In (*do-*)support of phrasal auxiliary movement

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1   Introduction

⋆ Previous work on head movement (Matushansky (2006), Harizanov and Gribanova (2018)) suggests that some head movement phenomena (i.e. auxiliary movement) are syntactic and should have the same properties as other types of phrasal movement → feature-driven

⋆ Canonically, feature driven movement is the response to a property on a probe that desires a specifier: we call it the EPP property

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Extended EPP - E2P2

- With evidence from the English auxiliary system, I argue for the following extension of the EPP, called the *Extended EPP* (or E2P2):

An E2P2 property on a head H for a feature x can be satisfied if H merges with a bearer of x.

- This version of the EPP is about merge and projection labeling rather than wanting a specifier

- Assuming a probe's complement head projects its features on the label of the complement phrase, complement heads should satisfy E2P2 as well as specifiers → 2 options for satisfying E2P2

⋆ This modification of the EPP will explain...

1. English auxiliary movement and the distribution of *do*-support
   → *do*-support is the result of featural movement of v to T (Chomsky 1995, Yuan 2015), which strands the root in V

2. Distribution of sentential negation in non-finite clauses

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(1)   a. For Gromit to not finish Wallace's cheese...

       b. For Gromit not to finish Wallace's cheese...

       c. Gromit has not finished Wallace's cheese.

       d. *Gromit not has finished Wallace's cheese.

⋆ A consequence of this theory is that we will challenge two long-held assumptions about the English auxiliary system

   1. That because auxiliaries *can* move to T, they always do (Emonds 1970)
      → I will argue that auxiliaries may remain in situ in the absence of negation/verum focus (Baker 1991)

   2. That auxiliary movement to C must be preceded by movement to T
      → I will argue that movement to C can be long distance, i.e. *v*-to-C movement

⋆ Along the way I will additionally argue for...

   1. a Preminger (2011) view of probing in which agreement may fail without crashing a derivation

   2. a feature inheritance (Chomsky (2005)) view of T's probe for verbal elements; E2P2 originates on C but may be inherited by T if C has no other active probes

2   Syntactic Head Movement

⋆ Harizanov and Gribanova (2018) show that the class of phenomena we refer to as *head movement* actually do not share the same set of properties. They propose the following split:

   1. **Syntactic head movement**
      → doesn't obey the Head Movement Constraint (HMC)
      → affects word order but not word size
      → has interpretive effects

   2. **Post-syntactic amalgamation**
      → obeys the HMC
      → affects word size
      → no interpretive effects

⋆ The English auxiliary system can illustrate this distinction

   • Post-syntactic amalgamation allows inflectional features from T to be spelled out on the verb (affix hopping)

   • Heads between T and V block this amalgamation because of the HMC[1]

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[1]Adverbs are claimed here not to project on the clausal spine, and therefore do not block amalgamation.

(2)   a.   [$_{TP}$ Gromit T [$_{vP}$ like**s** cheese]]

      b.   *[$_{TP}$ Gromit T [$_{NegP}$ not [$_{vP}$ like**s** cheese]]]

- By contrast, auxiliaries may front over negation, violating the HMC

- This looks like a combination of syntactic movement followed by post-syntactic amalgamation, yielding *aux + T*

(3)   [$_{TP}$ Gromit ha**s** [$_{NegP}$ not [$_{AuxP}$ *t* [$_{vP}$ eaten cheese]]]]

⋆ **Summary:**

- Auxiliary movement is syntactic head movement

- Affix hopping is post-syntactic amalgamation

⋆ English verbs are claimed to be pronounced in v following V-to-v movement and T-to-v lowering → I regard this as post-syntactic amalgamation of V-v-T pronounced on v.

⋆ Matushansky (2006) provides us with the model of syntactic head movement I will be assuming henceforth. Head movement has 2 components:

1. Phrasal movement of a head to a specifier position
2. *m-merge* of the two heads into a single complex head

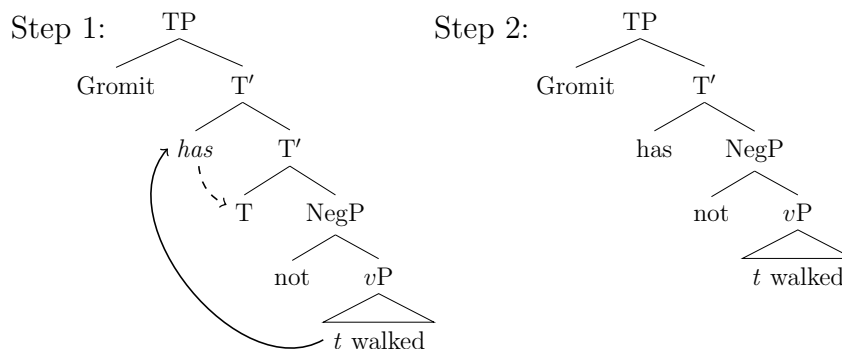⋆ M-merge is claimed to apply early enough that future movement steps target the complex head

Figure 1: Schematic of head movement from Matushansky (2006).

⋆ In summary, syntactic head movement should be subject to the same conditions as other types of movement

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- Here I propose a feature-driven account of head movement that suggests an extension to our notion of the EPP

- This extension captures the interaction between auxiliaries and negation in English on the assumption that auxiliaries need not move string vacuously to T

3 Auxiliaries and E2P2

⋆ We know from Chomsky (1957), Emonds (1970), and subsequent work the following facts about the English auxiliary system and negation

1. auxiliary verbs move to T

   (4) a. Gromit has not eaten cheese recently.
        b. *Gromit not has eaten cheese recently.
        c. Gromit is not eating cheese at the moment.
        d. *Gromit not is eating cheese at the moment.

2. multiple auxiliaries follow a fixed hierarchy: *modal - have - bePROG - bePASS - main verb*

3. when the vP is separated from T by negation or emphasis, and there is no auxiliary that can move to T, the otherwise blocked auxiliary *do* is used

   (5) a. Gromit did not eat cheese at the scene of the crime.
        b. No, Gromit *did* eat cheese at the scene of the crime!
        c. *Gromit not ate cheese at the scene of the crime.

⋆ Here we assume that sentential negation is generated between T and auxiliaries on the basis of data like (6). When auxiliaries are forced to remain in situ, negation surfaces above them (unless it is constituent negation, as in (6b), as evidenced by the polarity of the tag question)

   (6) a. Gromit will not have liked the cheese, will he/*won't he?
        b. Gromit will have not liked the cheese, won't he/*will he?
        c. For Gromit to not have stolen Wallace's cheese...

⋆ Whatever property of T that requires auxiliary movement must be satisfied in the absence of auxiliaries by an in situ verb (or *do*-support in the presence of negation)

   (7) ✓ [$_{TP}$ Gromit **T** [$_{vP}$ v [$_{VP}$ walked]]]

⋆ Contra Emonds (1970) and following Baker (1991), I therefore propose that auxiliaries can also satisfy this property in situ in the absence of intervening heads

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Extending the EPP:

I propose that in addition to a phi probe, T also has a probe that searches for verb-like elements (perhaps to host T's phi and tense features). These two probes have an extended EPP property (henceforth E2P2 property), that can be satisfied in the following ways (where x^v is a verbal element, and x^φ is a phi goal):

1. via movement, i.e. x^v/x^φ moves to T

2. if x^v/x^φ heads T's sister

With Chomsky (1995), Alexiadou and Anagnostopoulou (1998), Pesetsky and Torrego (2004), and others, I will propose that agreement is a precursor to satisfaction of the EPP.

- E2P2 properties care only about whether T merges with an element that bears the relevant feature
  → If that feature is a property of the head of T's complement, E2P2 is satisfied by virtue of the fact that T selected for and merged with its complement
  → If that feature is not on the head of T's complement, it or its bearer must move to T as a specifier

- In English, φ-bearing elements never head T's complement, so they must always move to satisfy E2P2, as the original EPP predicts

⋆ In (8) we see E2P2 satisfied by in-situ verbs/auxiliaries, moved auxiliaries, and *do*-support

(8) a. [$_{TP}$ Gromit **T** [$_{vP}$ v [$_{VP}$ walked]]]]
     b. [$_{TP}$ Gromit **T** [$_{AuxP}$ has [$_{vP}$ v [$_{VP}$ walked]]]]]
     c. [$_{TP}$ Gromit **has** [$_{NegP}$ not [$_{AuxP}$ t [$_{vP}$ v [$_{VP}$ walked]]]]]]
     d. [$_{TP}$ Gromit **did** [$_{NegP}$ not [$_{vP}$ v [$_{VP}$ walk]]]]]

- **Proposal:** *do*-support is featural movement from v to T (Chomsky 1995, Yuan 2015) followed by a spell-out rule; the main verb is stranded by virtue of the fact that this step happens in the syntax, while V-to-v is post-syntactic amalgamation

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***Do*-support** (inspired by Bobaljik 1995): v is pronounced as *do* when separated from vP by a maximal projection
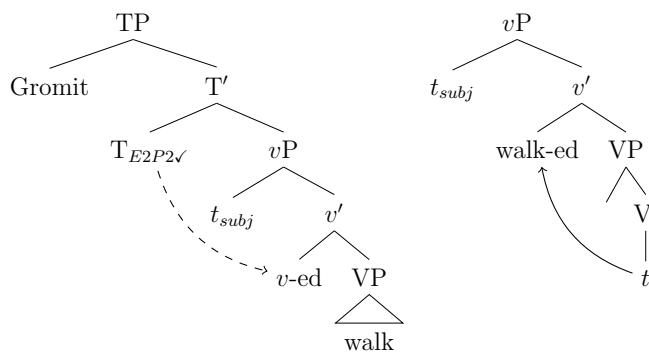

Figure 2: An in-situ v/auxiliary satisfies E2P2. V amalgamates with v post-syntactically.
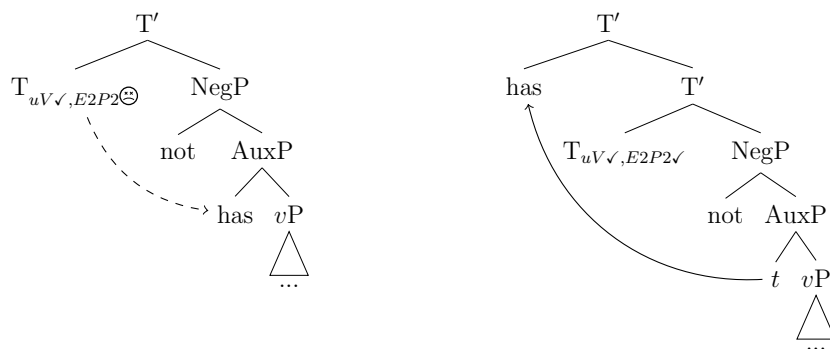
Figure 3: Negation blocks satisfaction of E2P2 by in-situ auxiliaries. Auxiliaries can and must move to satisfy E2P2.
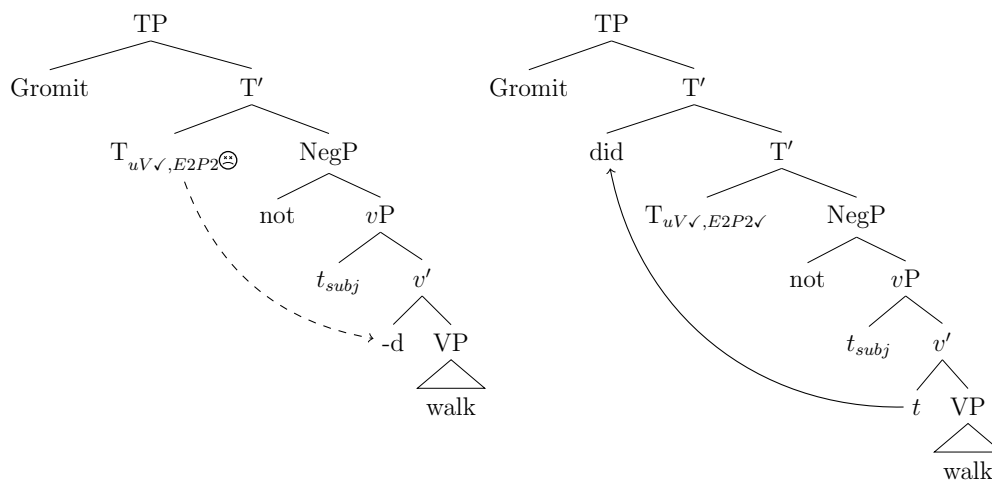
Figure 4: Negation blocks satisfaction of E2P2 by in-situ v. v must therefore move, and because it is now separated from vP by a maximal projection, it becomes pronounced as *do*. The verb is stranded because v-to-T movement happens in the syntax, but V-to-v is post-syntactic.

⋆ On this account, adverbs do not trigger auxiliary movement or *do*-support on the assumption that they are merged within a phrase, and do not project on the clausal spine

4 Negation in non-finite clauses

⋆ **Prediction**: In the absence of economy or Anti-locality constraints, if English had an overt T head, we might expect optionality in word order between the complement head and T in general
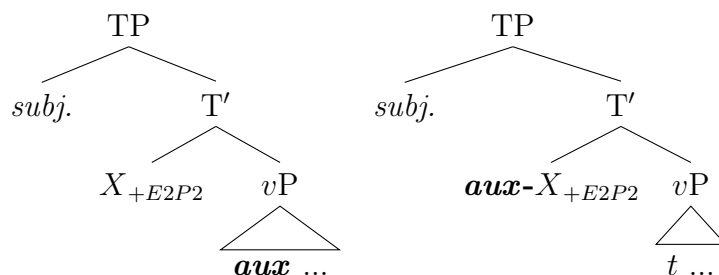

Figure 5: An overt T head probing for some head X should show optional word order with X.

⋆ **In English, non-finite T is overt (*to*)**

- Non-finite T doesn't trigger auxiliary movement, presumably because it has no inflectional features that require a host

- However sentential negation can surface either to its left or to its right, unlike auxiliaries in T[2]

(9) a. For Gromit to not finish Wallace's cheese would be a shame.
     b. For Gromit not to finish Wallace's cheese would be a shame.

⋆ When *not* surfaces above *to*, we see in (10f) that they must be linearly adjacent

(10) a. For Gromit **to not** occasionally finish Wallace's homework would be a shame.
     b. For Gromit occasionally **to not** finish Wallace's homework would be a shame.
     c. For Gromit **to** occasionally **not** finish Wallace's homework would be a shame.
     d. For Gromit **not to** occasionally finish Wallace's homework would be a shame.
     e. For Gromit occasionally **not to** finish Wallace's homework would be a shame.
     f. *For Gromit **not** occasionally **to** finish Wallace's homework would be a shame.

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[2]The *not* in both (9a,b) can take sentential scope, and speakers cannot discern a difference in meaning between them. Some speakers prefer the order *not to* to *to not*, but produce both freely as verified by corpus data in the appendix.

⋆ **An E2P2 property on T for sentential negation could explain both the word order optionality and the indivisibility of *not to***

- If non-finite T merges with a NegP, *not* is the head of T's sister and could satisfy an E2P2 property for negation on T

- Alternatively it can move to T, first forming a specifier and then m-merging to form an indivisible unit *not-to*

Step 1:

$$\begin{array}{c}\text{C}'\\ \swarrow \quad \searrow\\ \text{for} \qquad \text{TP}\end{array}$$

Step 1, tree: C′ → for, TP; TP → subj., T′; T′ → to$_{+E2P2_{neg}}$, NegP; NegP → not, vP; vP → …

Step 2: C′ → for, TP; TP → subj., T′; T′ → not, T′; T′ → to$_{+E2P2_{neg}}$, NegP; NegP → t, vP; vP → …

Step 3: C′ → for, TP; TP → subj., T′; T′ → not-to$_{+E2P2_{neg}}$, NegP; NegP → t, vP; vP → …
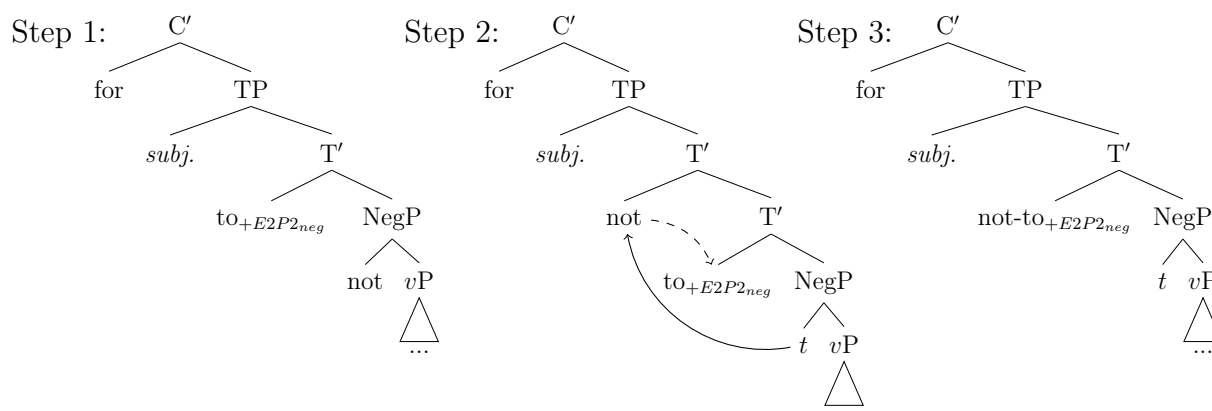
Figure 6: If T has an E2P2 property for negation, and negation chooses to satisfy it via movement, it should first move to a specifier position of T, and then m-merge to T, yielding the indivisible unit *not-to*. No adverb may intervene.

⋆ **Problem:** If T has an E2P2 property for negation, why can't *not* surface above auxiliaries in T?

- I propose that we can predict this easily if we
  1) adopt a view of probing that is based on locality, and
  2) accept that **m-merge occurs in the syntax at the same time as the associated movement step**

Figure 7 tree: TP → Gromit, T′; T′ → T$_{+E2P2_{neg,V}}$, NegP; NegP → not, vP; vP → has walked. (Arrows labeled 1 → not, 2 → has walked.)
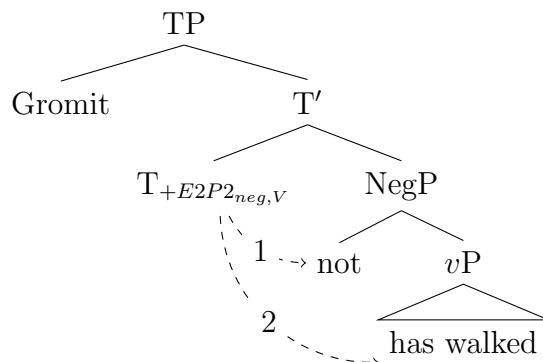
Figure 7: When T's various probes scan their domain, they see negation before auxiliaries. Negation therefore moves before auxiliaries. Cyclicity gives the desired word order *aux not*.

- The assumption that m-merge between *not* and T applies before the auxiliary moves ensures that the auxiliary never *tucks in* under it (Richards 2005)
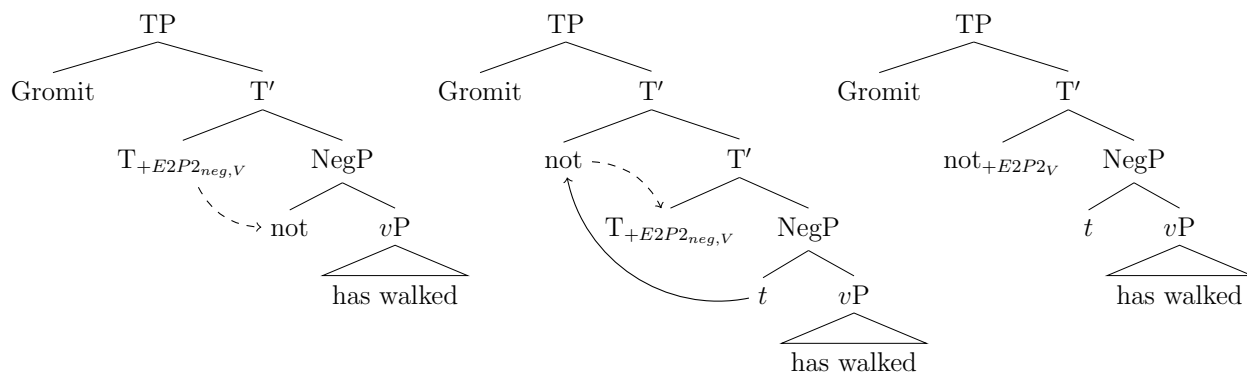
Figure 8: T first probes for and finds *not*, which may move to T. M-merge applies immediately.
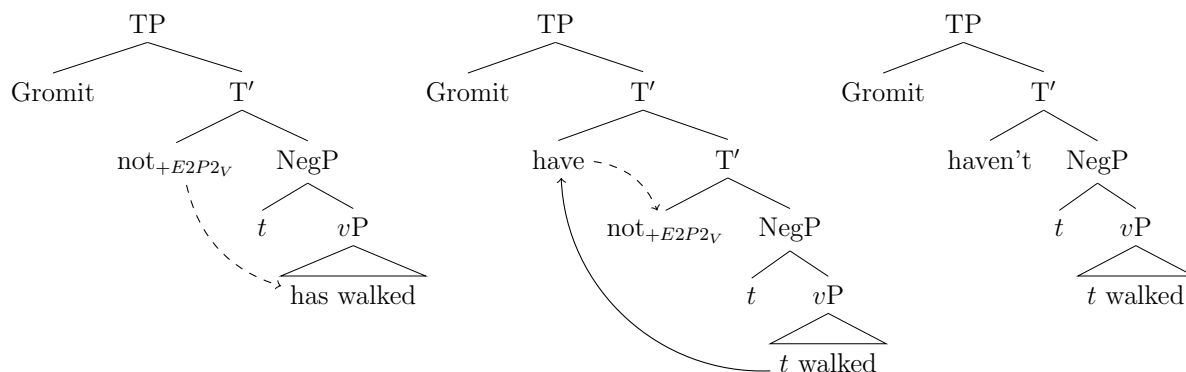
Figure 9: Then T probes for and finds the auxiliary , by which point *not* has formed a complex head with T. The auxiliary then moves cyclically to T, surfacing above *not*.
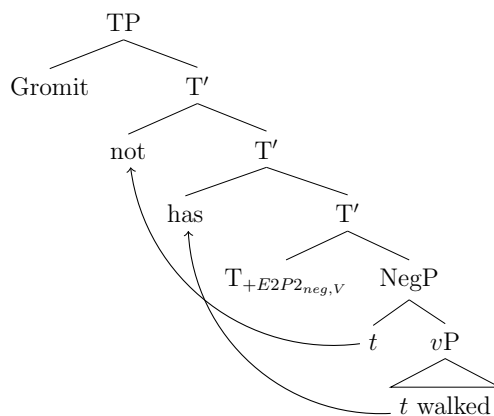
Figure 10: If m-merge applied later in the derivation, the auxiliary might have been able to tuck in under negation, yielding the ungrammatical form *not aux*.

⋆ These results suggest an explanation for the contraction *n't* as well. I propose that the contraction *n't* is the result of an auxiliary or modal m-merging with a *not* in T

  • Evidence for this proposal is that *not* can only adjoin to verbs in T to form *n't*. *Not* cannot adjoin to anything else to form *n't*.

(11) a. I can't eat the cheese.
      b. I won't...
      c. I haven't...
      d. I don't...
      e. *I often tryn't to pay attention. (c.f. *I often try not to pay attention.*)
      f. *For hern't to understand would be a shame. (c.f. *For her not to understand...*)
      g. *It would be a shame to haven't seen the movie.

⋆ One might balk at the idea that T has a probe for negation given that negation doesn't appear in every derivation.

  • Preminger (2011) provides perspective on this problem by arguing that agreement can fail without crashing the derivation → the neg probe is always there, but isn't always satisfied

⋆ **Note on optionality:** This sort of optionality is a bit puzzling. We might wonder why negation would ever choose to move to T if an equally viable, less involved derivation exists in which negation remains in situ. At this point we can either accept that parts of the grammar allow for true optionality, and do not have economy or Anti-locality constraints, or we can posit the existence of an optional null intervening head between T and negation in the *not to* examples.

4.1 VP Ellipsis

⋆ Assuming that VP ellipsis is the deletion of all structure below a T head, and adopting the proposal that auxiliaries can remain in situ in the absence of negation, we predict that auxiliaries should be deletable as well in the following examples (and we don't expect *do*-support)

  • Contrary to the prediction, auxiliaries behave across ellipsis sites the way they do across negation/verum focus

(12) a. Gromit hasn't had any cheese today but Wallace *(has).
      b. Gromit isn't eating cheese but Wallace *(is).
      c. Gromit didn't eat any cheese but Wallace *(did).

⋆ If this theory is correct, it predicts that ellipsis sites are introduced by a null head bearing the e-feature proposed by Merchant (2001)
  → This null head between T and the elided material (vP) would force satisfaction of E2P2 by movement

5   T-to-C Movement

⋆ While I have claimed auxiliary movement to T to be optional in the absence of negation/verum focus, T-to-C movement is clearly obligatory always

(13)   a. What has Gromit eaten today?   (14)   a. *What Gromit has eaten today?
         b. What is Gromit eating?   b. *What Gromit is eating?
         c. What does Gromit like to eat?   c. *What Gromit likes to eat?

⋆ Harizanov and Gribanova (2018) regard T-to-C movement as an example of syntactic head movement with no post-syntactic amalgamation → has no word-building effects

- On my account, T-to-C movement should also be a response to an E2P2 property

- On standard assumptions that movement to T feeds T-to-C movement, the adjacency of T and C makes puzzling the fact that T-to-C movement is obligatory

⋆ The assumption that movement to T feeds T-to-C movement is already puzzling for *do*-support, given that *do*-support need not be triggered on T for it to appear in C

My proposal:

- Movement to C is long-distance, i.e. *v*-to-C rather than T-to-C

- There is one E2P2 property for verbal elements, born on C, and inherited by T (Chomsky 2005) just in case C has no other active probes
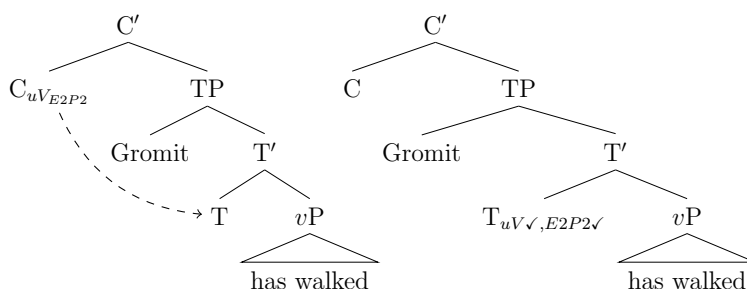

Figure 11: E2P2 is born on C but can be inherited by T if C has no other active probes (e.g. if it is not interrogative)

⋆ The fact that T is always an intervening head between C and the verbal element yields obligatory *v*-to-C movement since E2P2 can never be satisfied via complementation
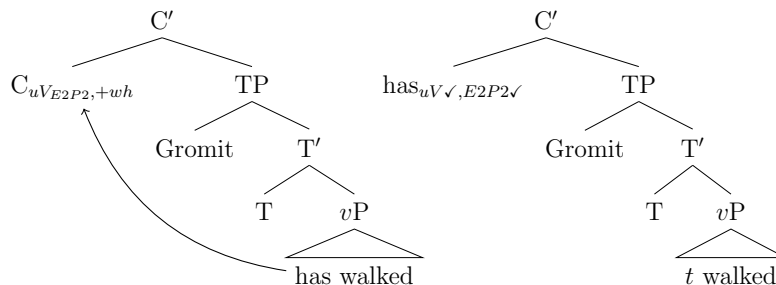
Figure 12: If C has other probing features on it (like +wh), C keeps its E2P2 property, triggering obligatory v to C movement

⋆ One might worry about the countercyclic nature of this process. If T inherits its E2P2 feature from C, all movement to T must tuck in under C instead of building new structure. To avoid this problem, we can adopt a free-merge or move-α view of movement (Chomsky 1970's/80's, 2016)[3].

6 Conclusion

⋆ This talk has been an exploration of the properties of feature-driven movement through the lens of the English auxiliary system and its interaction with negation

- This talk built on work by Matushansky (2006), Harizanov and Gribanova (2018), and others showing that some head movement phenomena have syntactic properties

- On the assumption that auxiliary movement to T is syntactic, I provided a feature driven account of head movement that allows in-situ verbs/auxiliaries to satisfy an EPP (now E2P2) property on T as complements or as specifiers of T

- *Do*-support was proposed to be featural movement of v to T/C, which strands the root due to the early nature of this process

⋆ This proposal derives additional support from the distribution of negation in non-finite clauses, based on the idea that T may have a probe for negation as well

⋆ We saw that a feature inheritance account of this E2P2 property correctly predicted the obligatory quality of T-to-C movement (or v-to-C movement as was proposed in this talk)

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[3]Of course if we allow movement to apply freely, we allow for the possibility that the auxiliary randomly moves to T before moving to C in T to C derivations. However as long as we assume that the auxiliary doesn't project its features on T in such a case because it doesn't check its features at T, movement of the auxiliary to C is still predicted to be obligatory under this proposal.

Appendix A

Figure 13: Corpus data about the *not to/to not* alternation. It looks like *not to* is used much more widely than *to not* (though both are very high frequency), but this number is inflated due to matches from prepositional *to* or expressions like *not to worry*. Any of the missing permutations brought up zero matches on the corpus site.

Scope judgements reveal that negation in both *not to/to not* can take sentential scope.

(15)   a. All the arrows have not been hitting the target. (all > not, not > all)

          b. All the arrows have been not hitting the target. (all > not, *not > all)

(16)   a. For all the arrows to have been not hitting the target recently, you must be tired. (all > not, *not > all)

          b. For all the arrows to not have been hitting the target recently, you must be tired (all > not, not > all)

          c. For all the arrows not to have been hitting the target recently, you must be tired (all > not, not > all)

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