

English Auxiliary Constructions and Related Phenomena: From a Constraint-based Perspective *

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Abstract

As noted by Sag and Wasow (1999: 295) and inter alia, the English auxiliary system involves a relatively small number of elements interacting with each other in complicated and intriguing ways. This has been one of the main reasons for making the system the most extensively analyzed empirical domains in the literature on generative syntax. This paper shows that the precise lexicon information on auxiliary verbs and constructional constraints sensitive to the presence of an auxiliary verb can play important roles in predicting various related properties. In particular, facts such as linear ordering restrictions among auxiliaries can directly follow from the precise subcategorization information on the auxiliary verbs. It also shows that constructional constraints can explicitly express generalizations among

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auxiliary-sensitive phenomena such as negation, inversion, contraction, and ellipsis, which we would otherwise miss.

1 Main Research Issues

Ontological Issues: One of the main research issues in the study of English auxiliary system concerns ontological issues: is it necessary to posit ‘auxiliary’ as an independent part of speech or not? Auxiliary verbs can be generally classified as follows:¹

- modal auxiliary verbs such as *will*, *shall*, *may*, etc.: have only finite forms and combine with a base VP
- *have/be* (have both finite & nonfinite forms and select a past participle VP)
- *do* (has a finite form only with vacuous semantic meaning)
- *to* (has a nonfinite form only with vacuous semantic meaning)

Such auxiliary verbs behave differently from main verbs in various respects. Ross (1969) provides strong arguments to treat ‘these so-called auxiliary verbs’ to be categorized as V, though they are crucially different in terms of the semantic contribution. For example, both auxiliary and main verbs bear tense information and can undergo the same syntactic operations such as gapping, as shown in (1):

- (1) a. John drank water and Bill __ wine.
b. John may drink water, but Bill __ drink beer.

Such phenomena provide apparent stumbling blocks to assign a different lexical category to the English auxiliary verbs from the main verbs.

Distinction between auxiliary and main verbs: Another important issue that raises in the study of the English auxiliary system is the question of which words function as auxiliary verbs and how we can differentiate the two. As noted in previous literature (see Akmajian et al. (1979), Pullum and Wilson (1977)), most reliable criteria for auxiliaryhood seems to lie in syntactic phenomena such as negation, inversion, contraction, and ellipsis (henceforth, NICE):

¹See section 3.4 for the arguments supporting the treatment of *to* as an auxiliary verb.

1. Negation: Only auxiliary verbs can be followed by *not* as a sentential negation (*have* and *be* too)

- (2) a. Tom will not leave.
- b. *Tom kicked not a ball.

2. Inversion: Only auxiliary verbs can undergo the subject-aux inversion.

- (3) a. Will Tom leave the party now?
- b. *Left Tom the party already?

3. Contraction: Only auxiliary verbs can have contracted forms with the suffix *n't*.

- (4) a. John couldn't leave the party.
- b. *John leftn't the party early.

4. Ellipsis: The complement of an auxiliary verb, but not of a main verb can be elided.

- (5) a. If anybody is spoiling the children, John is ___ .
- b. *If anybody keeps spoiling the children, John keeps ___ .

In addition to these NICE properties, tag questions can be another criterion: an auxiliary verb can appear in the tag of tag questions, but not a main verb:

- (6) a. You should leave, shouldn't you?
- b. *You didn't leave, left you?

The position of adverbs or floating quantifiers can also be adopted in differentiating auxiliary verbs from main verbs. The difference can be easily observed from the following contrast:

- (7) a. She would never believe that story.
- b. *She believed never his story.

- (8) a. The boys will all be there.
- b. *Our team played all well.

Adverbs such as *never* and floating quantifiers such as *all* can follow an auxiliary verb, but not a main verb.

Ordering Restrictions: The third main research issue centers on how to capture the ordering restrictions among auxiliary elements. Auxiliary verbs are subject to restrictions that limit the sequences in which they can occur and the forms with which they can combine. Observe the following contrast:

- (9) a. The children will have been being seen.
b. He must have been being interrogated by the police at that very moment.
- (10) a. *The house is been remodelling.
b. *Margret has had already left.
a. *He has will seeing his children.
b. *He has been must being interrogated by the police at that very moment.

As can be observed here, when we have more than two auxiliary verbs, they must come in a certain order. In addition, each auxiliary verb requires that the immediately following one be in a particular morphological form.

In the study of the English auxiliary system, any adequate syntactic theory thus needs to address the following issues at least:

- Should we posit an auxiliary category?
- How can we distinguish main verbs from auxiliary verbs?
- How can we account for phenomena (such as NICE) that are sensitive to the presence of an auxiliary verb?
- How can we capture the ordering and cooccurrence restrictions among auxiliary verbs?

The aim of this paper is to provide answers to such questions from a lexicalist, constraint-based theory of HPSG. This perspective is basically different from traditionally accepted views that posits movement operations with rather strict configurational structures.

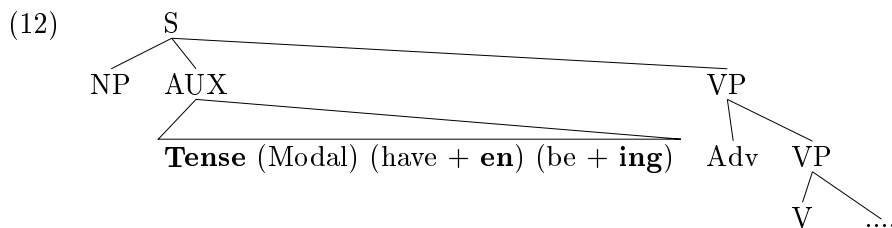
2 Development of Derivational Analyses

2.1 Chomsky (1957)

The seminal work on these three issues is that of Chomsky (1957). His analysis, introducing the rule in (11), directly stipulates the ordering relations among auxiliary verbs:

(11) Aux \rightarrow Tense (Modal) (have + en) (be + ing)

The PS rule in (11) would generate a deep structure like the following:



In surface structure, the Affix Hopping rule ensures that the obligatory element Tense is hopped to Modal or to the main verb when Modal does not appear.² Such a movement operation generates cases like (13):³

- (13) a. Mary will solve the problem.
b. Mary solved the problem.
c. Mary was solving the problem.

Another crucial mechanism Chomsky's (1957) system introduces is the so-called English particular rule "do-support" to account for negative sentences:

- (14) a. John must not avoid Bill.
b. George will not answer the question.

²The Affix Hopping rule states "Move Aux to V, unless Aux dominates a Modal."

³Arguments for Affix Hopping from Aux to V, rather than by movement of V to Aux, come from adverb positions:

- (i) a. Mary cleverly avoided Bill.
b. John rarely visited Mary.

If V raises to Aux (Tense), this would then generate cases like **Mary avoided cleverly Bill*.

- (15) a. *Mary not avoided Bill.
b. Mary did not avoid Bill.

The presence of *not* (or Neg) in such examples is claimed to prevent Tense from joining with the verb. This eventually leads to posit us the language particular rule *do*-support to save stranded Tense.

Several issues arise from such an analysis where the order among auxiliary verbs is imposed on constituents through the interactions among the PS rule, Affix Hopping, and *do*-support rule. For example, the constituent structure in (12) misses the constituent properties we find in coordination (cf. McCawley (1988)):

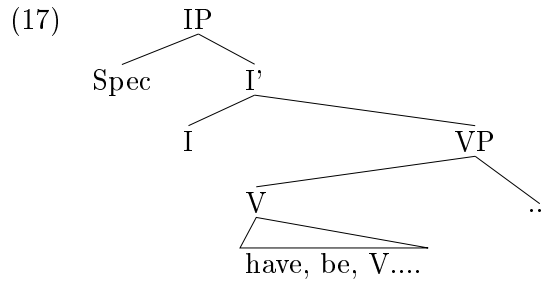
- (16) a. Fred [must have been singing songs] and [probably was drinking beer.]
b. Fred must both [have been singing songs] and [have been drinking beer.]
c. Fred must have both [been singing songs] and [been drinking beer.]
d. Fred must have been both [singing songs] and [drinking beer.]

As noted in (16)a, the auxiliary verb forms a constituent with the following VP.

Another related question that arises from such a system is whether it is necessary to have two different categories: verb and auxiliary. Though they are different with respect to properties such as NICE, they have substantial similarities. For example, they both can head a sentence; they both can bear tense information; they both are sensitive to identical syntactic phenomena such as gapping. If we conflated the two into one simple category V (while distinguishing the two with a feature like AUX), the grammar would be much simpler.

2.2 Government and Binding Theory (Chomsky 1981)

Incorporating the category Comp and Infl into X-bar theory, the GB (Government and Binding) system developed in Chomsky (1981) posits a structure like (17) for English auxiliary constructions:



In this system, S is the maximal projection of Infl and Infl takes VP as its complement. The basic assumptions that this analysis adopts are the following:

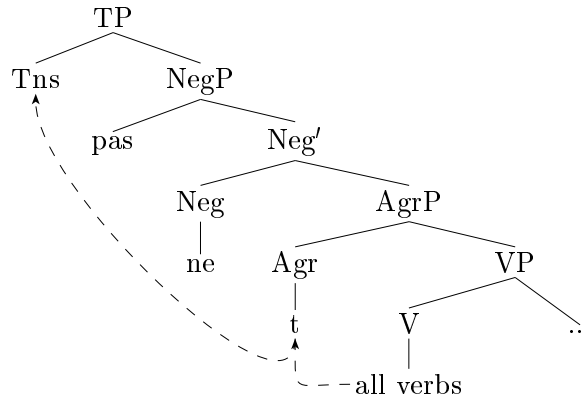
- (18) a. *have* and *be* under V raise to Infl,
 b. Otherwise Infl lowers to V (Affix Hopping),
 c. Otherwise *do* adjoins to Infl (*Do*-Insertion)

One main difference of this system from an earlier system is that the base-generated *have* and *be* under V move up to the Infl position. In so doing, the system differentiates these aspectual auxiliary verbs from other main verbs by introducing a feature value like AUX.

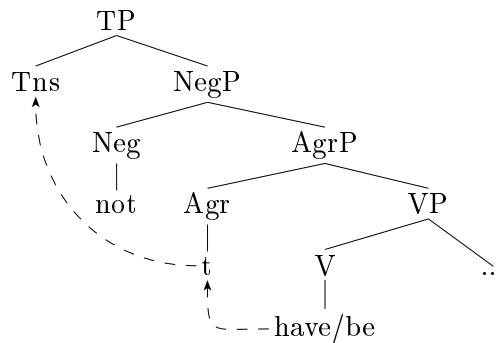
2.3 Analyses of Pollock (1989) and (1994)

Drawing on the earlier insights of Emonds (1978), Pollock (1989) and his subsequent work (1994, 1997a,b) propose that all verbs in French move to a higher structural position, whereas this is possible in English only for the auxiliaries *have* and *be* (see Kim and Sag 2002). Such a parametric difference between the two languages can be schematized as in the following trees:

(19) a. French:



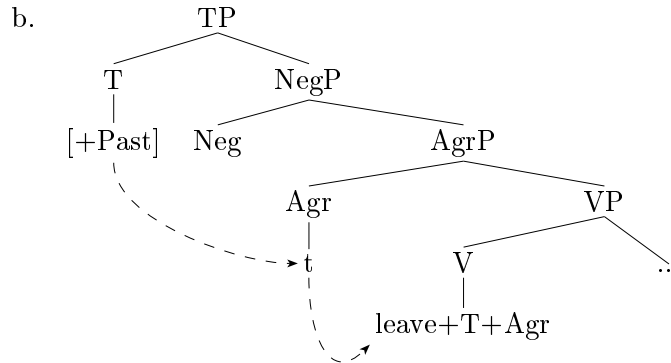
b. English:



Pollock's (1989) system assumes that, unlike French, English non-auxiliary verbs cannot undergo this movement because Agr in French is 'transparent' (or 'strong') whereas Agr in English is 'opaque' (or 'weak'). The richness of French verbal morphology is assumed to provide the motivation for the strength of French Agr, in consequence of which, the raised verb in French can transmit theta roles to its arguments through AGR, thus avoiding any violation of the theta criterion. But the weakness of English Agr (assumed to follow from the paucity of English verbal morphology) is what blocks lexical verbs from assigning theta roles once they have moved to Tns. Hence movement of a theta-assigning verb in English would result in a violation of the theta criterion.

Meanwhile, English main verbs do not undergo the head movement process. Rather, they may undergo the transformation of Affix Movement, as sketched in (20)b.

(20) a. John left the town.



In the structure (20)b, Tns and Agr should be lowered onto the verb via Affix Movement, generating the S-Structure (20)a. The basic spirit of this analysis—that ‘morphology determines syntactic movement’—has remained essentially unchanged in subsequent research (Pollock 1997a, 1997b, Chomsky 1995) though what triggers V-movement has varied considerably in subsequent work.⁴

However, the treatment of auxiliaries has been rather unstable. Pollock (1989) assumes that main verbs, *have*, and *be* are generated under V, *do* under AGR, and *modals* under T. But in Pollock (1997), main verbs are based-generated under V whereas *do*, *have*, *be* and modals are under Mood or can be generated under T also through a reanalysis process.

2.4 Checking and Minimalist Approaches (Chomsky 1991, 1993)

Departing from Pollock (1989) and Chomsky (1991), Chomsky (1993) adopts a strictly lexicalist view in assuming that verbs are fully inflected from the lexicon. The system however still requires the verbs to be syntactically associated with the appropriate functional heads for their inflectional properties to be checked off. Within this system, there is thus no need for Affix Hopping. His analysis attributes parametric differences between English and French to the question of whether verb raising takes place in overt syntax

⁴In Pollock (1997a), V-movement is driven by ‘mood’ distinctions, where modals, *have* and *be* are interpreted as mood markers. In Pollock (1997b), by contrast, V-movement is dependent upon ‘interpretable’ or ‘uninterpretable’ ‘person’ features. From Haegeman’s (1995) perspective, English and French are both claimed to have V-movement. The difference between the two languages comes from the fact that French verbs move to I at S-structure and English finite lexical verbs move to I at LF. The English verbs can wait until LF because their features are ‘interpretable’.

(French) or in the LF component (English). In English the V-features of Agr are weak and not visible at PF. This allows English to delay V-raising until LF according to the principle of Procrastinate. This system plays a central role in ruling out examples like (21):

(21) *John likes not Mary.

In accounting for cases like (22), the system takes *have* and *be* to be semantically vacuous, hence not visible to LF operations.

(22) a. John has not returned the book yet.
b. John is not a student.

This assumption requires *have* and *be* to be overtly raised before LF operations in order to avoid a crash at LF.

As pointed out by Lasnik (1999), this lexicalist, minimalist approach raises several questions. It is unclear whether *have* and *be* are always semantically vacuous for cases like the following:

(23) a. There is a solution.
b. John has money.

(24) a. There is not a solution.
b. John has not money. (British English)

Though *is* in (23) seems to have the meaning of *exists*, it is overtly raised in (24)a. Further, British English *have* in (24)b has the meaning of *own*, but nothing is wrong to overtly raise it.⁵

In addition, as noted by Lasnik (1995, 1999), the limit of Chomsky (1993) analysis concerns an account of examples like the following:

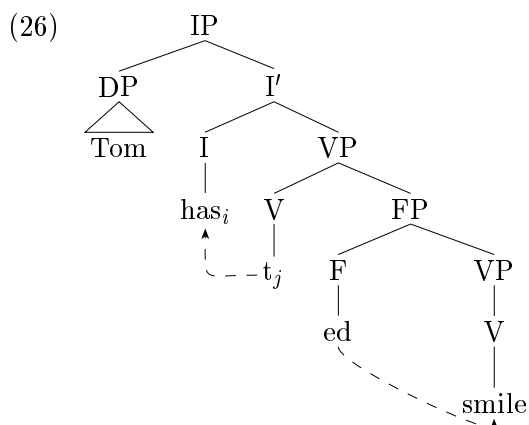
(25) *John not likes Mary.

Since the system posits neither affix lowering operation nor *do*-support, it cannot explain why the derivation does not crash in examples like (25). What Lasnik (1999: 104) points out is that if under Chomsky's (1993) system the derivation for (25) crashed, "it could not block (25), since Procrastinate only chooses among convergent derivations."

⁵See Lasnik (1999) for the discussion of conceptual and theoretical problems of Chomsky's (1993) analysis.

2.5 Hybrid Analysis (Lasnik 1995, 1999)

In an effort to remedy Chomsky's (1993) analysis, Lasnik (1995, 1999) adopts a hybrid analysis of English auxiliary system.⁶ Lasnik's claim is that English auxiliaries are always inserted into structures fully inflected (like all French verbs) whereas English main verbs are inserted into structures uninflected. This can be represented as following:



Central to this system is the Stranded Affix Filter in (27), a rule prohibiting affixes from remaining unattached in the syntax.

(27) The Stranded Affix Filter:

A morphologically realized affix must be a syntactic dependent of a morphologically realized category, at surface structure.

This filter ensures affixes must either undergo merger or be deleted. In support of his hybrid analysis, Lasnik (1995) provides VP ellipsis phenomena with the supposition of the rule that ellipsis requires complete identity of verb forms at PF. However, as noted by Potsdam (1996), such an analysis faces empirical problems for cases like (28):

- (28) a. I didn't touch the TV, but Percy might have [touched the TV].
 b. Why don't you sit quietly? I am [sitting quietly].

The derivation of these examples would violate Stranded Affix Filter. For example, it is possible to elide the VP *sit quietly* in the target clause on

⁶His analysis adopts Chomsky's (1957) basic approach, including *do*-support.

the right under exact identity with the VP antecedent *sit quietly*. But this would then leave the affix *-ing* stranded:⁷

- (29) [Why don't_i you I' [t_i sit quietly]]. [I am_i VP [t_i FP [ing VP [sit quietly]]]].

2.6 Summary

Transformational analyses have posited a universal basis for a wide range of constructions and hence hold promise for providing an explanation of language-particular divergences in terms of parametric variation. We are not in a position to discuss the issues raised from such views. The goal of this paper is to sketch a radically different, lexicalist account of the English auxiliary system. In what follows, the paper observes basic properties of modals, *have/be*, and *do* and *to* and then motivates our lexicalist treatment of English auxiliaries within the articulated feature system of HPSG. It also shows that the present approach with enriched lexical information can provide a straightforward account for the ordering restrictions among auxiliaries and related phenomena such as NICE properties.

3 More on the Basic Properties of Auxiliary verbs

3.1 Modals

One main property of modal auxiliaries such as *will*, *shall* and *must* is that they have no semantic restrictions on the types of the subject, indicating their status as raising verbs:

- (30) a. There might be a unicorn in the garden.
b. It will rain tomorrow.
c. John will leave the party earlier.
- (31) a. *There hopes to finish the project.
b. *The bus hopes to be here at five.

As seen from the contrast, the type of subject in (30) depends on what kind of subject is required by the verb right after the modal. This is different from sentences with a control verb in (31).

In addition, they can only occur in finite forms. They cannot occur neither as infinitives nor as participles.

⁷See Lasnik (1997) for his counterarguments against Potsdam's (1996) points.

- (32) a. *to would/*to can/*canning
 b. *John wants to can study syntax.

They further have no 3rd person inflection form:

- (33) a. *John musts leave the party early.
 b. *John wills leave the party early.

As its subcategorization information, modal verbs select a base VP as its complement:

- (34) a. John can [kick/*kicked/*kicking/*to kick the ball].
 b. John will [kick/*kicked/*kicking/*to kick the ball].

Reflecting these basic properties, modals may have the following information as its lexical entry:

- (35)
$$\left[\begin{array}{l} \text{HEAD} \left[\begin{array}{ll} \textit{verb} & \\ \text{VFORM} & \textit{fin} \\ \text{AUX} & + \end{array} \right] \\ \text{SUBJ} \langle \boxed{\text{NP}} \rangle \\ \text{COMPS} \langle \text{VP} [\textit{base}, \text{SUBJ} \langle \boxed{\text{NP}} \rangle] \rangle \end{array} \right]$$

This simple lexical entry for modals predicts why the following examples are unacceptable. For example, the subcategorization information that a modal requires a base VP will rule out all the examples in (36):

- (36) a. *Kim must $VP[\textit{fin}]$ [bakes a cake].
 b. *Kim must $VP[\textit{fin}]$ [baked a cake].
 c. *Kim must $VP[\textit{fin}]$ [will bake a cake].

But the auxiliaries *have* and *be* can be followed by a modal since both can be in nonfinite forms:

- (37) a. John can $VP[\textit{bse}]$ [have danced].
 b. John can $VP[\textit{bse}]$ [be dancing].

The lexical entry also specifies that the VP's subject is identical with the subject of a modal auxiliary (indicated by the box $\boxed{\text{NP}}$). This specification will rule out cases like (30): For example, the VP *rain tomorrow* requires an expletive subject *it*. The modal *will* in a sense inherits this lexical restriction in (35).

3.2 Aspectual Verbs: *Be* and *Have*

The aspectual verbs *have* and *be* are different from modal verbs. For example, unlike modals, they have nonfinite forms (*would have*, *would be*, *to have/to be*); they have the 3rd person inflection form (*has*, *is*); they select not a base VP but a different phrase as we will see in due course. In addition, they are different from modals in that they are main verbs.⁸

- (38) a. He is a fool.
b. He has a car.

On the assumption that every sentence has a main verb, *be* and *have* here are main verbs. However, this doesn't mean that *is* here lacks auxiliary properties: it exhibits all of the the NICE properties as can be seen in what follows. This could be another reason why the verb should be categorized as 'V' with a feature like AUX. The differences from modal verbs lie in other areas such as semantics and verb inflectional possibilities.

3.2.1 *Be* Constructions:

It is not difficult to find out that aspectual verb *be* all have NICE properties:

- (39) a. John is not singing a song.
b. Is John singing a song?
c. John isn't singing a song
d. John is singing a song and Mary is, too.

There are three usages of *be*: copula *be*, passive *be*, and progressive *be*. As noted by Lapointe (1980), Falk (1984) and others, there is no categorical or syntactic reason to distinguish these three: they all show identical behavior with subject-auxiliary inversion, position of adverbs including floating quantifiers, and so forth.

- (40) Subject-Aux Inversion:
a. Was the child found?
b. Was the child in the school?
c. Was the child running into the car?

⁸A related question is raised by an anonymous reviewer. The reviewer questioned if *be* in *John wants to be happy* and *is* in *John is happy* is really an auxiliary verb. With respect to the NICE properties, the copula *be* is an auxiliary verb. This doesn't mean that the copula here is not a main verb. The copula is a verb with the feature of auxiliaryhood. The same is true with the British usage of *have* as in *Has John money?* and *John hasn't money.*

(41) Position of an adverb:

- a. The child (*completely) was (completely) deceived.
- b. The child (*completely) was (completely) crazy.
- c. The child (*completely) was (completely) running into the car.

Thus, all three will have the lexical information given in (42) as their common denominator.⁹

$$(42) \text{ be: } \left[\begin{array}{l} \text{HEAD} \quad \left[\begin{array}{l} \textit{verb} \\ \text{AUX} \quad + \end{array} \right] \\ \text{SUBJ} \quad \langle \text{NP} \rangle \\ \text{COMPS} \quad \langle \text{XP}[+ \text{Predicative}] \rangle \end{array} \right]$$

The XP value is dependent upon the kind of *be*: the copula *be* selects XP[+PRD], the passive *be* for VP[*pass(ive)*], and the progressive *be* for VP[*(prog)ressive*].¹⁰

The XP value of the three *bes* can be as those given in (43):

$$(43) \text{ a. cop: } \left[\text{COMPS} \langle \text{XP}[+ \text{PRD}] \rangle \right]$$

$$\text{ b. pas: } \left[\text{COMPS} \langle \text{VP}[\textit{pass}, + \text{PRD}] \rangle \right]$$

$$\text{ c. prog: } \left[\text{COMPS} \langle \text{VP} [\textit{prog}, + \text{PRD}, - \text{Asp}/- \text{Stative}] \rangle \right]$$

This lexical information predicts data such as the following:

- (44) a. John is [happy about the outcome].
- b. The children are [seen in the yard].
- c. John was [seeing his children].

⁹There are of course certain differences among the three with respect to their own aspectual and passive value and the restriction on their VP complement. For example, the progressive *be* requires a nonaspectual VP headed by present participle to account for cases like (i).

- (i) a. *John was being being nasty.
- b. *John is being going.

See GPS (Gazdar, Pullum and Sag) (1982) for further details.

¹⁰This analysis can encompass the three types (syntactically and possibly semantically) and hence may explain coordinate sentences like (i) (cf. Falk (1984)).

- (i) Kim is a candidate for mayor, campaigning hard for election, and expected to win.

- (45) a. *John was [being [being nasty]].
 b. *John [is [being going]].
 c. *John is [having sung a song].

Since the progressive *be* can select only a VP whose head value is nonaspectual and nonstative, we immediately rule out the examples in (45).

3.2.2 Perfective *have*

Like *be*, *have* also behaves just like an auxiliary verb:

- (46) a. John has not sung a song.
 b. Has John sung a song?
 c. John hasn't been singing a song.
 d. John has sung a song and Mary has __ , too.

Even when it is used as a main verb in British English, it passes NICE properties:

- (47) a. John has not enough money.
 b. Has John enough money?

Given these observations, we can posit the following information as the lexical entry for the aspectual *have*:

- (48)
$$\left[\begin{array}{l} \text{HEAD} \left[\begin{array}{l} \textit{verb} \\ \text{AUX } + \end{array} \right] \\ \text{SUBJ} \langle \square \rangle \\ \text{COMPS} \langle \text{VP}[\textit{psp}, \text{SUBJ} \langle \square \rangle] \rangle \end{array} \right]$$

The interaction of subcategorization and morphosyntactic information is enough to predict the ordering restrictions among modals:

- (49) a. He has $VP[\textit{psp}]$ [seen his children].
 b. He will $VP[\textit{bse}]$ [have $VP[\textit{psp}]$ [been $VP[\textit{prog}]$ [seeing his children]]].
 c. He must [have [been [being interrogated by the police at that very moment]]].
- (50) a. *Americans have $VP[\textit{prog}]$ [paying income tax ever since 1913].
 b. *George has $VP[\textit{fin}]$ [went to America].

(50)a is ungrammatical since *have* requires a past participle VP. (50)b is out since the following VP is finite.

3.3 Periphrastic *do*

As noted in Kim (2000a, 2000b) and others, the so-called dummy *do* has several similar as well as different properties compared with other auxiliaries, as noted in the literature (cf. Klima 1964, Hudson 1976, GPS 1982, Falk 1984, Quirk et al. 1985, Warner 1993, among others).¹¹

First of all, the periphrastic *do* also exhibits the NICE properties like other auxiliaries:

- (51) a. John does not leave the town.
b. In no other circumstances does John drink alcohol.
c. They don't leave the town.
d. Jane likes the apples, but Mary doesn't __ .

Like other modals, *do* does not appear in infinitive clauses.

- (52) a. *They expected us to do leave him.
b. *They expected us to can leave him.

There are also some properties that distinguish *do* from other auxiliaries. First, unlike other auxiliaries, *do* appears neither before nor after any other auxiliary:

- (53) a. *He does be leaving.
b. *He does have been eating.
c. *They will do come.

Second, the verb *do* has no obvious intrinsic meaning to speak of. Except for the grammatical information such as tense and agreement, it does not carry any semantic value. Third, if *do* itself is positive, then *do* needs to be emphatic (stressed). But in negative sentences, no such requirement exists.¹²

- (54) a. *John does leave.
b. John DOES leave.

- (55) a. John did not come.
b. John DID not come.

¹¹See Sag 2001 for a different view on *do*.

¹²But, in what follows we will see that the present analysis predicts the occurrences of *not* in (55)a and b to be different.

The most economic way of representing these lexical properties seems to assume that the periphrastic *do* has the lexical entry given in (56) (see Kim 2000a):

$$(56) \left[\begin{array}{l} \text{HEAD} \quad \left[\begin{array}{l} \textit{verb} \\ +\text{AUX}, \textit{fin} \end{array} \right] \\ \text{SUBJ} \quad \langle \boxed{1}\text{NP} \rangle \\ \text{COMPS} \quad \langle \boxed{2}\text{VP}[-\text{AUX}, \text{SUBJ} \langle \boxed{1} \rangle] \rangle \end{array} \right]$$

Like other auxiliaries including modals, *do* is specified to be [+AUX]. The feature specification [+AUX] ensures that like other auxiliary elements, *do* is also sensitive to negation, inversion, contraction, and ellipsis (NICE properties). Further, like other auxiliaries, *do* selects a subject NP and a VP complement whose unrealized subject is structure-shared with its subject ($\boxed{1}$). Treating *do* as a raising verb like other English auxiliaries is based on typical properties of raising verbs that differentiate them from equi verbs (cf. P&S 1994): (a) raising verbs, unlike equi verbs, do not by themselves assign any semantic role to their subjects, (b) the index of the role-assigned subject in equi verbs should be ‘referential’, but no such restriction appears on the subject of raising verbs, and (c) unlike equi verbs, raising verbs do not allow NP complements. Auxiliaries including *do* have these raising verb properties.

- (57) a. John may leave.
 b. It may rain.
 c. *John/*It may something.

- (58) a. John did not leave.
 b. It did not rain.
 c. *John/*It did not something.

The [+AUX] specification and raising-verb treatment of *do* enable us to capture its similarities with other auxiliaries and modals. But its differences stem from the lexical specifications on feature values for HEAD and its complement VP.

Unlike auxiliaries *have* and *be*, *do* is specified to be *finite*. This property then accounts for why no auxiliary element can precede *do*.¹³

¹³Like *do*, modals also do not have non-finite forms.

- (59) a. He might [have left].
 b. *He might [do leave].

The first requirement on the complement VP of the auxiliary *do* is [*bse*]. This feature specification blocks modals from heading the VP following *do*. Since modals are specified to be [*fin*], the ungrammaticality of (60) is a natural expectation.

- (60) a. *He do can leave here.
 b. *He do may leave here.

The lexical entry further specifies that its complement VP be [$-AUX$]. This requirement will correctly predict the ungrammaticality of examples in (61) and (62).

- (61) a. *Jim [DOES [have supported the theory]].
 b. *The proposal [DID [be endorsed by Clinton]].

- (62) a. *I [do [not [have sung]]].
 b. *I [do [not [be happy]]].

In (61) and (62), the VPs following the auxiliary *do*, stressed or not, bear the feature [+AUX] inherited from the auxiliaries *have* and *be*. This explains their ungrammaticality.¹⁴

3.4 Infinitival Clause Marker *to*

Pullum (1982) notes that *to* and *do*, in addition to differing by one phonological feature, *voicing*, differ in one small way: *do* appears only in finite contexts, and *to* only in non-finite contexts.

¹⁴But note that there are differences between *do* and *don't* in imperatives and in non-imperatives. One telling difference is that *do* in imperatives can occur before another auxiliary like *be* and *have*.

- (i) a. Do be honest!
 c. Don't be silly!

do and *don't* in imperatives also have one distinct property: only *don't* allows the subject *you* to follow. Their properties indicate that they have different lexical information from those in non-imperatives. I leave aside the exact of the usages of *do* and *don't* in imperatives. See Quirk et al. 1985, Warner 1993, among others, for an account of their usages in imperatives.

- (63) a. *John believed Kim to do leave here.
 b. John believes Kim to leave here.

Other than that, they share the property that they obligatorily take bare verbal complements (hence not modals):

- (64) a. *John believed Kim to leaving here.
 b. *John did not leaving here.

In terms of NICE properties, *to* observes the VP ellipsis criterion:

- (65) a. Tom wanted to go home, but Peter didn't want to __ .
 b. Lee voted for Bill because his father told him to __ .

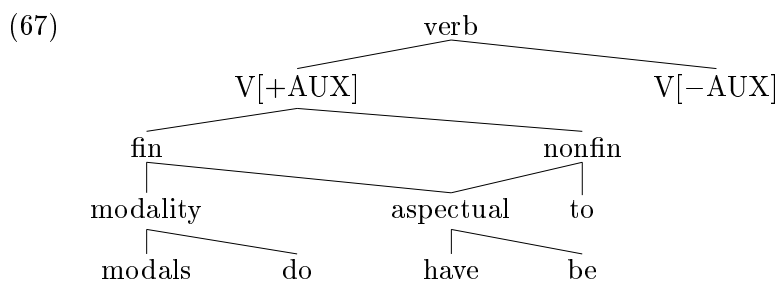
These properties mean that *to* would have a lexical entry like the following:

- (66)
$$\left[\begin{array}{l} \text{HEAD} \quad \left[\begin{array}{l} \textit{verb} \\ +\text{AUX}, \textit{nonfin} \end{array} \right] \\ \text{SUBJ} \quad \langle \boxed{\text{NP}} \rangle \\ \text{COMPS} \quad \langle \boxed{\text{VP}}[\textit{bse}, \text{SUBJ} \langle \boxed{\text{NP}} \rangle] \rangle \end{array} \right]$$

The lexical entry of *to* is thus similar to that of *do*, in that they both are raising verbs.

3.5 Summary

Given the facts we have observed, we could posit the following hierarchical structure:



Auxiliary verbs can be classified into two types based on the finiteness. Those that can be finite are classified into *modality* and *aspectual*, the former of which includes modal auxiliary verbs and *do*.

4 An Account for NICE Properties

4.1 Auxiliaries with Negation

Following Warner (1993), Kim (2000), and Kim and Sag (1995 and 2002), I adopt the idea that the English negator *not* leads a double life: one as a nonfinite VP modifier when it is constituent negation and the other as a complement of a finite auxiliary verb when it is sentential negation.¹⁵

The properties of *not* as a nonfinite VP modifier can be supported from its similarities with adverbs such as *never* in nonfinite clauses as given in (68) (cf. Baker 1991, Ernst 1992).

- (68) a. Kim regrets [never/not [having seen the movie]].
b. We asked him [never/not [to try to call us again]].
c. Duty made them [never/not [miss the weekly meeting]].

If we assume that *not* modifies a nonfinite VP, we can predict its various positional possibilities in nonfinite clauses. For example, in all the good examples in (69) and (70), *not* simply modifies a nonfinite VP. But in the bad examples, this nonfinite VP modifying lexical constraint is violated.

- (69) a. [Not [speaking English]] is a disadvantage.
b.*[Speaking not English] is a disadvantage.
c.*Lee likes not Kim.
- (70) a. Lee is believed [not $_{VP[inf]}$ [to like Kim]].
b. Lee is believed to [not $_{VP[inf]}$ [like Kim]].
c.*Lee is believed [to $_{VP[inf]}$ [like not Kim]].

But in finite clauses, it is well-known that *it* has restricted distributions as given in (71).

- (71) a. Lee never/*not left.
b. Lee will not leave.

One possible piece of evidence to differentiate two types of negation may come from scope possibilities in an example like (72) (cf. Warner 2000).

¹⁵As a reviewer points out, this paper does not cover cases like *I am afraid not*, *not in a million years*, *not that I know of* and so forth. The negator *not* in such cases could be taken either as a metalinguistic or a modifier. It can be neither the head of NegP nor the complement of a finite auxiliary.

(72) The president could not approve the bill.

The negation here could have the two different scope readings as given in (73).

- (73) a. It would not be possible for the president to approve the bill.
 b. It would be possible for the president not to approve the bill.

The most economical way to differentiate sentential negation from constituent negation seems to assume that the sentential negation is a syntactic complement of a finite auxiliary verb (cf. Kim and Sag 1995, 2002, Kim 2000, Warner 2000). I claim that this English specific property comes not from lexical properties but from construction constraints on the type *negation-ph*, which is a subtype of *aux-head-ph*, as represented in (74):

(74) *negation-ph*

$$\begin{array}{c}
 \text{H} \\
 \left[\quad \right] \rightarrow \left[\begin{array}{l} \textit{word} \\ \text{HEAD} \left[\begin{array}{l} \text{VFORM } \textit{fin} \\ \text{AUX } + \\ \text{NEG } + \end{array} \right] \\ \text{COMPS } \langle \text{②ADV}[\text{NEG } +], \text{③VP}[\textit{bse}] \rangle \end{array} \right] \text{②[] } \text{③[]}
 \end{array}$$

According to the constraint in (74), the construction *negation-ph* in English is thus peculiar in that it selects an adverbial element such as *not* and a VP[base] as its complement. This view of negation will then generate the structure (75)a and (75)b for constituent and sentential negation respectively.

Here there is a semantic difference between the auxiliary verb *shall* in (76)a and the one in (76)b: the former conveys futurity whereas the latter has a deontic sense.

Similarly, the following pair exhibits a scope difference (examples due to John Payne, as cited by GPS (1982: 64)):

- (77) a. Kim mightn't go.
b. Mightn't Kim go?

In (77)a, the modal has scope over the negation ('It is possible that Kim might not go.'). whereas in (77)b, only the reverse scope is possible ('Is it not the case that possibly Kim will go?').¹⁷

Further, there are inflected forms that occur only in inversion constructions, e.g. the first person singular negative contracted form of the copula illustrated in (78) (see also Hudson (1977) and GPS (1982).):

- (78) a. *I aren't going.
b. Aren't I going?

As far as we are aware, no treatment of these observations has ever been offered in transformational terms. It is somewhat unclear how to restrict a particular inflected form like *aren't* so that it will occur only in the structure that results after movement has applied, or how to restrict scope assignment rules in the relevant way. However, in the lexicalist analysis sketched above, contrasts like those just noted find a more comfortable home.

As Fillmore (1999) argues at length, the construction type *subject-auxiliary-inversion (sai-ph)* has numerous subtypes in English.

- (79) a. Wish: May she live forever!
b. Matrix Polar Interrogative: Boy, was I stupid!
c. Aren't: Aren't I the clever one!
d. Negative Imperative: Don't you even touch that!
e. Subjective: Had they been here now, we wouldn't have this problem.
f. Exclamative: Am I tired!

¹⁷As a reviewer points out, auxiliary verbs *can't* does not induce scope ambiguities as in like *Kim can't go* vs. *Can't Kim go?*. This identical relationship can be captured either by a lexical process or a constructional constraint. Considering only a few auxiliary verbs exhibit such scope ambiguities further support the lexical treatment of the relationship between declarative and interrogative sentences. See Warner (2000) for the detailed discussion of scope possibilities in such cases.

Each of these constructions has its own constraints that can hardly be predicted from other constructions. For example, in ‘wish’ constructions, only the modal auxiliary *may* is possible. In negative imperative, only *don’t* allows the subject to follow. These idiosyncratic properties support the supposition of a *subject-aux-ph* (*sai-ph*) as an independent construction as in (80) whose subtypes include those in (79):

(80) *sai-ph*

$$[\text{SUBJ } \langle \rangle] \rightarrow \mathbf{H} \left[\begin{array}{ll} \textit{word} & \\ \text{INV} & + \\ \text{AUX} & + \\ \text{SUBJ} & \langle \boxed{0} \rangle \\ \text{COMPS} & \langle \boxed{1}, \dots, \boxed{n} \rangle \end{array} \right], \boxed{0}, \boxed{1}, \dots, \boxed{n}$$

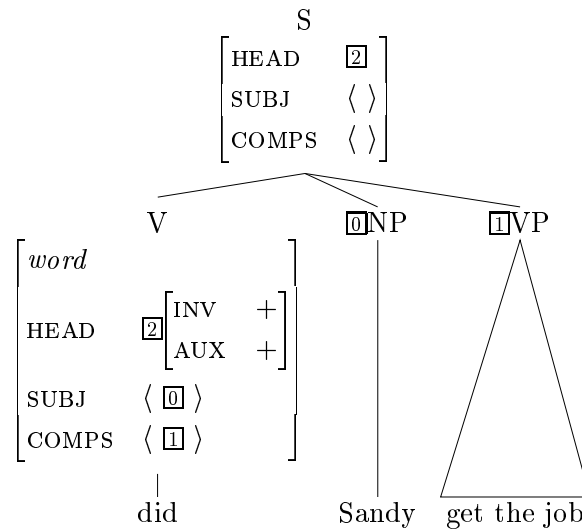
In this kind of phrase, which must be headed by an inverted ([INV +]), finite, auxiliary verb, elements are ‘cancelled’ from both head daughter’s SUBJ list and its COMPS list. Again, further constraints on such phrases are consequences of the Generalized HFP and other general constraints—they do not have to be stipulated (see Ginzberg and Sag 2001). What does need to be stipulated, following Fillmore and Ginzburg and Sag is that there are a number of subtypes of *sai-ph*, all of which inherit the constraints shown in (80).

It then follows that all auxiliary verbs compatible with the requirements in (80), including unfocussed *do*, may appear in matrix polar interrogatives, in ‘negative adverb preposing’ constructions, in matrix *wh*-interrogatives, exclamative constructions, and so forth:

- (81) a. Did Sandy get the job?
 b. Never did they play better!
 c. When did Pat say that?
 d. Boy, do they stink!

The basic structure for an inverted polar interrogative is sketched in (82):

(82)



The feature *INV* allows an analysis of the lexical idiosyncrasy noted earlier. The $[INV -]$ finite auxiliary *better*, for example, is incompatible with the requirements of (80) and appears in none of the subtypes of *sai-ph*. The first-person contracted form *aren't*, a form of *shall* conveying futurity, and a form of *mustn't* assigned a ‘not-possible’ reading can be lexically specified as $[INV +]$. Hence they can appear in inversion constructions, but not in the declarative construction.

4.3 Auxiliaries with Contraction

As we have noticed earlier, the auxiliary verbs can be contracted with the preceding subject or the following negation can be contracted with them.

- (83) a. They'll be leaving.
 b. They'd leave soon.

- (84) a. They wouldn't leave soon.
 b. They shouldn't leave soon.

One observed property of negation contraction is the existence of lexical idiosyncrasies as in **willn't*, **amn't*, **mayn't*. Based on such and other observations, Zwicky and Pullum (1983) claim it is better to take *n't* as a kind of inflectional affix. In the context of the framework we adopt here, we would then posit an inflectional rule as in (85) (cf. Sag and Wasow 1999):¹⁸

¹⁸The analysis sketched here does not cover the contraction of *be* as in the examples (i) that a reviewer has pointed out:

(85) N't Inflection Lexical Rule:

$$\left[\begin{array}{l} \text{I-FORM } \boxed{\square} \\ \text{HEAD } \left[\begin{array}{l} \textit{verb} \\ \text{VFORM } \textit{fin} \\ \text{NEG } - \end{array} \right] \end{array} \right] \longrightarrow \left[\begin{array}{l} \text{I-FORM } \boxed{\square} +n't \\ \text{HEAD } \left[\begin{array}{l} \textit{verb} \\ \text{VFORM } \textit{fin} \\ \text{AUX } + \\ \text{NEG } + \end{array} \right] \end{array} \right]$$

Such a lexical treatment could provide a way of accounting for the peculiar behavior of *aren't* in (86):

- (86) a. Aren't I lucky?
 b. Aren't I doing a good job?

- (87) a. *I aren't lucky.
 b. *I aren't doing a good job.

Since we take *n't* as an inflection, we could allow morphological exceptions. We could assume *aren't* is different from the one in examples like *You aren't doing a good job*. We could lexically specify that *aren't* can be used with a first-person subject just in case it is inverted.

In a similar manner, we could present an account for the auxiliary contraction with the preceding subject. That is, we could assume an inflectional lexical rule that allows the auxiliary verb to be contracted to its preceding noun. Following Bender and Sag (2002), we then can generate the following lexical entry for a word like *they're*:

(88) $\left[\left\langle \text{they're} \right\rangle \right]$

HEAD	$\left[\begin{array}{l} \textit{verb} \\ \text{FORM } \textit{fin} \end{array} \right]$
SUBJ	$\langle \rangle$
COMPS	$\langle \boxed{\square} \rangle$
ARG-ST	$\left\langle \boxed{\square} \text{NP}[3\text{pl}], \boxed{\square} \left[\begin{array}{l} \text{PRD } + \\ \text{SUBJ } \langle \boxed{\square} \rangle \end{array} \right] \right\rangle$

-
- (i) a. You think who's been lying?
 b. Who do you think's been lying?
 c. *Who's do you think been lying?

See Sag and Fodor (1994) for a direction for a traceless analysis for such contractions.

The word, selecting an empty SUBJ list and a singleton COMPS list, has two arguments.¹⁹

4.4 Auxiliaries with Ellipsis

The standard generalization of VPE is that it is possible only after an auxiliary verb as shown in the contrast (89) and (90).

- (89) a. Kim can dance, and Sandy can __ , too.
b. Kim has danced, and Sandy has __ , too.
c. Kim was dancing, and Sandy was __ , too.
- (90) a. *Kim considered joining the navy, but I never considered __ .
b. *Kim got arrested by the CIA, and Sandy got __ , also.
c. *Kim wanted to go and Sandy wanted __ , too.

The first issue in the analysis of VPE is the status of the elided VP. Following Lobeck 1987, López 1994, among others, I also take the elided VP phrase to be a *pro* element. The properties of the VPE we have seen in the beginning can be also found in pronouns. First of all, pronouns are phrases and can appear across utterance boundaries as in (91). In addition, they can occur in coordinate or subordinate clauses as in (92), are subject to the Backwards Anaphora Constraint as in (93), can violate the island constraints as in (94), and even can have split antecedents as in (95).

- (91) A: Does John eat fish?
B: Yes, but **he** hates it.
- (92) John eats fish because/and **he** hates meat.
- (93) a. Because **he** doesn't like meat, John ate fish.
b. ***He** doesn't like meat because John hates killing animals.
- (94) Bill really likes his new car. I think that the fact that **it** is an antique was a big selling point.
- (95) John arrived and later Susan arrived. **They** left together.

In accounting for the *pro*-drop phenomenon exemplified by Korean sentences like (96), we do not need to posit a phonologically empty pronoun if a level of argument structure is available, as pointed out by Bresnan (1982).

¹⁹See Bender and Sag (2002) for details.

- (96) John-i *pro* poassta.
 John-NOM saw
 ‘John saw (him)’

We can simply encode the pronominal properties in the argument structure. Interpreted in the framework of HPSG, we can represent this as the constraint given in (97) (cf. Bender 2000).

- (97) Argument Realization in Pro-Drop:

$$word \rightarrow \left[\begin{array}{l} word \\ HEAD \quad \left[\begin{array}{l} SUBJ \quad \boxed{A} \\ COMPS \quad \boxed{B} \ominus \text{list}(pro) \end{array} \right] \\ ARG-ST \quad \boxed{A} \oplus \boxed{B} \end{array} \right]$$

The constraint in (97) tells that a *pro* element in the argument structure need not be realized in syntax. For example, as represented in (98), the transitive verb *poassta* ‘see’ takes a *pro* object NP as its argument and thus the *pro* NP is not instantiated as the syntactic complement of the verb.

- (98) *poassta* ‘see’

$$\left[\begin{array}{l} word \\ HEAD \quad \left[\begin{array}{l} verb \\ FORM \quad \text{fin} \end{array} \right] \\ SUBJ \quad \langle \boxed{I} \rangle \\ COMPS \quad \langle \quad \rangle \\ ARG-ST \quad \langle \boxed{I}NP, \text{NP}[pro] \rangle \end{array} \right]$$

Adopting this treatment of *pro* phenomena as a mismatch between the argument-structure and the syntactic valence features (cf. Manning and Sag 1999), we could interpret English VPE a language specific constraint of the argument realization constraint on *auxiliary verbs*, as represented in (99).

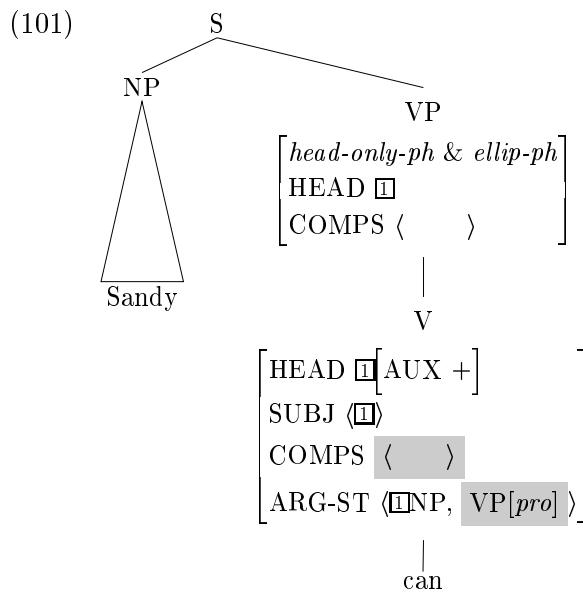
- (99) Argument Realization Constraint on *aux-verbs*:

$$\left[\begin{array}{l} aux-verb \\ HEAD \quad \left[\begin{array}{l} AUX \quad + \end{array} \right] \\ SUBJ \quad \boxed{A} \\ COMPS \quad \boxed{B} \\ ARG-ST \quad \boxed{A} \oplus \boxed{B} \oplus \text{list}(XP[pro]) \end{array} \right]$$

What the constraint in (100) tells is that when the final phrasal element in the argument-structure list of an auxiliary verb is a *pro*, this *pro* phrase need not be realized in the COMPS list, relevant to syntax. For example, the lexeme of the auxiliary verb *can* in (100)a takes a VP[base] as its complement. When this VP is realized as a *pro* element, it need not appear in its COMPS list, as illustrated in (100)b.

<p>(100) a. lexeme <i>can</i>:</p> <table style="border: 1px solid black; padding: 5px; width: 100%;"> <tr><td style="padding: 2px;"><i>lexeme</i></td><td></td></tr> <tr><td style="padding: 2px;">PHON</td><td style="padding: 2px;">can</td></tr> <tr><td style="padding: 2px;">SUBJ</td><td style="padding: 2px;">⟨ ⟩</td></tr> <tr><td style="padding: 2px;">COMPS</td><td style="padding: 2px;">⟨ ⟩</td></tr> <tr><td style="padding: 2px;">ARG-ST</td><td style="padding: 2px;">⟨NP, VP[bse]⟩</td></tr> </table>	<i>lexeme</i>		PHON	can	SUBJ	⟨ ⟩	COMPS	⟨ ⟩	ARG-ST	⟨ NP , VP[bse] ⟩	<p>b. word <i>can</i> in VPE</p> <table style="border: 1px solid black; padding: 5px; width: 100%;"> <tr><td style="padding: 2px;"><i>word</i></td><td></td></tr> <tr><td style="padding: 2px;">PHON</td><td style="padding: 2px;">can</td></tr> <tr><td style="padding: 2px;">SUBJ</td><td style="padding: 2px;">⟨ ⟩</td></tr> <tr><td style="padding: 2px;">COMPS</td><td style="padding: 2px;">⟨ ⟩</td></tr> <tr><td style="padding: 2px;">ARG-ST</td><td style="padding: 2px;">⟨NP, VP[<i>pro</i>]⟩</td></tr> </table>	<i>word</i>		PHON	can	SUBJ	⟨ ⟩	COMPS	⟨ ⟩	ARG-ST	⟨ NP , VP[<i>pro</i>] ⟩
<i>lexeme</i>																					
PHON	can																				
SUBJ	⟨ ⟩																				
COMPS	⟨ ⟩																				
ARG-ST	⟨ NP , VP[bse] ⟩																				
<i>word</i>																					
PHON	can																				
SUBJ	⟨ ⟩																				
COMPS	⟨ ⟩																				
ARG-ST	⟨ NP , VP[<i>pro</i>] ⟩																				

The lexical entry in (100)b will then project the VPE structure (101) for a sentence like (89a).²⁰



In the structure of (101), the head daughter's COMPS list (VP[bse]) is elided and is not realized in syntax. The sentences in (89)b and (89)c are also such cases: verbs such as *has* and *was* are all auxiliary verbs ([+AUX])

²⁰For the conditions on *ellipsis-ph*, see section 2.3.

and subcategorize for a VP complement. Thus, the VP complement of all these verbs can be elided but not that of the main verbs in (90).

In the same manner, this analysis will easily generate examples like (102).

- (102) Kim must have been dancing and $\left. \begin{array}{l} \text{a. Sandy must have been ___, too.} \\ \text{b. Sandy must have ___, too.} \\ \text{c. Sandy must ___, too.} \end{array} \right\}$

One important constraint on VPE is that it cannot apply immediately after an adverb, as illustrated in (103).

- (103) a. Tom has written a novel, but Peter never has ___.
 b. *Tom has written a novel, but Peter has never ___.

One simple fact we can observe from (103) is that adverbs cannot modify an empty VP. In the framework of HPSG, VP modifying adverbs carry at least the lexical information given in (104).

- (104) $\left[\begin{array}{l} \text{HEAD} \left[\begin{array}{l} \textit{adv} \\ \text{MOD VP:} \boxed{2} \end{array} \right] \\ \text{CONTENT} \left[\begin{array}{l} \textit{adv-rel} \\ \text{ARG} \quad \boxed{2} \end{array} \right] \end{array} \right]$

The lexical entry in (104) simply states that the adverb with this lexical information modifies a VP. The head feature MOD guarantees the fact that the adverb selects the head VP it modifies. This then entails that when the VP that an adverb modifies is not syntactically realized as in (103)b, there is no VP for the adverb to modify. Given Sag and Fodor's (1994) traceless theory²¹, an ungrammatical example like (103)a then would have the structure given in (105).

- (105)
- ```

 VP
 / \
 V[+AUX] *VP
 | |
 has Adv[MOD VP]
 |
 never

```

<sup>21</sup>Sag and Fodor (1994) reexamine empirical motivations for phonetically empty categories which have been important theoretical foundations in modern GB analyses. They show that all independent arguments for the existence of traces such as auxiliary contraction, *wanna* contraction, and position of floated quantifiers are neither satisfactory nor well-grounded. They also present positive arguments for terminating filler-gap dependencies by lexical heads, not by traces. See Sag and Fodor (1994) for details.

This explains the unacceptability of VPE after an adverb. Theoretically, HPSG has a small set of schemata, analogous to X' schemata, which specify partial information about universally available types of phrases. The adjunct schema is one of the universally available options for well-formed phrases. This adjunct schema roughly says that an adjunct and the head it selects through its modifier feature (MOD) forms a well-formed phrase. Now look at the structure in (105). In the present lexical theory where a VP modifier (e.g. *always* and *never* in (103)a,b selects its head VP through the head feature MOD(IFIED), the absence of this VP then means that there is no VP the adverb can modify. And this results in an ill-formed structure: no universal schema in HPSG renders such a structure acceptable, thus explaining the ungrammaticality of (103)b.

But notice that we have a different prediction for a modifier that may occur to the right of a VP, as given in (106).

- (106) a. Tom will not finish his book on Monday, but Kim [[will \_\_ ] on Tuesday].  
 b. Kim will not eat the fish with knife, but Kim [[will \_\_ ] with chopsticks].

The adverbial elements here are right-adjoined to the VP headed by the auxiliary *will*, as represented by the brackets. Thus, there is a VP head daughter the adverbials can modify. A similar observation can be found in the contrast between VP final adverbs and VP initial adverbs:

- (107) a. Kim has been driving the car carelessly, but Mary [[has \_\_ ] carefully].  
 b. \*Lee is simply being a student, but Kim is not [simply [\_\_ ]].

Though the adverb *carefully* modifies the VP headed by *has*, *simply* has nothing to modify.

This analysis then implies that sentences like (108) (a reviewer's example) are ungrammatical since *slowly* has nothing to modify to form a well-formed head-adjunct phrase.

- (108) \*John has eaten his cake quickly but Peter slowly.

The adverb *slowly* lexically specifies that it needs to modify a VP: a head-modifier phrase is a well-formed phrase only if a modifier truly modifies its head.



A related consequence is a straightforward account of cases like the following contrast (Lasnik 1995):<sup>22</sup>

- (109) a. Tom finished his homework, and he quickly did \_\_ .  
 b. John's theory has utterly surprised me, but Peter's theory hardly has \_\_ .  
 c. John partially revised his paper, and Sue completely did \_\_ .
- (110) a. \*John's theory has utterly surprised me, but Peter's theory has hardly \_\_ .  
 b. \*John partially revised his paper, and Sue did completely \_\_ .

As noted in Kim (2000), adverbs such as *completely* and *hardly* are VP modifiers that must precede the host. This means that these adverbs in (110)a and (110)b have nothing to modify. This simply explains why they do not form well-formed phrases.

VPE shows a puzzling property with respect to the negator *not*: it is possible to strand the negator *not* in VPE when it follows a finite auxiliary, but not when it follows a nonfinite auxiliary verb.

- (111) a. Kim said he could have heard the news, but Lee said that he could not \_\_ .  
 b. \*Kim said he could have heard the news, but Lee said that he could have not \_\_ .

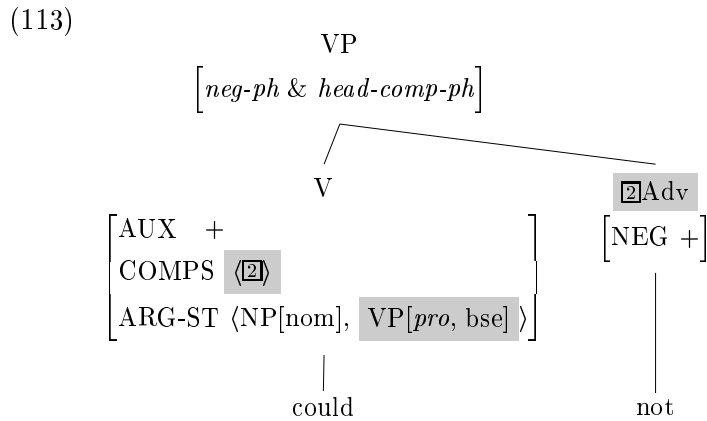
Given that the negator *not* is basically an adverb, we would predict the ungrammaticality of (111)b. However, we could not account for the grammaticality of (111)a.

We are now ready to provide our analysis for the contrast in (111). Given the constructional constraint on *negation-ph*, the negator *not* in (111)a (but not the one in (111)b) is the complement of the finite auxiliary verb *could* as given in (112)a. But when its VP complement is realized as *pro*, this VP does not appear in the COMPS list as represented in (112)b.

- (112) a.  $\left[ \begin{array}{l} \text{COMPS } \langle \boxed{2}, \boxed{3} \rangle \\ \text{ARG-ST } \langle \text{NP}, \boxed{2}\text{ADV}[\text{NEG } +], \boxed{3}\text{VP}[\text{bse}] \rangle \end{array} \right]$
- b.  $\left[ \begin{array}{l} \text{COMPS } \langle \boxed{2} \rangle \\ \text{ARG-ST } \langle \text{NP}, \boxed{2}\text{ADV}[\text{NEG } +], \text{VP}[\text{bse}, \text{pro}] \rangle \end{array} \right]$

<sup>22</sup>The accountability of such examples has been questioned by an anonymous reviewer.

The lexical information (112)b would then project the syntactic structure in (113).



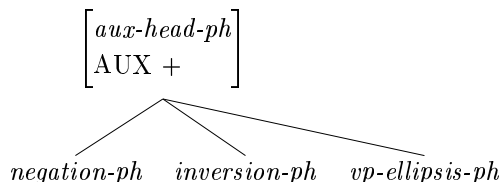
Notice that the phrase [*could not*] in (113) forms a well-formed head-complement structure where *not* is the complement of the head *could*. Nothing blocks this structure. One may ask whether it is acceptable not to satisfy the MOD feature of the adverb *not* in such a case. But note here that the structure (113) is not an adjunct structure, but a head-complement structure because the negator is now converted to a complement. The HPSG theory says nothing about what happens when a complement has a MOD value. Thus its presence in a complement does not affect the well-formedness of the given phrase.<sup>23</sup>

#### 4.5 Summary

We have seen so far that NICE phenomena are all sensitive to the presence of an auxiliary verb. That is, they all require their head to be headed by an auxiliary verb. This in turn has implied that they are all subtypes of *aux-head-ph*, as represented in (114):

<sup>23</sup>As for a reviewer points out, for a comprehensive treatment of VPE, we need to cover VPE in infinitival clauses. For a lexicalist analysis of VPE in infinitival clauses, see Kim (2001).

(114)



## 5 Conclusion

This paper started with three research questions for the English auxiliary system: ontological issues of auxiliary verbs, phenomena that tell us differences between auxiliary and main verbs, and ordering restrictions among auxiliary verbs.

The present system provides a lexicalist analysis of the English auxiliary system comprising a richly structured ordering system with numerous idiosyncratic properties. This system results from the interactions among constraints imposed upon the lexical information including morphosyntax and valence information of heads, simple constituent structures on the language, and constructions.

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