation, it must move covertly, and yet the first link of the movement chain, overt movement from Mod to T, would reconstruct.

Taking these issues into consideration, we conclude that Matushansky's theory of head movement is also unlikely to provide a satisfying account of the clause structure-insensitive nature of modal scope with respect to clausemate negation.

4.3 A phrasal movement account of PPI modals

If head movement is not the right way to derive wide scope for necessity modals, what about phrasal movement? Phrasal movement is a suggestion that Homer (2011; 2015: pp. 31–32, and Appendix III) briefly entertains to account for wide scope modals. For Homer, the ModP undergoes phrasal movement to a position above negation, if and only if it is ungrammatical below negation. He doesn't give any particular details about the structure, but we infer that it would be something like (54), where the ModP moves to a position above the Neg head, say Spec,NegP.

(54)

```
              NegP
            /      \
       ModP_i      Neg′
       /   \       /    \
     Mod   vP    Neg   M̶o̶d̶P̶_i̶
```
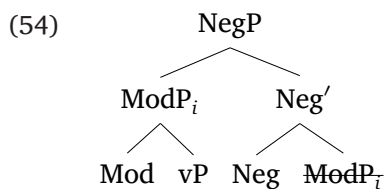
Such an analysis predicts that the embedded vP should scope over negation as well, and there are cases that show this is not correct. Consider an example with *supposed*: while the modal scopes over a higher negation, the *v*P it embeds does not, as shown by the scope facts below, where *know* from the embedded vP must scope below negation.

(55)   Mary isn't supposed to know that I was cheated.   supposed > not > know
                                                                *supposed > know > not

The same point can be made with cases where there are NPIs in the embedded clause. These ought to be unlicensed if the predicate they are contained in is moved covertly out of the scope of negation (see Wagner 2006 for concrete evidence for effects of this kind), yet in (56) there is no problem with the NPI, so long as negation is present.

(56)   Mary is *(not) supposed to think that anyone cheated.

This indicates that the *v*P would reconstruct back to its original position, where it can compose with negation, leaving Mod in its derived position, which later composes with and scopes above the negated *v*P.

This seems to require an exotic species of partial predicate reconstruction, for example a version of the remnant movement-based account of Kayne (1998). However we bring up further points which cause trouble for *any* movement-based account, which may even include an imaginative implementation of Kayne's theory.

A general point we take issue with is the existence of polarity-driven phrasal movement of PPIs, which is what Homer invokes in this analysis. There are other instances of polarity items that cannot undergo movement to rescue their grammaticality. For example, we saw that *probably* is ungrammatical under negation, as seen in example (23b), repeated below:

(57)   *She won't probably lose.

One could argue that since overt movement is available to rescue the grammaticality of this sentence, covert movement cannot be (cf. Bobaljik & Wurmbrand 2012). However, there are other instances in which overt movement is not available, yet movement does not save the grammaticality of a polarity-sensitive item. One is in a sentence containing negation, an NPI, and an intervening element blocking the NPI's licensing – i.e. a configuration that violates Linebarger's (1980) Immediate Scope Constraint. We give a known example of such a configuration with *anything* in (58), and one with the NPI modal *need* in (59a).

(58)   She didn't (*always) like anything.

(59)   a.   She didn't (*always) need go there.
        b.   She didn't (always) need to go there.

The grammaticality of these sentences would be rescued if the NPIs *anything* and *need* moved between negation and *always*, where they would satisfy the Immediate Scope constraint. However, we do not observe this. Why then can *must* move to satisfy its polarity requirements, but not *need*?

More generally, as argued in previous sections, wide scope readings of modals are subject to different conditions than more well-known instances of phrasal movement like typical quantifier raising. Movement of modals is restricted to specific necessity modals, while typical QR is available to all types of nominal quantifiers. Movement of modals is not restricted to any syntactic configurations, while typical QR is restricted to certain languages and syntactic configurations (Bobaljik & Wurmbrand 2012); in fact, we have seen specific cases in which QR of nominal quantifiers above negation is not available, while wide scope readings of certain modals are (as in Scottish Gaelic and Ewe with their complementizer negation, and in English negative inversion constructions).

We conclude that the sketched phrasal movement account of Homer (2011; 2015) faces a variety of problems that make it no better off than the more developed head movement-based account of I&Z.

4.4 The invalidity of the argument from *de dicto* indefinites

There is one argument that both I&Z and Homer use to back the movement analysis of modal scope: *de dicto* (or non-specific)[39] readings of indefinites that are meant to diagnose wide scope

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[39] We use this alternative term, in order to avoid confusion with other *de dicto* phenomena irrelevant to the data in this section.

readings of modals. They note that the movement approach predicts the availability of non-specific readings for indefinites which scope above negation, since the modal has moved to a higher position where it may scope over the subject as well as negation. Indeed, if a subject scopes below a necessity modal and above negation, then we can be quite sure that the modal has undergone movement. I&Z and Homer argue that this prediction is borne out. In (60) and (61), the DPs may be interpreted as non-specific, which is a diagnosic for an intensional operator outscoping them. In these sentences, the only apparent possibility for this intensional operator is the necessity modal *must*.

(60)   Some students must not leave.   (I&Z)
        available reading: must > some students > not

(61)   *Context: The rules of this bowling game state that exactly one pin must remain standing, no matter which one…*   (Homer 2011; 2015)
        Exactly one pin mustn't be knocked down.
        available reading: must > exactly one pin > not

These indefinites are not interpreted below negation, therefore, the only scopal construal that achieves the desired interpretation is one in which the modal has moved from below negation to above the indefinite.

    We claim, following the same line of reasoning as in Jeretič (2021a), that this argument is invalid. This is because non-specific readings of indefinites are available even in cases in which they cannot scope below a modal. We construct examples that involve modals that scope below negation, but indefinites that still scope above. Consider the following examples, in which the modals *can* and *need* scope below negation.

(62)   *Context: In this bowling game, exactly one pin must remain standing, no matter which one.*
        Exactly one pin can't be knocked down.

(63)   *Context: A room only fits 30 people. Around 40 students show up to the class.*
        Unfortunately, about 10 students can't fit into this room. (I will pick at random who gets to stay.)

(64)   Some things don't need to be said.

In these three different scenarios, there is a clear available non-specific reading of the subject indefinite. Strikingly, this reading cannot be achieved by manipulating the scope of the three elements. The modals (*can* or *need*) all have unambiguous narrow scope with respect to negation (*neg>mod*), and the subject indefinites all unambiguously scope above negation in these scenarios. This means we end up with the only possible scope construal to be *subj>neg>mod*.

However, this configuration is at odds with the non-specific interpretation of the indefinite to correspond to a narrow scope of the indefinite with respect to the modal.[40]

We take this to be evidence that there must be a mechanism to achieve the non-specific reading of the indefinite other than having it scope below the modal. Examples (62) and (64) are generic statements: a high scoping generic operator can thus provide the source of the non-specific reading, allowing the modal to stay below the indefinite. In (63), the statement holds of the (near) future, which can also be analyzed intensionally. We do not make any claims about what the final analysis for these sentences is, only that the source of the non-specific reading may be different than scoping below the modal, and thus it cannot be used as a diagnostic for movement of the modal in any of these sentences.

5 An in situ analysis

In the preceding discussion we have argued that the movement-based analysis of apparent wide scope for modals suffers from many problems when we try to extend it to a wide array of languages, and from that we have drawn the somewhat negative conclusion that a movement-based analysis is to be rejected. As noted in the introduction, the reasoning is akin to the reasoning in previous work on the scope of specific indefinite DPs, in particular their ability to escape islands: accommodating the facts with a fully syntactic, movement-based account would require a major revision of how we think movement works, so it is preferable on syntactic grounds to take up a non-movement-based in-situ account of the scope facts, should one be available. To conclude this article, we would like to take some time to outline a recent in-situ account of the modal scope facts which we think ought to provide a plausible alternative that we are in need of, for at least a subset of the cases of wide scope necessity modals. We then show how this proposal indeed captures insensitivity to the variety of syntactic parameters involved in a negated modal sentence.

5.1 A scaleless implicature analysis for wide scope necessity modals

Jeretič (2021a; b) proposes a no-movement analysis of wide scope necessity modals. On this analysis, root modals take semantic scope below negation, but may achieve a wide scope interpretation by

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[40] Note that I&Z contrast their example cited in (60) with an example with *may*, in which it scopes below negation, cited below.

(i)   Some students may not leave.   some students > not > may

While it may be true that the non-specific interpretation of *some students* in this particular example sounds marginal, it is unclear how big the contrast is with (60), or what the source of the strangeness is. In particular, flavor may play a role: deontic *may* appears to require that the permission applies to a specific individual, which is not the case for deontic *must*. We can check this by looking at the availability of deontic *must* in the sentence "it must be the case that some students leave", but not deontic *may* in the sentence "it may be the case that some students leave" (only epistemic *may* is available). In contrast, deontic *can* is available in "it can be the case that some students leave".

triggering a *scaleless implicature*, which is a semantic enrichment that arises from the effect of an exhaustivity operator. In other words, a negated necessity expression will have as its base meaning the expected narrow scope interpretation of the modal $\neg > \square$ given by the syntax, which, after application of the exhaustivity operator, is strengthened to a meaning equivalent to the wide scope $\square > \neg$. Crucially, this meaning is achieved without the modal having to move.

The analysis is implemented in a grammatical framework for scalar implicatures, such as Fox (2007) or Bar-Lev & Fox (2020). Scaleless implicatures are predicted when a quantifier Q projects subdomain alternatives (expressions that are obtained from replacing the domain of quantification of Q with each of its subsets), and no scalar alternative (a quantifier expression that stands in an entailment relation with Q).

For example, English necessity modal *must* can be analyzed as a scaleless implicature trigger. As written in (65), we take *must* to be a universal quantifier over a set of worlds *M*, which corresponds, following standard Kratzerian modal semantics (Kratzer 1989), to the best worlds of a modal base according to a contextual ordering source. For simplicity, we ignore modal base and ordering source in the notation for the meaning of *must*, and simply name the domain of quantification *M*.

(65) $\text{must}_M\, p := \forall w \in M.p(w)$

We assume that *must*'s set of alternatives lacks a scalar alternative, which would correspond to a possibility modal, i.e. an existential quantifier over the same domain *M*. Jeretič (2021a) argues that scalematehood must include a full match in semantic properties modulo force,[41] however there is no possibility modal in English that is a perfect match for *must*. In particular, among the most plausible candidates, *can* differs from *must* in its temporal properties, and *may* can't express teleological and pure circumstantial flavors, which are covered by *must* (see Jeretič 2021a for details). Therefore, *can* and *may* cannot be scalar alternatives to *must*, nor can any other possibility modal in English. Furthermore, we assume that *must* is lexically specified to project subdomain alternatives, which are obtained by replacing the modal's domain of quantification by its non-empty subsets, as shown in (66).

(66) $Alt(\text{must}_M\, p) := \{\text{must}_{M'}\, p\,|\,\varnothing \subset M' \subseteq M\}$

It is assumed that when an utterance has alternatives, an exhaustification operator applies to strengthen the utterance by excluding these alternatives from the meaning of the utterance, or

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[41] Other theories of scalar alternatives will say otherwise; if one wants to keep a more standard theory, we can encode scalelessness in *must* differently, namely to follow previous authors like Chierchia (2013); Zeijlstra (2017) and say the alternatives projected by quantifiers are fully lexically specified, which would make it irrelevant whether or not there is an actual scalemate in the lexicon.

including them. In (67) is the definition of the exhaustifier proposed by Bar-Lev & Fox (2020). This operator is designed to first exclude all the 'innocently excludable alternatives' (IE) – those which can be non-arbitrarily excluded without yielding a contradiction, as defined in (68a), and then include any remaining 'innocently includable alternatives' (II) – those which can be non-arbitrarily included without yielding a contradiction, as defined in (68b).

(67) $[\![\text{EXH}]\!](C)(p)(w) \equiv \forall q \in IE(p, C)[\neg q(w)] \wedge \forall r \in II(p, C)[r(w)]$

(68) a. $IE(p, C) = \cap\{C' \subseteq C: C'$ is a maximal subset of C, s.t. $\{\neg q : q \in C'\} \cup \{p\}$ is consistent$\}$

  b. $II(p, C) = \cap\{C'' \subseteq C: C''$ is a maximal subset of C, s.t. $\{r : r \in C''\} \cup \{p\} \cup \{\neg q : q \in IE(p, C)\}$ is consistent$\}$

We assume this operator can apply at the TP or CP levels, and must apply if it globally strengthens the utterance.

Now, take a negated root *must* utterance in (69a) before exhaustification. Its LF is given in (69b), where, crucially, negation is above the modal (mismatching the higher PF position of *must* in T). Its translation in predicate logic is in (69c).

(69) a. $S = $ you must$_M$ not go
  b. $S:$ [$_{NegP}$not [$_{ModP}$must [$_{vP}$you go]]]
  c. $[\![S]\!] = \neg\forall w \in M.go(w)$

Following (66), the set of alternatives of S is shown in (70).

(70) $Alt(S) = \{$you must$_{M'}$ not go$|\emptyset \subset M' \subseteq M\}$

To clearly present the derivation of the scaleless implicature, we simplify the domain of quantification M to a mere two worlds $\{w_1, w_2\}$ (the end result is generalizable to an infinite domain). The sentence with the simplified domain of quantification and its associated set of alternatives are given below.

(71) a. $S = $ you must$_{\{w_1, w_2\}}$ not go
  b. $Alt(S) = \{$you must$_{\{w_1, w_2\}}$ not go, you must$_{\{w_1\}}$ not go, you must$_{\{w_2\}}$ not go$\}$

Using this simplified domain, we now derive the set of innocently excludable alternatives (IE) and that of innocently includable ones (II). The alternatives of the type 'you must$_{\{w_1\}}$ not go' and 'you must$_{\{w_2\}}$ not go' are not IE alternatives, because excluding them from the utterance yields a contradiction, as shown in (72).

(72) $\neg\forall w \in \{w_1, w_2\}.go(w) \wedge \forall w \in \{w_1\}.go(w) \wedge \forall w \in \{w_2\}.go(w) \equiv \perp$

Including them yields no contradiction: all alternatives are therefore II. The EXH operator then applies (merging at the TP or CP level), as shown in (73a). Since all alternatives are II, no alternative is excluded, and all alternatives are included. A scaleless implicature is derived; the resulting meaning, shown in (73b), corresponds to the equivalent to the wide scope of the modal with respect to negation.

(73) a. $[_{TP}\text{EXH [not [must [you go]]]]]}$
      b. EXH $(Alt(S))(S)$
          $\equiv \neg\forall w \in \{w_1, w_2\}.go(w) \wedge \neg\forall w \in \{w_1\}.go(w) \wedge \neg\forall w \in \{w_2\}.go(w)$
          $\equiv \forall w \in \{w_1, w_2\}.\neg go(w)$

Thus we can see that under a scaleless implicature analysis, LF movement of the modal above negation is not necessary to achieve the observed wide scope reading.

5.2 Its insensitivity to syntactic diversity

The exhaustification operation responsible for the strengthening to a wide scope reading is in principle not affected by the syntactic status or position of the negation or the modal. Analyzing wide scope interpretations of modals in this way allows us to capture their insensitivity to the variability of syntactic configurations covered in this paper. In contrast, what may affect the computation of an implicature are intervening semantic elements which affect the result of the exhaustification procedure.

   We here name the types of syntactic options for negated modals discussed in this paper, and show how the scaleless implicature computation remains largely unaffected by them. Keep in mind that a scaleless implicature analysis need not (and arguably, should not) explain all instances of wide scope readings of modals mentioned in this paper. Here we just show that such an analysis is applicable in and insensitive to the variety of relevant syntactic configurations.

5.2.1 Different preverbal negation markers

First, we take configurations from section 3.1, in which sentential negation appears before the modal, e.g. in languages without V-to-T like Russian, with preverbal negative particles, like Spanish, or embedded positions in V2 languages like Norwegian. These cases are straightforwardly explained, since they have an LF in which negation scopes above the modal, and EXH simply applies at the TP or CP level above negation. Similarly, languages with negation found in the CP layer, such as Scottish Gaelic and Ewe, can easily have a wide scope interpretation of negation, as long as EXH can merge above this CP negation. In sum, the specifics of the syntax of the modal or the negation marker are irrelevant to whether exhaustification can take place, as long as negation is above the necessity modal in the LF and EXH can merge above the negation (and there are no intervening semantic operators capable of affecting the result of EXH application).

5.2.2 High negative operators

Examples from section 3.2 include negative DPs, negative inversion constructions, and modals embedded in *neither..nor* constructions.

With negative DPs, *must* can have a wide scope interpretation with respect to negation. We will first show a way in which this fact can be derived within the scaleless implicature analysis. We then discuss some data that reveals a subtle empirical picture in which the scope interpretations of negated *must* are sensitive to whether the subject is interpreted specifically, and to whether *must* is anchored to its grammatical subject; we show how the scaleless implicature analysis can derive the right readings in each case.

We first show that wide scope of the modal with NegDPs is derivable in the scaleless implicature analysis when the NegDP splits its scope between negation scoping above the modal, and the existential scoping below.[42] In this case, we have a simple configuration with negation scoping right above the modal, with no intervening existential, as shown in (74b). A scaleless implicature is thus derived in the same way as the basic cases, as shown in (74c).

(74)   a. S = no-one must go
      b. $[\![S]\!] = \neg\Box\exists x.go(x)$
      c. $[\![\textsc{exh}(Alt(S))(S)]\!] \equiv \Box\neg\exists x.go(x)$

Now, what happens if the NegDP does not scope split, and the existential is above the modal? In this case, the intervening existential affects the derivation, and EXH application derives the unattested meaning 'no-one (specific) has to go, but someone (non-specific) must go'.[43] We will not give an explanation for why this inference is unattested, although we suggest that it could be that the meaning is too complex or unnatural to be communicated via implicature, and it is therefore avoided in the presence of other parses.[44] We will instead show evidence that a wide scope reading of the modal relative to negation is only compatible with a non-specific reading of

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[42] While negation must scope above the modal, as discussed in section 3.2 (seen e.g. with the unavailability of narrow scope of negation with 'no-one can go'), the existential of the NegDP may scope below. An example that shows a non-specific (narrow scope) reading of the existential from a NegDP with respect to a modal is 'No employees need to be fired.' adapted from the famous split scope example from Potts (2000) (see also De Swart (2000); Abels & Martí (2010); Penka (2011) for examples of split scope of NegDPs in English, German, Dutch and Scandinavian languages).

[43] Details go as follows. Subdomain alternatives are excludable, yielding an unattested inference.

(i)   a. S^* = no-one must$_{\{w_1, w_2\}}$ go
      b. $Alt(S^*)$ = {no-one must$_{\{w_1, w_2\}}$ go, no-one must$_{\{w_1\}}$ go, no-one must$_{\{w_2\}}$ go}
      c. $\textsc{exh}(Alt(S^*))(S^*) \equiv \neg\exists x.\forall w \in \{w_1, w_2\}.go(x)(w) \land \exists x.\forall w \in \{w_1\}.go(x)(w) \land \exists x.\forall w \in \{w_2\}.go(x)(w) \equiv \neg\exists x.\forall w \in \{w_1, w_2\}.go(x)(w) \land \forall w \in \{w_1, w_2\}. \exists x.go(x)(w)$

[44] There are in fact arguments that language avoids encoding 'non-connected' meanings (Chemla et al. 2019), and that exhaustification operations are constrained so as to avoid non-connected meanings (Enguehard & Chemla 2021). Such a constraint would thus be responsible for blocking this particular inference.

the existential (□ > ∃), but not a specific one (∃ > □). In (75a) is an example of a context that forces a specific reading of the existential. In this context, negated *must* can only have a weak reading, contrasting with (75b), in which the modal has an apparent wide scope with respect to negation, but the existential is interpreted below it (non-specifically).

(75) a. *Context: I'm looking at a list that says who, among the people present, must stay.*
           ??I looked at the list, and no-one (out of the people present) here must go.
           intended: Everyone present here must stay.   *�*¬ > ∃ > □
           only reading available: No-one present here has to go.   *check*□ > ¬ > ∃

      b. *Context: I need everyone in the room (regardless of who they are) to stay.*
           No-one here must go!   *check*□ > ¬ > ∃

The examples above rely on a particular usage of *must*, namely one in which it refers to a set of rules that don't apply to the grammatical subject, but rather to a contextually relevant bearer of obligation; in (75a), this unified set of rules is given by 'the list', and the bearer of obligation appears to include the speaker and hearers (this is an 'ought-to-be' reading of *must* following Feldman 1986; Brennan 1993; Hacquard 2006). But *must* has another interpretation, where it is anchored to an individual introduced by the syntactic subject of the modal and encoded as the bearer of the obligation, following Hacquard 2006 (this is an 'ought-to-do' reading of *must*). We will show here that forcing this interpretation of *must* has effects on the availability of its wide scope readings, which are furthermore predicted by the scaleless implicature analysis. Let's first start with how subject anchoring affects the composition of a modal sentence with a subject NegDP: the domain of the modal is now defined relative to a variable, bound by the existential quantifier, as schematized in (76).

(76) $\neg\exists x.\forall w \in M(x).p(w)$

The simple definition of subdomain alternatives is no longer applicable to this case, since there is no fixed modal domain M to define a subset of it. Therefore, a more sophisticated definition has to be adopted, in which a subdomain alternative of an expression is obtained by picking a subset of the modal domain *for each* assignment of x. This has been proposed in Jeretič 2022b (for a scaleless implicature analysis of neg-raising with *think*, which is a quantifier over a belief set, always anchored to the subject). If we take (76), together with such a definition of subdomain alternatives, and apply EXH, a scaleless implicature is derived. We omit the details of this complex derivation here. Instead we construct an example, in (77), that corresponds to a formula such as that in (76), namely one in which the modal domain is explicitly anchored to a set of rules particular to each individual from the NegDP's domain.

(77)   As per the rules of each household, no child from this class must go outside after dark.
                                                                    check□ > ¬ and ∃ > □

In this case, although the quantifier has an (obligatorily) specific interpretation, a wide scope interpretation of the modal is available, in contrast with the unanchored modal reading of (75a) which can only be interpreted below negation. A scaleless implicature analysis thus provides an explanation for each corner this intricate empirical picture. In contrast, a movement-based analysis does not. While it does give a natural explanation for the obligatory non-specific reading of the existential when the modal takes wide scope in (75), it cannot say anything about the reading observed in (77): first, a modal whose domain has a bound variable cannot move above the quantifier binding that variable; second, that quantifier has a specific reading, which indicates wide scope above the modal, again incompatible with movement of the modal above the negated existential.

Finally, as pointed out in section 3.2, some English speakers allow for narrow scope of the modal with NegDPs. We attribute the availability of this narrow scope reading to a particular property of the projection of alternatives adopted in Jeretič (2021a), namely that they are by default closed off at clause boundaries (therefore, at least, at the TP and CP level), instead of or after EXH has applied. We furthermore assume that the subject can QR above this boundary, in which position EXH would no longer have access to *must*'s alternatives, making strengthening unavailable. We illustrate this in (78), which has two possible LFs, and associated interpretations for such expressions, where ! is the alternative closure operator.

(78) a. $[_{TP}\text{EXH} [_{TP} \text{no-one [must [go]]]]}$ $\qquad\qquad\qquad \equiv \Box\neg\exists x.go(x)$

   b. $[_{CP}\text{EXH} [_{CP} \text{no-one} [_{TP} ! \text{[must [go]]]]]]}$ $\qquad\qquad \equiv \neg\exists x.\Box go(x)$

The locus of variation determining whether or not the LF in (78b) is available could lie in the syntactic position where exhaustification can occur (e.g. the TP or CP), the syntactic position at which alternatives are closed off, or whether exhaustification must happen before QR: this question is beyond the scope of this paper. Note that the property of alternatives being closed off at a clause boundary is also instrumental in explaining the narrow scope of *must* with extra-clausal negation (or lack of obligatory 'cyclic neg-raising', as shown in Homer (2015) to be a property of some neg-raisers).

Turning to negative inversion constructions, e.g. 'never/at no point must...', these generally involve some kind of negative existential quantification to license the inversion. Therefore, the basic makeup of the LF is similar to the negative existential cases presented above. We do not go into the details of the analysis of these constructions, but it is reasonable to assume that they can have the same properties that license the wide scope interpretations in the cases observed with NegDPs, namely a) scope splitting of the negative existential on either side of the modal, or b) a meaning of `must' that is anchored to a time variable (or whichever variable is involved in a negative inversion licensing adverbial). Syntactically, negation in these constructions is taken to be in the FocP or CP, a higher position than the typical sentential negation position. This position, like in cases described above, does not prevent a scaleless implicature from arising, as long as EXH can apply above it and the alternatives are not yet closed off.

(79) $[_{CP}\text{EXH} [_{FocP} \text{at no point } [_{Foc'}\text{must ... }]]]$ $\equiv \Box\neg\exists t.go(t)$

Again, there appears to be variation in whether the wide scope of the modal is the only reading available (as reported by Francis (2017)), or the narrow scope also is (as per the authors' judgments). We expect the narrow scope of the modal to be available for the same reasons as above, namely that the quantifier can move above the point where alternatives can be closed off.

(80) $[_{CP}\text{EXH} [_{CP} \text{at no point } [_{CP} ! [_{Foc'}\text{must ... }]]]$ $\equiv \neg\exists t.\Box go(t)$

Finally, we find wide scope of *must* licensed in *neither..nor* constructions. As explained in section 3.2, the availability of these readings are highly problematic for a movement account of the wide scope of *must*. The scaleless implicature analysis, in contrast, can straightforwardly account for the wide scope interpretation of the modal in a negative disjunction, as shown in the derivation below, again using a simplified modal domain of two worlds. We assume the LF is a negative disjunction, but any equivalent LF works.

(81) $S = \neg(q \vee \Box_{\{w_1, w_2\}}p)$

(82) $Alt(S) = \{\neg(q \vee \Box_{\{w_1, w_2\}}p), \neg(q \vee \Box_{\{w_1\}}p), \neg(q \vee \Box_{\{w_2\}}p)\}$

The set of alternatives of the negative coordination contains no IE alternative, because excluding the alternatives yields a contradiction, as shown below.

(83) $\neg(q \vee \Box_{\{w_1, w_2\}}p) \wedge (q \vee \Box_{\{w_1\}}p) \wedge (q \vee \Box_{\{w_2\}}p)$
         $\equiv \neg(q \vee \Box_{\{w_1, w_2\}}p) \wedge \Box_{\{w_1\}}p \wedge \Box_{\{w_2\}}p$ (because q is false)
         $\equiv \bot$ (because $\Box_{\{w_1, w_2\}}p \equiv \Box_{\{w_1\}}p \wedge \Box_{\{w_2\}}p$ is false)

Further, the alternatives can be included, and yield the desired interpretation, as shown in (84).

(84) $\text{EXH} (Alt(S))(S) \equiv \neg(q \vee \Box_{\{w_1, w_2\}}p) \wedge \neg(q \vee \Box_{\{w_1\}}p) \wedge \neg(q \vee \Box_{\{w_2\}}p)$
         $\equiv \neg(q \vee \Box_{\{w_1, w_2\}}p) \wedge \neg\Box_{\{w_1\}}p \wedge \neg\Box_{\{w_2\}}p \equiv \neg q \wedge \Box_{\{w_1, w_2\}}\neg p$

5.2.3 Embedded modals

Finally, we turn to the case of modals in non-finite constructions, in which they are syntactically lower than their finite counterparts, because they do not move to T. Again, from a syntactic point of view, the exhaustification procedure does not care whether a modal is higher or lower in a structure, because the alternatives projected by the modal can percolate up to the matrix level. However, these embedded constructions may be associated with semantics that intervene with the exhaustification. And we see that in some cases, scaleless implicatures are observed, while in others, they are not.

Our examples of non-finite wide scope modals include infinitival constructions, near future tense and past counterfactuals in French, Spanish and Dutch, and small clause constructions in English. We do not show how the scaleless implicature analysis interacts with the semantics of

these constructions, since details of proposals for the semantics of these operators are varied and complex, and may make different predictions in how they interact with exhaustification. The main point again, however, is that their syntax is not an issue in deriving wide scope.

As an example of semantic intervention in exhaustification, we cite one case in which perfective marking on modals in French and across languages effectively blocks scaleless implicature from being computed, as observed and analyzed in Jeretič (2021a; b). The analysis of the blocking is given in the version of EXH proposed by Fox (2007); to briefly summarize it, perfective on modals induces actuality entailments, which have the effect of producing a contradiction if any alternative is excluded, thus alternatives are never excluded, and no strengthening is ever derived. (For an alternative analysis of scaleless implicature blocking by perfective, see Jeretič & Özyıldız (2022), who use the exhaustivity operator from Bar-Lev & Fox (2020).) The examples given in Jeretič (2021a) of perfective-marked modals whose wide scope interpretations are blocked come from a range of different syntactic configurations, some involving non-finite embedding (as with French *passé composé*, e.g. 'n'a pas dû', NEG AUX NEG must.PTCP), others with simple perfective morphology on the finite verb (as with French *passé simple*, e.g. 'ne dut pas', NEG must.PFV NEG, and Spanish perfective marking, e.g. 'no tuvo que', NEG must.PFV). This generalization is an example of how semantic factors like perfective are capable of affecting the availability of wide scope, in contrast with syntactic factors like non-finite embedding, further reinforcing the claim that wide scope readings of modals are not due to syntactic movement but rather are the result of semantic mechanisms.

5.3 Further predictions

5.3.1 Capturing polarity sensitivity

The scaleless implicature analysis captures the polarity sensitivity of the availability of wide scope interpretations, previously observed by Homer (2011; 2015) and Iatridou & Zeijlstra (2013), and the source of the analysis of these modals as Positive Polarity Items. Scaleless implicatures, like typical scalar implicatures, are polarity sensitive: they are obligatory in unembedded environments, and optional in non-upward-entailing ones. In particular, in order to capture empirical generalizations, Jeretič (2021a) formulates the principle where EXH applies obligatorily if it globally strengthens the utterance, and optionally if it doesn't. As a result, narrow scope readings (i.e. unstrengthened) of *mustn't* are predicted to be available in non-upward-entailing environments, e.g. under *only* or in conditional antecedents, because embedded EXH does not globally strengthen the utterance in these cases. More precisely, the two following LFs can be associated with a negated *must* clause in a conditional antecedent, yielding two possible readings.

(85)   If John mustn't go, …
      a.   if EXH John not must go ≡ if □¬(John go)
         … he has no choice but to stay.

b. if John not must go ≡ if ¬□(John go)
    … he has a choice to stay.

5.3.2 An argument from typology

A movement account of wide scope necessity modals raises the question as to why there are no root possibility which can take wide scope above sentential negation (as mentioned in section 2). This asymmetry is explained if wide scope interpretations are derived using some kind of semantic strengthening. This is because the wide scope reading of a possibility modal relative to negation is weaker than its narrow scope, and therefore cannot be derived by strengthening, in contrast with a necessity modal, whose wide scope with respect to negation is stronger than its narrow scope.

5.4 Summary

We have presented an alternative analysis to the wide scope interpretations of necessity modals, which does not rely on movement, but rather on a semantic strengthening mechanism. This analysis, and semantics-based analyses more generally, is predicted to be largely insensitive to the variety of syntactic configurations of negations and modals, and therefore wide scope interpretations are expected to be observed across these cases, provided there is no intervening semantic operator preventing exhaustification.

The scaleless implicature analysis outlined above is however by no means the only available in situ analysis, and arguably shouldn't apply to all cases of wide scope modals. A related but different analysis, also present in Jeretič (2021a), involves an underlying possibility modal as a scaleless implicature trigger. In unembedded, unnegated contexts, it is strengthened to a necessity reading. Under negation, no implicature is triggered, and it retains its possibility reading; a negated possibility meaning ¬◊ is equivalent to a wide scope necessity □¬, thus accounting for the basic behavior. Such analyses can be found in Staniszewski (2020) for English *should* and Jeretič (2021a) for several modals including Ecuadorian Siona *ba'iji*. Non-scaleless implicature analyses are available as well, e.g. modals can be analyzed as pluralities of worlds that are homogeneous and exhibit a neg-raising behavior (see Jeretič 2021a: Ch6 and Agha & Jeretič (2022) for such an analysis for weak necessity modals, like English *should*).

6 Conclusion

In this paper, we argued against deriving apparent wide scope for root necessity modals with respect to negation by movement. We first argued that head movement is unlikely to be the source of wide scope readings of necessity modals in all languages. We showed that the availability of wide scope interpretations does not correlate with a language's clausal structure, which would be expected to affect the availability of head movement. Instead, a number of additional tenuous

assumptions would have to be taken to account for the data in such languages, namely covert head movement, and movement to a high, unclear position that would violate the HMC, and a movement that differs in its properties from overt head movement and QR. These problems multiplied when we considered a wider range of configurations for the wide-scoping modals, such as nonfinite and participial embedding contexts and contexts where the negative operator is particularly high.

Finally, we outlined the recent alternative account of the apparent wide scope readings for modals in Jeretič (2021a; b), in which the modal stays in situ syntactically and is obtains apparent wide scope by virtue of exhaustification of the modal's alternatives.

With all these considerations in hand, we suggest that the in-situ account of apparent wide scope for modals in Jeretič (2021a; b) is to be preferred because it can avoid the syntactic problems we have identified for the movement-based accounts. This final stage of argument is incomplete in the context of the present article, as we have only briefly outlined the alternative semantic analysis of Jeretič (2021a; b). A fuller comparison of the in-situ approach with the movement approach would require a more thorough assessment of the specifics of the semantic analyses and the broader syntax-semantics frameworks that they are embedded in. The tension we can see here should be familiar from the discussion of the scope of indefinites since Fodor & Sag (1982):[45] we can change how the semantic theory works to avoid major changes to the syntactic theory, or we can maintain a familiar semantics and "bite the syntactic bullet", i.e. accommodate a range of changes to the syntactic theory. Our primary contribution here has been to make clear what "biting the syntactic bullet" would entail in the domain of modals, and it is to be set against the backdrop of other reassessments of the status of head movement in syntactic theory.

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[45] A similar tension is also to be found in the discussion of association with focus since Anderson (1972). Just like with indefinites (see footnote 1), there remains a number of empirical issues to be resolved with association with focus, such as those raised by Wagner (2006).

Abbreviations

NEG = negation, 1 = first person, 2 = second person, 3 = third person, SG = singular, REL = relative pronoun, INF = infinitive, COMP = complementizer, COMP.NEG = negative complementizer, IND = independent, DEP = dependent (= within an embedded non-relative clause), PST = past, PROSP = prospective, DAT = dative, JUS = jussive, EXPL = expletive, SUBJ = subjunctive, PTCP = participle, COND = conditional mood, DEF = definite, REFL = reflexive

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Competing interests

The authors have no competing interests to declare.

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