Scope Reconstruction in Head Movements as Featural Valuations

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1 Introduction This paper examines the scope between negation and modals in English and proposes that scope is determined in the position where agree finishes checking and valuing modal's polarity features. It implements Iatridou & Zeijlstra's (2013) proposal of modal's polarity sensitivity and Szabolci (2004)'s PPI featural specifications with Upward Agree (Bjorkman & Zeijlstra, 2019) and suggests that not only head movement of modals is syntax proper, but LF directly access the feature-checking location for scope interpretation**. 2 English Modals and Negation Patterns** The puzzle is that modals in English are idiosyntactically different from each other in terms of their linear order (PF) and scope interpretation (LF) w.r.t. negation: in (1), while both *need/can* and *must* precede the negation *n't/not* in English, *need/can* sit in the scope of negation (*need* also requires the presence of *not*) whereas *must* outscopes it (1a-c). Modals like *need* and *have* in *to*-infinitival forms (1d) follow and sit in the scope of negation. Why?

(1a) John need *(not) come.	*not > need*
(1b) John can't come.	*not > can*
(1c) John must not come.	*must > not*
(1d) John doesn't need/have to come.	*not > need/have*

3 Proposal Based on modal's polarity sensitivity account proposed by Iatridou & Zeijlstra (2013) and Iatridou (2014), I motivate the Modal Interpretation Principle (MIP) in (2).

(2) Modals are interpreted in the position where agree finishes checking ALL modal's polarity features.

3 Modal's Polarity Sensitivity Iatridou & Zeijlstra (2013) first argues that modals that obligatorily scope over negation ('*must*') are PPIs and those obligatorily scope under negations ('*need'*) are NPIs, with the rest being neutral modals, based on the distributional parallels between typical polarity items (*any* and *some*) and modals: ① $need_{\text{deontic}}$ is acceptable in NPI environments like NegDP (*no one need leave*). ② PPI *must* is acceptable in the scope of meta-linguistic negation (*No student MUST read five papers but one is encouraged to do so*). ③ PPI *must* is fine with an intervening scope taker (*the shielding effect*) (*He must not marry him because he is handsome. LF: not > because > must)* ④ *some* and *must* are fine in the scope of a clausemate negation if it is in the scope of NPI licensing environment (the *Baker/Szabolci* Facts) (*I am surprised that John must not write papers about it. LF: surprised > not > must*). **4 Modal's Domain Widening** I contribute another semantic argument for modal's polarity sensitivity, namely, *domain widening/ strengthening* effect (Kadmon & Landman, 1993, Krifka, 1995, Chierchia, 2011, etc). Typical NPIs like *any* use a wider domain of quantification in question like (3a), which conveys the scalar implicature that the speaker does not even have dry socks. Not surprisingly, NPI modals like $need_{deontic}$ also uses an accessibility relation based on a wider set of rules than *can*, including the rules that A is permitted to come (*can*) and the rules that the lack of A's coming will incur some bad consequences. This can be analyzed in the same line as the promotion of the secondary ordering source proposed in von Fintel & Iatridou (2006) for English *ought to/should* or in Bybee's (1994) accessibility relations of $R_{need}(w)$ as a superset of $R_{can}(w)$.

(3) a. A: Do you have wet socks? B: I don't have ANY socks. (Kadmon &Landman, 1993, p.356)

b. A: Can I come? B: Yes, you can, but you NEED NOT.

5 Featural Specifications Since modals are polarity sensitive, I propose that modals encode different POLARITY FEATURES: NPI modals like *need* in (1a) encoded with an uninterpretable *neg* feature [*u*NEG:__], neutral modals like *can* in (1b) with an uninterpretable polarity feature [*u*Σ:__], and PPI modals (which are double NPIs) like *must* in (1c) with a single positive feature [*u*POS:__],

which is divided to two uninterpretable *neg* features: a strong [*u*SNEG:__] and a weak [*u*WNEG:__] in **featural geometry** framework (Sichel & Toosarvandani, 2024). In addition, modals and negation encode CATEGORY FEATURES: modals are auxiliaries, thus encoding the [CAT: AUX] feature, except *need/have to* which are semi-auxiliaries with the [CAT: V] feature (Chomsky, 1977). In Matushansky (2006) where head movement is triggered by selectional features, negation *n't/not* has [SEL: AUX] feature, because *n't/not* must cliticize or follow an aux (**John n't/not come*).

	Negation *n't/not*	**NPI modal** *need*	**Neutral modal** *can*	**PPI modal** *should*	**Verb modal** *have/need to*
CATETORY FEATURE	[SEL: AUX]	[CAT: AUX]	[CAT: AUX]	[CAT: AUX]	[CAT: V]
POLARITY FEATURE	{[*i*Σ:NEG] | [*i*NEG]}	[*u*NEG:___]	[*u*Σ:___]	{[*u*POS:___] | {[*u*SNeg : ___], [*u*WNeg : ___]}}	[*u*Σ:___]

6 Implementations With **Upward Agree** where uninterpretable features probe **upwards** for accessible goals (Bjorkman & Zeijlstra, 2019, etc), modals' scope with respect to negations are determined in the place where agree completes checking all their polarity features: NPI and neutral modals encode only one [*u*NEG:___] (NPI modal) or [*u*Σ:___] (neutral modal) which can be checked and valued by a higher [*i*NEG] or [*i*Σ:NEG] in negation (5-6). Thus they are interpreted **low**. PPI modals must be interpreted **high** because they encode two [*u*NEG:___] features and only one is valued by negation (7). The other feature must be valued by a higher ***Op***$_{i\text{NEG}}$ independently argued by Falaus & Nicolae (2016). Thus, it is only in the **high** position where agree completes checking and valuing ALL its polarity features. Verb modals like *have /need to* are interpreted low because they are neutral modals like *can*. They stay low because they are verbs with [CAT: V] which cannot agree with the [SEL: AUX] on negation. Thus, *do* is inserted as a last resort in (8c). Thus the linear order and scope relations between modals and negations are explained by MIP. **7 Predictions** MIP predicts that further head movements preserve scopes, which is borne out in T-to-C movements (*can't you come*? *not* > *can*) **Phase** scopes are phase-bounded, borne out in scopes across CP phase boundaries (*John did not say that Mary can come. not* > *can*) **Locality** Intervening scope elements prevent Agree, borne out in (*You can't often bribe officials*

(5) NPI modals *need*

a. [NegP ***n't*** [SEL: AUX], [*i*~~NEG~~],[*i*Σ:NEG] [ModP ***need*** [CAT: AUX], [~~*u*NEG: NEG~~]]]
   AGREE 1

b. [***need*** [CAT: AUX], [~~*u*NEG: NEG~~] [NegP ***n't*** [SEL: AUX], [*i*~~NEG~~],[*i*Σ:NEG] [ModP <***need***> [CAT: AUX], [~~*u*NEG: NEG~~]]]]
   MOVEMENT

c. [***need*** [~~CAT: AUX~~], [~~*u*NEG:~~NEG] [NegP ***n't*** [~~SEL: AUX~~], [*i*~~NEG~~],[*i*Σ:NEG] [ModP <***need***> [CAT: AUX], [~~*u*NEG: NEG~~]]]]
   AGREE 2

(6) Neutral Modals *can*

a. [NegP ***n't*** [SEL: AUX], [*i*NEG],[~~*i*Σ:NEG~~] [ModP ***can*** [CAT: AUX], [~~*u*Σ: NEG~~]]]
   AGREE 1

b. [***can*** [CAT: AUX], [~~*u*NEG: NEG~~] [NegP ***n't*** [SEL: AUX], [*i*NEG],[~~*i*Σ:NEG~~] [ModP <***can***> [CAT: AUX], [~~*u*Σ: NEG~~]]]]
   MOVEMENT

c. [***can*** [~~CAT: AUX~~], [~~*u*NEG:~~NEG] [NegP ***n't*** [~~SEL: AUX~~], [*i*NEG],[~~*i*Σ:NEG~~] [ModP <***can***> [CAT: AUX], [~~*u*Σ: NEG~~]]]]
   AGREE 2

(7) PPI modals *should*

a. [NegP ***n't*** [SEL: AUX], [*i*~~NEG~~],[*i*Σ:NEG] [ModP ***should*** [CAT: AUX], {[~~*u*SNEG:NEG~~] / [*u*WNEG:__]}]]
   AGREE 1

b. [***should***[~~CAT: AUX~~], {[~~*u*SNEG:NEG~~] / [*u*WNEG:__]} [NegP ***n't*** [~~SEL: AUX~~], [*i*~~NEG~~],[*i*Σ:NEG] [ModP***should***[CAT: AUX], {[~~*u*SNEG:NEG~~] / [*u*WNEG:__]}]]
   MOVEMENT & AGREE 2

c. [***Op***$_{i\text{~~NEG~~}}$[***should***[~~CAT: AUX~~], {[~~*u*SNEG:NEG~~] / [~~*u*WNEG:NEG~~]} [NegP***n't***[~~SEL: AUX~~],[*i*~~NEG~~],[*i*Σ:NEG][ModP***should***[CAT: AUX], {[~~*u*SNEG:NEG~~] / [*u*WNEG:__]}]]
   AGREE 3

(8) Neutral Modals *have to*

a. [NegP ***n't*** [SEL: AUX], [*i*NEG],[~~*i*Σ:NEG~~] [ModP ***have to*** [CAT: V], [~~*u*Σ: NEG~~]]]
   AGREE 1

b. [***have to*** [CAT: AUX], [~~*u*NEG: NEG~~] [NegP ***n't*** [SEL: AUX], [*i*NEG],[~~*i*Σ:NEG~~] [ModP <***have to***> [CAT: V], [~~*u*Σ: NEG~~]]]]
   ~~*MOVEMENT*~~

c. [***do*** [~~CAT: AUX~~] [NegP ***n't*** [~~SEL: AUX~~], [*i*NEG],[~~*i*Σ:NEG~~] [ModP ***have to*** [CAT: V], [~~*u*Σ: NEG~~]]]]
   AGREE 2

nowadays. *not > often > can)*. Therefore, feature valuation in agree explains the scope reconstruction in head movements and support that head movements are syntax proper.

Bibliography *Bjorkman & Zeijlstra (2019). Checking up on (ϕ) -Agree. LI; von Fintel & Iatridou (2008). How to say ought in foreign. Time and modality; Iatridou & Zeijlstra (2013). Negation, polarity, and deontic modals. LI; Kadmon & Landman (1993). Any. LP; Sichel & Toosarvandani (2024). The featural life of nominals. LI;Szabolcsi (2004). Positive &negative polarity. NLLT.Falaus & Nicolae.(2016) Fragment answers and double negation in negative concord languages. SALT. Bybee, J. L. (1994). The evolution of grammar: Tense, aspect, and modality in the languages of the world.*