

# Subject Auxiliary Inversion

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## Abstract

In subject auxiliary inversion in English, the typical declarative word order subject-auxiliary-verb is instead realized as auxiliary-subject-verb. This inversion occurs in a number of environments, namely, matrix questions, conditionals, blessings and curses, comparatives, exclamatives, negative imperatives, and in environments where certain elements have been fronted (*so/as/nor*, negative phrases, phrases with *only*, and certain others). Most theoretical analyses of subject auxiliary inversion treat all of these instances uniformly, but some recent work indicates that there are actually two distinct types of inversion, one which can affect multiple auxiliaries and one which cannot. The most prominent theoretical account of subject auxiliary inversion, head movement of Infl (or T) to C, accounts best for the type that can only invert one auxiliary, but is incompatible with the type that inverts multiple auxiliaries. This type may involve a lower than usual position for the subject, instead. Subject auxiliary inversion is subject to a strict adjacency requirement, which requires that the fronted auxiliary be adjacent to the subject it has inverted with. Many theoretical proposals struggle to account for this requirement, as well as for the possibility of subject auxiliary inversion in embedded clauses. Subject auxiliary inversion is also one of the contexts for *do* support, and any theoretical account needs to explain why this is so and how *do* support comes about. Finally, subject auxiliary inversion has figured prominently in debates regarding learnability (the “poverty of the stimulus” argument), and it is also important for the question of whether grammatical roles like “subject” are primitive notions of grammar, or not. It appears that subject auxiliary inversion refers only to structure, and not to notions like “subject,” suggesting that grammatical roles are not primitives.

## 1 Introduction

*Subject auxiliary inversion* refers to a phenomenon in English where the typical declarative word order subject-auxiliary-verb is instead realized as auxiliary-subject-verb. This inversion occurs in yes-no questions, for instance (questions that seek an answer of either “yes” or “no”):

- (1) a. Many workers have joined the union.
- b. Have many workers joined the union?

If the corresponding declarative has no auxiliary, the auxiliary *do* is used in the inversion construction (2). If there are multiple auxiliaries in the clause in which inversion is to take place, the first one inverts (3):

- (2) a. The protesters gathered in the square.
- b. Did the protesters gather in the square?
- (3) a. Those students have been studying all night.
- b. Have those students been studying all night?
- c. \* Have been those students studying all night?
- d. \* Been those students have studying all night?

Besides yes-no questions, subject auxiliary inversion also takes place obligatorily when a negative or *only* phrase has fronted; in conditionals that lack *if*; with fronted *so* or *as* (typically with ellipsis);<sup>1</sup> and in matrix wh-questions where some element other than the subject is questioned:

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<sup>1</sup>It is not clear whether inversion with *nor* should fall under negative inversion, or should be treated like fronted *so/as*. In section 3.3, we will see that it patterns with *so/as* in some ways.

- (4) *Negative Fronting*
- Never again will I vote for a major-party candidate.
  - \* Never again I will vote for a major-party candidate.
- (5) *Conditionals*
- Had he done as he was supposed to, he would not be in this mess right now.
  - \* He had done as he was supposed to, he would not be in this mess right now.
- (6) *Fronted So/As*
- The sun came out and so did the vacationers.
  - \* The sun came out and so the vacationers did.
  - The hotel had free wifi, as did the beach club, but it was very slow.
  - \* The hotel had free wifi, as the beach club did, but it was very slow.
- (7) *Non-Subject Wh-Questions*
- Why is there a fly in my soup?
  - \* Why there is a fly in my soup?

Subject auxiliary inversion also takes place obligatorily in blessings, curses, and wishes (Fillmore 1999), but here the auxiliary is always *may*:

- (8) *Blessings/Curses/Wishes*
- May you never be happy again! (curse)
  - ≠ You may never be happy again! (deontic modal)

Subject auxiliary inversion may also take place in comparatives, but in this context it is optional:

- (9) *Comparatives*
- Men spent more time in leisure activities than did women.
  - Men spent more time in leisure activities than women did.

According to Merchant (2003), inversion is only possible in comparatives when there is also VP ellipsis, but this is disputed by Culicover and Winkler (2008).

Subject auxiliary inversion can also optionally take place in exclamatives, with complications when negation is involved (an inverted negative actually affirms the positive):

- (10) *Exclamatives*
- Boy, is he dumb! ~ Boy, he is dumb!
  - Wasn't that brave of him! ≠ That wasn't brave of him!

Negative imperatives also involve subject auxiliary inversion in English, visible when the subject is pronounced:

- (11)
- You be first! (positive imperative: no inversion)
  - Don't you be late! (negative imperative: inversion)
  - Are you late?
  - \* Do you be late?

Negative imperatives are unusual, however, in requiring *do* even with main verb *be*. Compare yes-no questions in (11c–d), which do not permit *do* with main verb *be* (with some exceptions discussed in section 3.6). The literature on negative imperatives debates whether to treat them differently from the other contexts of subject auxiliary inversion. Since the issue is a large one, negative imperatives will not be dealt with here, other than a few

remarks below. See, among many others, Beukema and Coopmans (1989), Zhang (1991), Henry (1995), Potsdam (1998, 2007), Rupp (1999), Han (2000), Flagg (2002).

There are other sporadic instances of subject auxiliary inversion, mostly occurring in literary language. A few examples follow, with many more presented in Green (1985).

- (12) a. Particularly did she commend its descriptions of some of those Italian places. (Dorothy Parker, *Little Curtis*)
- b. Many a moonlit night have I murmured it to the nightingales. . . (Dorothy Sayers, cited by Green 1985)
- c. He had a screwed up sort of face did Lord Vincent, as if the world tasted sour in his mouth,. . . (Mark Lawrence, *Prince of Thorns*)
- d. So little time did we have that we had to cut corners. (Huddleston and Pullum 2002)

In none of these cases would inversion be obligatory.

Subject auxiliary inversion is distinct from other types of inversion constructions in English which will not be discussed here. These include quotative inversion, locative inversion, and preposing around *be*:

- (13) a. “Why should I?” asked the man suspiciously. (*Quotative Inversion*)
- b. Under the bridge lived a troll. (*Locative Inversion*)
- c. Few are those whose words match their actions. (*Preposing around Be*)

Quotative inversion and locative inversion take place with main verbs, while preposing around *be*, as its name implies, is limited to the verb *be*. Some references on these constructions include Emonds (1976), Green (1985), Quirk *et al.* (1985), Rochemont and Culicover (1990), Birner (1994), Bresnan (1994), Collins and Branigan (1997), Birner and Ward (1998), Culicover and Levine (2001), Postal (2004), Bruening (2010, 2013).

In the subject auxiliary inversion contexts, inversion is limited in Modern English to auxiliary verbs. This was not the case in older stages of English, however, when main verbs could also invert:

- (14) Hear you the news abroad? (Shakespeare, *Richard III*)

Subject auxiliary inversion is often said to be a remnant of the verb second phenomenon that occurs in most modern Germanic languages. Indeed, the most prominent theoretical analysis of subject auxiliary inversion in Modern English treats it in a way virtually identical to the treatment of verb second (see section 2.2).

Main verb *be* continues to invert like an auxiliary in all dialects of Modern English, while main verb *have* continues to invert for some modern speakers of British English. Some verbs that are not auxiliaries by other criteria, namely *need* and *dare*, sometimes invert like auxiliaries (as in *Need I say more?* and *How dare you?!).*

## 2 Theoretical Accounts

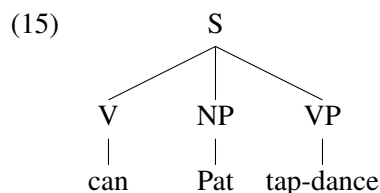
The English auxiliary system was first analyzed in modern syntactic terms by Chomsky (1957). All theoretical accounts of subject auxiliary inversion build on Chomsky’s seminal analysis. Subject auxiliary inversion is also intimately connected with the phenomenon of *do* support. A desideratum of any theory is an explanation for why subject auxiliary inversion is one of the contexts for *do* support (along with negation, verum focus, VP fronting, and VP ellipsis). Chomsky’s analysis, adopted in some form or other by most work since, was that the syntactic head representing tense and agreement had to be adjacent to the main verb in order for the tense/agreement affix to attach to the main verb. If they were not adjacent, *do* was inserted to support the affix. In subject auxiliary inversion, the tense/agreement head inverts with the subject, destroying the necessary adjacency between tense/agreement and the main verb (for explication, see Lasnik 2000, 79–86). A very similar idea was that *do* is present from the beginning, but deletes when adjacent to the main verb (e.g., Akmajian and Heny 1975, 131–138). Subject auxiliary inversion again destroys the environment for *do* deletion (e.g., den Besten 1983). For very different accounts of *do* support

and its relation to subject auxiliary inversion, see Baker 1991 and Bruening 2010, as well as Kim and Sag 2002 (whose account is sketched below).

Theoretical accounts of subject auxiliary inversion can be divided into two groups, movement accounts and non-movement accounts. Non-movement accounts will be presented first. Within the movement category, subject auxiliary inversion is notable for having a single, widely accepted account, with only small variations on the general analysis having been proposed.

## 2.1 Non-Movement Accounts

Non-movement accounts of subject auxiliary inversion include those of Dependency Grammar, Head-Driven Phrase Structure Grammar (HPSG) and its predecessors and successors, and Construction Grammar. Construction Grammar analyses of subject auxiliary inversion (very different ones) are given in Fillmore (1999) and Goldberg (2006). Gross and Osborne (2009) sketch a Dependency Grammar analysis of subject-auxiliary inversion. Kim and Sag (2002) give an HPSG account. The HPSG analysis posits the following structure for a subject auxiliary inversion sentence (Sag, Wasow, and Bender 2003, 410); the Dependency Grammar structure is very similar:



The auxiliary verb and the subject are simply inverted compared to the representation of a declarative clause.

In these analyses, the various facts of subject auxiliary inversion are captured through constraints. For instance, in the HPSG account, the V on the left must be specified [AUX +], meaning that it must be an auxiliary verb. See the works cited for details, as well as Green (1985) for an earlier analysis. In addition, Maekawa (2006) offers an analysis of negative inversion in terms of linearization-based HPSG, while Park (2012) provides an analysis of comparative inversion (see section 3.3).

Non-movement accounts of subject auxiliary inversion often cite as a virtue the fact that they can capture various idiosyncrasies of the different uses of inversion. For instance, they specify that only *had*, *were*, and *should* among the auxiliaries undergo inversion in conditionals (Fillmore 1999; see Pesetsky 1989),<sup>2</sup> while the “semi-auxiliary” *better*, though it can occur before negation and therefore seems to be auxiliary-like, does not undergo inversion (Kim and Sag 2002).<sup>3</sup> They also list first-person *aren’t* (see section 3.5) as only occurring inverted (Fillmore 1999, Kim and Sag 2002). However, these analyses capture these idiosyncrasies just by stipulation, simply listing the

<sup>2</sup>It is not clear to me that this limitation is factually correct. English literature from not too long ago includes numerous examples of conditional inversion with other auxiliaries, particularly *could* and *did*:

- (i) a. Could she but see him, could she but speak with him, she would bestow upon him her condolences if she could offer him no more substantial aid. (Sylvester Judd, *Margaret*, 1845)
- b. The deadness of her winter was past; new life and fruitfulness were before her, did she but know it. (William J. Hocking, *Studies in the Book of Ruth*, 1947)
- c. Think you, how her pain would be doubled, did she but hear your wild words. (Bram Stoker, *Dracula*, 1897)

It is not clear to me whether such instances of inversion are truly archaic, like the inversion with main verb *think* in the first part of the quote from *Dracula*, or are merely infrequent and literary. (Note that Pesetsky 1989 accounts for the inability of *do* to undergo conditional inversion by claiming that it can never move at all; this account is incompatible with earlier English where *do* did undergo conditional inversion.)

<sup>3</sup>This failure to invert is probably due to the fact that *better* actually occurs with the auxiliary *had*: *You had better not do that. Had* frequently reduces to *'d* and often to nothing, but one could analyze it as still being present. The negative version of *had*, at least, can undergo subject auxiliary inversion: *Hadn't we better go now?* It therefore appears that *better* is not an auxiliary at all, it is an element that takes a nonfinite verb phrase as complement, and nonfinite VPs can be negated with *not* (see Kim and Sag 2002). (See also note 3 of Hudson 2000 on *better* in child English and some dialects of English.)

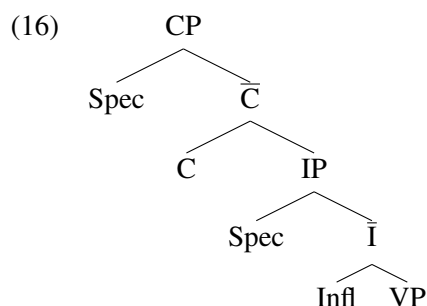
constraints, and there is no reason a movement account could not add similar stipulations to its own model of grammar, should a deeper explanation prove elusive.<sup>4</sup>

The account of *do* support in Kim and Sag (2002) is that lexical verbs are specified [AUX–], while auxiliary verbs other than *do* are unspecified for the value [AUX]. *Do* is specified [AUX +]. All the contexts for *do* support, including subject auxiliary inversion, require [AUX +]. Lexical verbs are therefore banned, but *do* is allowed, as are all the other auxiliaries since they are unspecified for [AUX]. Auxiliaries also have a polarized version, [POL +], which is emphatic. Non-emphatic *do* is not allowed in declaratives because a constraint states that they must be either [AUX +] and [POL +] (emphatic) or else [AUX –] and [POL –]. Since the other auxiliaries are unspecified for [AUX], they can occur in the latter environments. *Do* is inherently [AUX +], so it may never occur in a [POL –] declarative (\**Sandy did get the job*). The contexts for subject auxiliary inversion are not subject to this constraint, so both unfocused and focused *do* may occur in those environments.

This account, while it seems to adequately describe the facts, does not explain them. It leaves all the important questions unanswered: Why does inversion take place in the first place? Why would certain environments specify that they require an auxiliary (they are [Aux +])? Why is conditional inversion limited to certain auxiliaries? These and related questions have been at the fore in the movement account to be described next, although, as we will see, adequate answers to them have yet to be found.

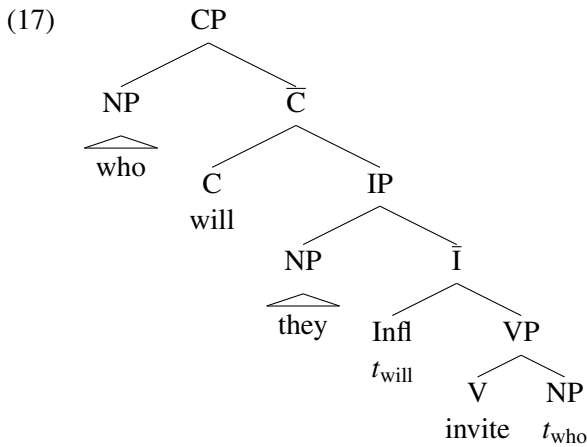
## 2.2 Movement: I-to-C

Chomsky (1957) simply proposed a transformation that inverted the subject and the auxiliary, his transformation  $T_q$  (page 112). The modern movement analysis seems to have been first suggested in Williams (1974), and its essence can be summed up by quoting him (page 222): “SAI [subject auxiliary inversion] actually moves the auxiliary into the complementizer.” That is, in subject auxiliary inversion, the auxiliary moves to the position that is occupied by complementizers like *that* and *if* in subordinate clauses. This analysis is developed in Emonds (1976), den Besten (1983), Koopman (1984), Travis (1984), and given its modern form by Chomsky (1986), who analyzed clause structure in X-bar terms as a head C (complementizer) selecting a phrase headed by Infl (action):



The head C is where complementizers like *that* and *if* appear, while Infl is the location of tense and agreement and the starting position of modal auxiliaries. Spec-CP hosts moved wh-phrases, while Spec-IP is the location of the subject of the clause. Subject auxiliary inversion is analyzed as moving Infl to C, so that a wh-question like *Who will they invite?* would have the following analysis:

<sup>4</sup>Kim and Sag (2002) also stipulate that in vernacular American English, only the contracted negative auxiliaries occur inverted in questions, and questions with uncontracted *not* do not occur, citing Bresnan (2000). However, this is factually incorrect, as Flagg (2005) shows.



The traces (“*t*”) represent the starting positions of the moved phrases. As just mentioned, the modals are analyzed as being of category Infl. (The reader should note that in work after Pollock 1989, Infl is often referred to as “T” for “Tense.” I will treat Infl and T as interchangeable here.)

In this account, the reason that main verbs do not invert in Modern English is that they never move as far as Infl. They stay within the lexical VP, in contrast with auxiliaries, which either start in Infl (the modals) or move there if there is no higher auxiliary (*have* and *be*). Since Emonds (1976), Modern English has been assumed to lack V-to-Infl movement with main verbs, in contrast with older stages of English, modern French, and other languages (see especially Pollock 1989). If there is no auxiliary and Infl is to move to C, *do* must be inserted to support the tense/agreement morpheme in Infl, following the basic premise of Chomsky’s (1957) original analysis of *do* support. In some versions *do* is inserted in Infl (e.g., Pesetsky 1989, Watanabe 1993, Embick and Noyer 2001), in others it is inserted in a lower V head and moves to Infl, comparable to *have* and *be* (e.g., Pollock 1989); for discussion see Bobaljik (1995). (Note that *do* patterns with the modals in not appearing in non-finite environments and in lacking an *-ing* form, but it differs from them in having a third person singular *-s* form and in not co-occurring with *have* and *be*.)

The main motivation for the I-to-C analysis is that it explains the complementary distribution of inversion and an overt complementizer. This complementarity is easiest to see in conditionals. Conditionals may have either the complementizer *if* or subject auxiliary inversion, but not both:

- (18) a. If he had done as I advised, he would not be in this mess right now.  
 b. Had he done as I advised, he would not be in this mess right now.  
 c. \* If had he done as I advised, he would not be in this mess right now.  
 d. \* Had if he done as I advised, he would not be in this mess right now.

If subject auxiliary inversion is movement to C, *if* occupies C, and no more than one morphological word may occupy a given head position (see below), then the I-to-C analysis explains why *if* may not co-occur with inversion. It is sometimes also said that this complementarity is behind the matrix-embedded contrast in questions, where inversion only takes place in matrix questions and not in embedded questions. The idea is that embedded questions have complementizers, *if* and *whether* in yes-no questions, and so do not have inversion. In fact, there are some dialects of English that allow inversion in embedded yes-no questions, and in these dialects inversion is in complementary distribution with *if* and *whether* (e.g., McCloskey 2006, Green 2012, 87–89).<sup>5</sup> However, this does not explain why embedded wh-questions do not have inversion (in Standard English), since matrix wh-questions co-occur with subject auxiliary inversion, and embedded wh-questions do not involve complementizers.

<sup>5</sup>There is one complication: inversion can co-occur with *whether* and *if* just when an adverbial intervenes between them:

- (i) John Fleetwood... asks if in the event that a member of Portmarnock Golf Club had a sex-change operation, would he/she still be eligible for membership? (McCloskey 2006, (72b))

See McCloskey (2006). This possibility can be accounted for in the expanded CP theory and the alignment theory discussed below.

The type of movement posited in I-to-C movement is head movement, a type of movement that is hypothesized to move one head, a zero-level category in X-Bar Theory, to another head. X-Bar Theory is thought to govern syntactic derivations, such that it cannot be violated at any point in the derivation (the Structure Preservation Hypothesis of Emonds 1976); heads could therefore only move to positions they can legitimately occupy in X-Bar Theory, which is to say other head positions. Head movement is also strictly local, obeying the Head Movement Constraint of Travis (1984). This constraint permits a head to move only to an immediately c-commanding head; intervening heads may not be skipped. This is why main verbs in English cannot move directly from V to C, bypassing Infl, and why lower auxiliaries may not jump across higher ones to invert (see example 3 above). For a good summary of head movement, see Roberts (2001).

As just mentioned, it is also important to the I-to-C account that a given head position can host only a single morphological word. It is generally thought that there is a tight connection between head movement and morphology, such that (at least some) verbal morphology is put together in the syntax by head movement. Finite auxiliary verbs must move to Infl in order to concatenate with tense/agreement morphemes, for instance (and something has to be said about main verbs in Modern English, which bear tense/agreement morphology but do not move to Infl). Most importantly, head movement is thought to be possible only if the two heads that are involved, the moving one and the one it moves to, can be put together into a single morphological word. Otherwise head movement is blocked. This constraint can be nicely illustrated with negation, which may undergo inversion with an auxiliary only if it contracts onto the auxiliary, thereby forming a single morphological word with it:

- (19) a. Don't you like wasabi?  
b. Do you not like wasabi?  
c. \*Do not you like wasabi?

See Zwicky and Pullum 1983, Baker 1988, Zhang 1991, Lasnik 1995, Roberts 2000, Flagg 2003, among many others.

Within this theory, an important question is why Infl must move to C in subject auxiliary inversion environments. The answer generally given has been that C in the relevant contexts has some property that attracts Infl, because it is somehow "Infl-like." In Chomsky (1993), this is stipulated as C having an uninterpretable V or T feature (or both) that must be checked off by moving T (the equivalent of Infl) to C. See Holmberg and Platzack (1995), Roberts and Roussou (1999) for slightly different proposals. The feature theory is developed most extensively by Pesetsky and Torrego (2001), whose proposal is notable for attempting to relate the pattern of subject auxiliary inversion in questions to other phenomena like the *that*-trace effect with subject extraction. Pesetsky and Torrego simply stipulate that C has an uninterpretable T feature, but make the further proposal that nominative case is also the presence of an uninterpretable T feature on an NP. In wh-questions, C has both a wh-feature and a T feature. The first requires movement of a wh-phrase to Spec-CP, while the second triggers T-to-C movement (subject auxiliary inversion) if the wh-phrase is not a subject. In a subject wh-question, the wh-feature and the T feature of C can be checked off simultaneously by simply moving the wh-phrase, because the wh-phrase, as a subject, has its own T feature (nominative case) that can match the T feature on C. Thus, Pesetsky and Torrego explain why non-subject wh-questions trigger inversion, but subject wh-questions do not. See their work for details, and proposed explanations for the *that*-trace effect and other phenomena.

A very different reason for subject auxiliary inversion is proposed by Bruening (2013). This work suggests that the English grammar involves an alignment constraint that requires that the left edge of the complement of C (i.e., IP) be aligned with the edge of a tensed verb in inversion contexts. In non-subject wh-questions, the subject intervenes between the edge of IP and the tensed verb, and so the tensed verb has to move over it in order to satisfy the alignment constraint. See more on this proposal below (sections 3.2 and 4).

In an influential work, Rizzi (1997) argued that CP needs to be expanded into several different functional projections: ForceP, Foc(us)P, and Fin(iteness)P, in that order, with the possibility of multiple TopicPs occurring between the others. Spec-FocP hosts fronted focused phrases, while Spec-TopP hosts fronted topics. Traditional complementizers are split into two categories, Force and Fin(iteness). If this proposal is adopted, it must be determined which head position a given complementizer occupies, and it also must be determined which head subject auxiliary inversion moves an auxiliary to. It should also be possible to have both a complementizer (in the

higher Force head) and subject auxiliary inversion (movement to the lower Fin head, or to Top or Foc) at the same time. This is exactly what is proposed for embedded negative inversion (section 3.1 below). Rizzi's (1997) own proposal is that *if* occupies the higher complementizer position, Force (as does *that*). Inversion in conditionals is movement of Infl through Fin to Force. This again captures the complementarity of *if* and subject auxiliary inversion by saying that they ultimately occupy the same position.

As mentioned above, the analysis of subject auxiliary inversion that treats it as head movement of Infl to C (or to one of the C-type heads in the expanded CP theory) has been overwhelmingly accepted in frameworks that make use of movement. However, there have been a few other proposals, some of which question whether all instances of subject auxiliary inversion should be treated the same. For instance, Pesetsky (1989) proposed that conditional inversion is indeed I-to-C movement, but in questions and negative inversion, there is no auxiliary movement beyond Infl and the subject is in a lower position (as was originally suggested for questions by McCawley 1970). Sobin (2003) suggests something similar specifically for negative inversion, with the subject occupying a lower than normal position (see section 3.1). The same proposal is made for some instances of comparative inversion by Culicover and Winkler (2008), described in section 3.3. Before turning to that, however, it should be noted that Watanabe (1993) pointed out data from adverb placement that argue against treating question inversion as a low position for the subject. The data come from Branigan and Collins (1993, 7, (18–19)):

- (20) a. John fortunately did not stay on his job.  
b. \* Which of his jobs fortunately did John quit?  
c. Which of his jobs did John fortunately quit?
- (21) a. John probably will (not) say what is on his mind.  
b. \* What probably will John say?  
c. What will John probably say?

As can be seen in (20a) and (21a), an adverb can appear between the subject and the highest auxiliary in a declarative. The highest auxiliary is presumably in Infl. If the subject were lower than Infl in a question, we would expect (20b) and (21b) to be grammatical: the adverb would still precede the auxiliary in Infl, while the subject would follow that. This is not grammatical, however; instead the adverb still follows the subject, while the auxiliary now precedes the subject (20c, 21c). This appears to be the result of movement of the auxiliary, as proposed by the I-to-C account.

It therefore appears that movement of the auxiliary, as in the I-to-C account, is correct for inversion in questions. In the next section, however, we will see some phenomena indicating that perhaps not all instances of subject auxiliary inversion are the same (in section 3.3 in particular).

### 3 Complications

As just foreshadowed, there are numerous facts that complicate the simple analyses described above.

#### 3.1 Embedded Inversion

First, a major issue for the I-to-C analysis is the ability of negative inversion to occur in embedded clauses with an overt *that*:

- (22) a. She made it clear that under no circumstances would she cancel the trip.  
b. I have found out, from its pages, that never once have I been right. (Dorothy Parker, cited in Green 1985)

The same is true of inversion with fronted *so/as*:

- (23) a. "I love almonds," I told her. She said that so did she.



- b. While the size of the pie might increase, analysts said that so would the battle to win the business of so-called junket operators that largely control the flow of top-flight customers. (*New York Times*)

It appears that subject auxiliary inversion is not, in fact, in complementary distribution with overt complementizers.

One response to this is to analyze negative inversion differently, with the subject in a lower-than-usual position (Sobin 2003). Sobin's specific analysis of negative inversion will not obviously extend to *so/as* inversion, since it crucially involves a negation projection (the fronted negative phrase occupies Spec-NegP). Another response is to posit CP recursion, such that one C head can take another CP as its complement in certain environments (Authier 1992).<sup>6</sup> The auxiliary moves to the lower of the two C heads, while *that* occupies the higher. The fronted negative phrase is in the specifier of the lower CP. In order to maintain the account of the complementarity of subject auxiliary inversion and *if* in conditional clauses, conditional clauses must not be one of the environments that licenses CP recursion. Unfortunately, it appears that negative inversion is also possible in a conditional with an overt *if*; the following are two of many examples found on the internet:

- (24) a. I would be very disappointed if at no time does one robot punch another robot in his shiny metal chin and make its head pop off.  
 b. If at no time does she reciprocate his advances & instead remains consistent in her message that she doesn't want to see him I think it bolsters her claim.

The CP recursion theory has to say that CP recursion only occurs when some XP fronts to occupy a specifier of CP (and apparently the Spec-CPs that are available in embedded clauses necessarily come below *that* and *if*).

The expanded CP analysis of Rizzi (1997) introduced above opens up various possibilities for accounting for embedded subject auxiliary inversion. For instance, Haegeman (2000) and Roberts (2001) analyze the fronted negative phrase as occupying Spec-Foc(us)P, while *that* is in the Force head right above FocP and the fronted auxiliary moves to the Foc head. According to Rizzi (1997), *if* also occupies the highest head, Force. FocP is only present if it needs to be (that is, when something is fronted to its specifier), so we expect complementizers and inversion to only co-occur when something else, like a negative phrase, has fronted. It is not clear where a fronted *so/as* would move in this theory; perhaps to Spec-FocP, again.

Note that in the expanded CP theory, subject auxiliary inversion has to be driven by different features of different heads in different contexts. For instance, if fronted negative phrases are in Spec-FocP and the auxiliary moves to Foc, it must be a feature of Foc that drives auxiliary movement. However, in a conditional the auxiliary moves to Force; in such contexts it must be a feature of Force that drives movement. Since *if* can co-occur with a fronted negative phrase with movement to Foc, as in (24) above, we therefore expect that the auxiliary should be able to move further, to Force, if *if* is not present. This does not seem to be possible:

- (25) a. \* I would have been very disappointed had at no time one robot punched another robot in his shiny metal chin.  
 b. \* Had at no time she reciprocated his advances. . .  
 c. \* Were at no time she to reciprocate his advances. . .

Note that this is explained in the alignment approach of Bruening (2013) in the same way as the adjacency requirement, next. It does not have a ready explanation in the expanded CP analyses that have been proposed.

### 3.2 Adjacency

An interesting and theoretically problematic fact about subject auxiliary inversion is that the fronted auxiliary has to be strictly adjacent to the subject (Rizzi 1997, Haegeman 2012, Bruening 2013):

- (26) a. When at last the sun came up, the desert was as empty as it had ever been.  
 b. \* When will at last the sun come up?

<sup>6</sup>On CP recursion analyses in general, see Reinhart 1981, Bhatt and Yoon 1991, Culicover 1991, Iatridou and Kroch 1992, Vikner 1995, McCloskey 2006.

- (27) a. I think that this week the gorilla has escaped only once.  
 b. \* Only once has this week the gorilla escaped.
- (28) (Rizzi 1997, (59))  
 a. If yesterday John had done that, . . .  
 b. \* Had yesterday John done that, . . .

As the (a) examples illustrate, an adjunct can come between a fronted wh-phrase or complementizer and the subject in Spec-IP if no inversion takes place.

The examples in (28) are particularly problematic for the I-to-C analysis discussed above. In that account, the auxiliary moves to the position occupied by *if* when *if* is not present. However, this analysis would expect (28b) to be grammatical: the auxiliary would simply move over the adjunct to the position occupied by *if* in (28a). Head movement is not sensitive to intervening adjuncts, or anything else other than heads; see Rizzi (1990).

As mentioned above, Rizzi (1997) proposed that *if* occupies the highest complementizer position in his expanded CP, Force. Inversion in conditionals is movement of Infl through Fin to Force. Rizzi captures the difference between *if* and inversion in adverb possibilities in (28) in the following way: the adverb is in Spec-Top, meaning that there is a Top head in between Force and Fin. Rizzi stipulates that the Top head is not a suitable host for movement of Infl. Infl therefore cannot move through Top on its way to Force, and it also cannot skip Top, because of the Head Movement Constraint. The result is that a TopicP can occur below Force when Force is *if* (28a), but such a TopicP blocks movement of Infl through it to Force in (28b). It is not clear what would block \**If yesterday had John done that, . . .*, with Infl moving only as far as the lower Fin head. Perhaps Infl is simply not attracted, and hence never moves, when Force is occupied by *if*.

Haegeman (2000) proposes that wh-phrases move to Spec-ForceP in embedded clauses, while preposed negative phrases move to Spec-FocP. The two can co-occur, with the auxiliary then moving to Foc:

- (29) Lee wonders why under no circumstances at all would Robin volunteer. (Haegeman 2000, 137, (28b))  
 (analysis: [<sub>ForceP</sub> why [<sub>FocP</sub> under no circumstances at all [<sub>Force</sub> would [<sub>IP</sub> Robin. . . ]])

In main clauses, on the other hand, Haegeman has wh-phrases and preposed negative phrases occupying the same position, Spec-FocP. The auxiliary moves to Foc. Maekawa 2006, however, shows that Haegeman is incorrect in thinking that wh-movement and negative fronting cannot co-occur in main clauses. They can:

- (30) Where under no circumstances would John go for a holiday? (Maekawa 2006, 230, (8c))

Amending Haegeman's system, main clauses and embedded clauses would simply not differ: wh-phrases are in Spec-ForceP, fronted negative phrases are in Spec-FocP, and the auxiliary moves to Foc. It is not clear why it would only move that far and not all the way to Force (31a), as it must in a simple wh-question when FocP is absent (31b):

- (31) a. \* Where would under no circumstances John go for a holiday?  
 b. Where would John go for a holiday? (*presumably*: [<sub>ForceP</sub> where [<sub>Force</sub> would [John. . . ]]])

(For more on various word order possibilities in the left periphery, see also Haegeman 2012 and Maekawa 2006.)

Haegeman (2000) explains the adjacency requirement between the inverted auxiliary and the subject (28) in the same way as Rizzi (1997): an intervening phrase is in Spec-TopP, and the Top head does not permit head movement through it. Neither Haegeman nor Rizzi provide a non-stipulative explanation for why auxiliaries cannot move through the Top head (in fact, Rizzi explicitly allows movement of a null head through Top, in order to govern the subject trace in subject extraction; he claims that Top only blocks movement of an overt head). Nor do they explain why the fronted phrase could not be in Spec-FocP instead, as is supposed to be the case in (29). Haegeman explicitly allows auxiliary movement to Foc, so an auxiliary should be able to move through Foc to Force, as well, as in (31a) and (25) above, but this seems to be ungrammatical.

A different account of the adjacency requirement is offered by Bruening (2013). Recall that Bruening (2013) proposed that the driving force behind subject auxiliary inversion is the necessity of aligning the finite verb with the left edge of the complement of C (that is, IP) in the inversion contexts. The adjacency requirement simply falls

out from the same alignment constraint: the adjunct causes an alignment violation, because it causes the tensed verb to not abut the left edge of C's complement. Fronted adjuncts are analyzed as being in Spec-CP in an instance of CP recursion, following Authier 1992 and the references in note 6:

- (32) a. [CP if [CP yesterday [IP John had done that]]]  
 b. \* [CP Had [CP yesterday [IP John <sub>t<sub>had</sub></sub> done that]]]

The alignment constraint is not active in (32a), but it is in (32b), where it is violated because the tensed verb (underlined) is not aligned with the left edge of IP.

The facts of co-occurrence of wh-phrases and negative inversion also follow in the phonological alignment theory: all fronted phrases are in specifiers of CP, so that CP recursion occurs when there is more than one fronted phrase; since the tensed auxiliary has to mark the left edge of IP, it will only ever move as far as the lowest C head:

- (33) a. [CP where [CP under no circumstances [̄c would [IP John go for a holiday ]]]]  
 b. \* [CP where [̄c would [CP under no circumstances [IP John go for a holiday ]]]]

The order in (33a) satisfies the alignment condition: the tensed auxiliary (underlined) abuts the left edge of IP. The order in (33b) violates the alignment condition. The examples in (25) above follow in the same way.

The phonological alignment theory of Bruening (2013) seems to fare better in explaining the allowed word orders than the expanded CP theory, and it also has no need for distinct Force, Finiteness, Topic, and Focus projections. The utility of these projections has been questioned by Abels (2012), who shows that the restrictions on ordering that Rizzi (1997) observed hold across clause boundaries, as well, which the split CP system has no account of. Whatever constraints explain the ordering restrictions across clause boundaries will also explain the ordering restrictions within a clause, so the expanded CP theory does not add anything to the explanation of the facts. Additionally, the various positions in the left periphery do not seem to be differentiated in the way the expanded CP theory requires; see in particular McCloskey (2006), who shows that the two head positions in CP recursion can both be pronounced, often both as the same item (e.g., *that*). This suggests that the CP recursion theory is correct in having two projections of the same category.

### 3.3 Multiple Auxiliaries

A problem for the head movement aspect of the I-to-C analysis of subject auxiliary inversion is the possibility of inverting multiple auxiliaries in a subset of the subject auxiliary inversion environments. Multiple auxiliaries seem to be possible in *so/as* inversion (Toda 2007, Culicover and Winkler 2008, Hatakeyama, Honda, and Tanaka 2010), in comparative inversion (Huddleston and Pullum 2002, Culicover and Winkler 2008, Park 2012), and in inversion with *nor* (Park 2012):

- (34) *So/As Inversion*  
 a. The results of education are long term and far reaching and so must be our commitment. (Toda 2007, 189, (3c))  
 b. If the necessity for the agreement is overlooked, then so will be the necessity of the child's having been trained to react to certain things in a certain way for it to mean anything by 'It is red'. (Godfrey Vessy, *Inner and Outer*, cited in Toda 2007, 189, (3a))

- (35) *Comparative Inversion*  
 a. It is no more expensive than would be the system you are proposing. (Huddleston and Pullum 2002)  
 b. But Mokotów was much further from the City Center than had been the old town and the evacuation under the German lines all the more perilous. (Culicover and Winkler 2008, 629, (6a))

- (36) *Nor Inversion*  
 a. I haven't been surprised by the rally, nor should have been my readers. (Park 2012, 326, (32c))  
 b. As for the balancing of the flywheel to the driven plate, my friend wasn't familiar with that, nor might have been the guy who did the conversion originally. (Park 2012, 326, (32d))

Culicover and Winkler (2008) and Hatakeyama, Honda, and Tanaka (2010) argue that this phenomenon could not involve subject postposing, because only the auxiliaries can precede the subject, other material cannot:<sup>7</sup>

- (37) a. The results of education are long term and far reaching and so must be our commitment in response.  
b. \* The results of education are long term and far reaching and so must be in response our commitment.
- (38) a. Sandy will have made more money by October than will have any of the other students before December.  
b. \* Sandy will have made more money by October than will have before December any of the other students.

According to Hatakeyama, Honda, and Tanaka (2010), adverbs are not allowed in between the fronted auxiliaries. The following example is their judgment, but I and two other (American) speakers I have asked disagree, and find it and similar examples acceptable:

- (39) \* Bill must be a genius, and so must surely be Ann. (Hatakeyama, Honda, and Tanaka 2010, 32, (19a))

Based on this judgment, Hatakeyama, Honda, and Tanaka (2010) propose that the two auxiliaries form an “amalgam” and move together as a single head. They suggest that forming an amalgam is a marked option, with acceptability decreasing with the number of auxiliaries (see their examples with consultant judgments, page 34, (24a–c)). This analysis cannot be correct for the speakers who permit adverbs in between the two auxiliaries.

Culicover and Winkler (2008) propose instead that the subject remains low in these constructions, in its base position in Spec-VP. They argue that certain conditions must be met in order for this to be allowed; most importantly, the subject must be contrastively focused. They present two arguments for the subject being low, involving parasitic gaps and multiple wh-questions, but their judgments are extremely suspect (in particular, I and others I have asked do not perceive a difference between the examples with comparative inversion and the examples without, which is the crucial contrast for their argument). Additionally, Park (2012) points out that ellipsis possibilities are not compatible with the simplest version of this proposal:

- (40) John might have been injured much more severely. . .  
a. . . than might have been Ben.  
b. . . than might have Ben.  
c. . . than might Ben. (Park 2012, 314–315, (10))

If the subject remained in its base position in the specifier of the lexical verb, it would be elided along with any auxiliaries when they are included in the ellipsis (so 40b–c would not be possible). In Culicover and Winkler’s proposal, the subject would have to be allowed to move to the specifier of an auxiliary verb, too, but only when that auxiliary verb is elided.

Nevertheless, adverb placement does seem to indicate that the subject is in a lower-than-usual position in these constructions. In (41a), with no inversion, the most natural position for *probably* is between the subject and the first auxiliary. With inversion, however (41b), *probably* most naturally precedes the first auxiliary, while the subject follows all the auxiliaries:

- (41) a. Sandy had made more money by October than any of the other students probably could have.  
b. Sandy had made more money by October than probably could have any of the other students.

This contrasts with questions in (20–21) above, where the order adverb-auxiliary-subject was not permitted. It therefore appears that question inversion has movement of the auxiliary, while comparative inversion may instead have the subject in a lower position (possibly one of several available positions, depending on the size of ellipsis).

Complicating the picture even more, according to footnote 7 in Hatakeyama, Honda, and Tanaka (2010), some speakers of English (British English, it appears) also permit multiple auxiliary fronting in negative inversion and in wh-questions, but not in yes-no questions. They give the following data:

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<sup>7</sup>The works cited only illustrate this with a single auxiliary. Because it is conceivable that inversion with a single auxiliary could differ from inversion with multiple auxiliaries, it is important to establish the facts with multiple auxiliaries as well.

- (42) a. John is a musician, but never is Bob.  
 b. ? John is a musician, but never must be Bob.  
 c. \* John is a musician, but never must have been Bob.
- (43) a. What must Ann be thinking?  
 b. What must be Ann thinking?  
 c. \* What must have been she doing?
- (44) \* Must be Robin sleeping?

All of these except (43a) are ungrammatical in American English, in contrast with *so/as*, comparative inversion, and inversion with *nor*. The following examples contrast *nor* with instances of negative fronting that are more natural for Americans than (42):

- (45) a. I haven't been surprised by the rally, nor should have been my readers. (Park 2012, 326, (32c))  
 b. I understand that the head coach would have done that, but under no circumstances should the assistant coach have.  
 c. \* I understand that the head coach would have done that, but under no circumstances should have the assistant coach.

Multiple auxiliaries are ungrammatical before the subject in negative fronting in American English, in contrast with inversion with *nor*.

Additionally, inversion with multiple auxiliaries seems to be best when VP ellipsis applies (see Culicover and Winkler 2008), so the following examples attempt inversion with *wh*-questions and yes-no questions with multiple auxiliaries and VP ellipsis. The result is ungrammatical:

- (46) a. I understand why the puppy must be neutered, but why must the kitten be, too?  
 b. \* I understand why the puppy must be neutered, but why must be the kitten, too?
- (47) a. I know that the dog must be brought along; should the cat be, too?  
 b. \* I know that the dog must be brought along; should be the cat, too?

Multiple auxiliaries are also absolutely ruled out before the subject in conditional inversion and in blessings/wishes/curses:

- (48) a. The other fairies were all invited; had Maleficent been, this tragic story would never have occurred.  
 b. \* The other fairies were all invited; had been Maleficent, this tragic story would never have occurred.
- (49) a. May he be drawn and quartered for his crimes! May you be, too!  
 b. May he be drawn and quartered for his crimes! \*May be you, too!

(Multiple auxiliaries are also ungrammatical before the subject in negative imperatives: *He wasn't late!* \**Don't be you either!*)

It therefore appears that conditional inversion and inversion with yes-no questions and blessings/wishes/curses are probably best analyzed as I-to-C movement, which cannot affect more than one auxiliary. Comparative inversion and inversion with *so/as/nor* probably involve a low position for the subject instead.<sup>8</sup> Inversion in *wh*-questions and with fronted negative phrases might differ by dialect. Each dialect will need to be accounted for in a theory, and it is not clear that this can be done other than by stipulation (see the note above about capturing idiosyncracies with stipulated constraints).

<sup>8</sup>An alternative would be to extend the analysis of quotative inversion in Bruening (2013) to multiple auxiliary fronting. Bruening (2013) analyzes quotative inversion as movement of a phrasal category across the subject. The category that moves is the complement of Infl or T. Any material that follows the subject has to move out of this category prior to it fronting. This phrasal movement would take adverbs along with it, so that in (41b) above, *probably could have* would move as a single phrase to a position higher than the subject. Note that this sort of phrasal movement analysis is what has been adopted in many recent works on subject-verb inversion in Romance languages (e.g., Kayne and Pollock 2001 and the other papers collected in Hulk and Pollock 2001).

### 3.4 Negation

Further idiosyncracies arise in subject auxiliary inversion with negation. As mentioned above, negation can contract onto an auxiliary and invert with it. Interestingly, however, this is not possible in conditionals (Green 1985, Pesetsky 1989):

- (50) (Green 1985, 130, (52))
- a. \* Hadn't we been there, it would have been difficult for them.
  - b. Had we not been there, it would have been difficult for them.

The pattern of contracted negation reverses in negative imperatives. Only the contracted auxiliary is allowed with an overt subject:

- (51) a. Don't you be late!  
b. \* Do you not be late!

See the works cited above on imperatives, especially Flagg (2002).

Additionally, in certain types of formal writing, negation can front with an auxiliary without contracting (Schütze 2004):

- (52) Have not the tens of thousands of words we have written on city planning sunk in? (Schütze 2004, 502, (20b))

This appears to have been more common in certain periods and styles; for instance, a search of Jane Austen's *Emma* (1815) turns up thirteen examples of "do not you," versus two of "don't you" and only one of "do you not." A number of examples can also be found in the writings of other authors, including Shakespeare but also the American author James Fenimore Cooper (1789–1851). Uncontracted negation fronting with the auxiliary is similar to the case of multiple auxiliary fronting above, although that is generally not possible in yes-no questions. It is incompatible with the simplest version of the head movement analysis described above, and it is not at all clear how it should be analyzed.

### 3.5 Strange Agreement

Another idiosyncrasy of subject auxiliary inversion that has been heavily discussed in the literature is the case of first-person *aren't*. The first-person form of *be* is not *are*, but it is just when it is negated and inverted, at least in some dialects (Langendoen 1970):

- (53) a. I am going.  
b. Am I going?  
c. \* Are I going?  
d. \* I aren't going.  
e. Aren't I going?

Related to this is the absence of a contracted *\*amn't*. The other forms of *be* have negated versions: *aren't*, *isn't*, *wasn't*, *weren't*; *\*amn't* seems to be a lexical gap, and is replaced with *aren't* just when inverted. See Hudson (1977, 2000), Gazdar, Pullum, and Sag (1982), Bresnan (2001), Frampton (2001), Embick and Marantz (2008).

### 3.6 Semantic Contrasts and Unexpected *do*

In most of the literature on subject auxiliary inversion, inversion is thought to have no semantic consequences by itself (although the fact that inversion takes place can mark a question, a conditional, or something else). That is, the propositional content of *She will never again eat a whole tube of wasabi* and *Never again will she eat a whole tube of wasabi* is the same. However, Kim and Sag (2002) claim that certain semantic contrasts can be found

between inverted and non-inverted auxiliaries. For instance, uninverted *shall* is said to indicate only futurity, while inverted *shall* indicates deontic modality:<sup>9</sup>

- (54) (Kim and Sag 2002, 402, (158))
- a. I shall go downtown. (future)
  - b. Shall I go downtown? (deontic modal)

In addition, uninverted *mightn't* is said to only permit the scope reading where *might* takes scope over negation (“It is possible that Kim might not go”), while the opposite scope obtains if it is inverted (“Is it not the case that possibly Kim will go?”):

- (55) (Kim and Sag 2002, 403, (159))
- a. Kim mightn't go. (modal > Neg)
  - b. Mightn't Kim go? (Neg > modal)

(*Mightn't* is missing from my own grammar, so I have no judgments on these sentences.) For more on scope involving modals and negation, see Iatridou and Zeijlstra (2013).

Similarly, conditionals formed with subject auxiliary inversion have been shown to differ semantically from conditionals with *if*. Subject auxiliary inversion seems to be possible in a subset of the environments that allow *if* (Iatridou and Embick 1994). According to Biezma (2011), conditionals with subject auxiliary inversion have antecedents that are GIVEN in the sense of Schwarzschild (1999). See also Horn (2000) and Bhatt and Pancheva (2006).

Subject auxiliary inversion with contracted negation is also known to license negative polarity items (NPIs) that would not be licensed without inversion. For instance, in the following examples, modified from McCloskey (1996, 89), the NPI *anybody* is not licensed in subject position when negation follows it, either because of lack of contraction onto the auxiliary (56a) or because no inversion takes place in embedded questions (56b). In (56c), however, negation has contracted and moved with the auxiliary, and the NPI is licensed:

- (56) a. \* Which one of them does anybody not like?  
b. \* They succeeded in finding out which one of them anybody didn't like.  
c. Which one of them doesn't anybody like?

See also Kayne (2000, note 3) and Roberts (2010, 8ff.). Roberts uses this fact, as well as scope facts from Lechner (2007), to argue that head movement may have semantic consequences, and so cannot be purely phonological movement as was suggested by Chomsky (2001).

In addition, it was noted above that there are certain exceptions to *do* co-occurring with main verb *be*. Most cases of this seem to involve a semantic contrast. Sentences like (57a) occur, and do not mean the same thing as the corresponding question without *do* (57b):

- (57) a. How do I be good enough? (found on internet)  
b. ≠How am I good enough?  
c. \* I do not be good enough.

*Do* may not occur in the corresponding declarative, even with negation (57c). My own intuition about (57a) is that it has some kind of modal force, which might lend support to the view that *do* is a modal element (but typically it is viewed as a semantically vacuous one). Other cases of *do* occurring with auxiliaries are discussed by Huddleston and Pullum (2002, 114) and Collins (2006). Their examples also contrast semantically (e.g., *Why don't you be more tolerant?* does not mean the same thing as *Why aren't you more tolerant?*: the former is a suggestion, while the latter is a yes-no question).

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<sup>9</sup>This contrast seems to be strongest with the first person. With other persons, uninverted *shall* seems to have some deontic modal force, as in, *the parties shall try to settle those conflicts amicably between themselves*.

## 4 Relation to the Notion of Subject

As mentioned above, subject auxiliary inversion only takes place with non-subject *wh*-questions, and not with subject *wh*-questions. This raises an issue with regard to models of grammar. The issue is whether generalizations about language, and hence theoretical accounts of them, refer to notions like “subject,” which is a derived one in some theories and a primitive in others. In theories where the notion of subject is a derived one (e.g., the Principles and Parameters and Minimalism frameworks), generalizations should not be able to directly refer to the notion of subject. Additionally, certain theoretical analyses crucially depend on the generalization referring to subjects. For instance, in the proposal of Pesetsky and Torrego (2001) described above, it was crucial to the account that subject *wh*-questions involve a subject, or more accurately an NP bearing nominative case (an uninterpretable T feature, for them).

However, certain facts suggest that “subject” is not part of the generalization about when subject auxiliary inversion takes place or does not take place. The first fact is an oddity noticed by Culicover (1992). Fronting phrases with *only* generally requires subject auxiliary inversion:

- (58) a. Only in that election did Leslie run for public office.  
b. \* Only in that election Leslie ran for public office.

The *only* phrase is not a subject, and hence requires inversion. *Only* phrases as subjects do not require inversion or *do* support, and in fact do not allow them (without emphasis):

- (59) a. Only Leslie ran for public office.  
b. \* Only Leslie did run for public office.

Now, oddly, if the subject is extracted in the presence of a fronted non-subject *only* phrase, inversion becomes ungrammatical again:<sup>10</sup>

- (60) (Culicover 1992, note 4)  
a. \* Leslie is the person who I said that only in that election did run for public office.  
b. Leslie is the person who I said that only in that election ran for public office.

If the correct generalization were that fronting of non-subjects (*wh*-phrases, negative phrases, phrases with *only*) triggered inversion, we would expect inversion to take place here, because a non-subject has been fronted.

The second fact is that questioning a fronted PP in locative inversion does not trigger subject auxiliary inversion (Bresnan 1994):

- (61) a. On which wall hung a picture?  
b. \* On which wall did hang a picture?

Bresnan (1994) used this fact to argue that the fronted PP is itself the subject, but Postal (2004) and Bruening (2010) present numerous arguments that it is not. Instead, a null expletive comparable to *there* occupies the subject position (Spec-IP). If this analysis is correct, however (and the bulk of the evidence indicates that it is), then the subject generalization about subject auxiliary inversion cannot be correct. In (61), a non-subject is questioned, which ought to trigger subject auxiliary inversion.

The actual generalization seems to be about whether the subject position (Spec-IP) is pronounced or not (Bobaljik 1995, 70–71, Bruening 2010). I will state it as follows:

- (62) English SAI Generalization:  
Subject-auxiliary inversion occurs in inversion environments when Spec-IP is occupied by a pronounced phrase. Subject-auxiliary inversion does not occur in inversion environments when Spec-IP is occupied by an unpronounced phrase (trace, null expletive).

<sup>10</sup>Culicover gave (60a) two question marks, but I believe it to be as ungrammatical as unmotivated *do* support generally.



In Culicover’s example (60), Spec-IP is occupied by a trace. In locative inversion (61), Spec-IP is occupied by a null expletive. In cases of subject extraction, Spec-IP is again occupied by a trace. What all three have in common is that Spec-IP is not pronounced.

According to Bobaljik (1995, 70–71), this follows from the view of *do* support where it is triggered by non-adjacency between Infl and the main verb. If Infl moves to C and Spec-IP is pronounced, Infl will not be adjacent to V and *do* support will be required. If Spec-IP is not pronounced, however, they will be adjacent, and *do* support will not be triggered. A different account is proposed by Bruening (2013), in the Align analysis described above. If the subject in Spec-IP is pronounced, it and not the tensed verb will be aligned with the left edge of IP. This triggers I-to-C movement, so that the right edge of the tensed auxiliary abuts the left edge of IP. If Spec-IP is not pronounced, however, the edge of IP is already the tensed verb, and no movement needs to take place.

Regardless of the theoretical account of the generalization, if the right generalization is the one stated in (62), then grammatical processes do not need to refer to notions like “subject,” and indeed they do not appear to. Instead, they refer to structure and structural positions. This lends support to frameworks that do not have grammatical relations as primitives.

Additionally, any adequate analysis of subject auxiliary inversion will have to account for the generalization in (62), and not the subject/non-subject generalization. Pesetsky and Torrego’s (2001) analysis, for instance, will not be successful: the fronted PP in locative inversion does not bear nominative case, and so will not check off the T feature on C without T-to-C movement.

## 5 Relevance to Larger Debates in Cognitive Science

Subject auxiliary inversion has figured prominently in the debate on the poverty of the stimulus in language acquisition. Subject auxiliary inversion is crucially structure-dependent, and does not refer to linear notions like “first” (Chomsky 1968, 51–52,<sup>11</sup> Chomsky 1971, 26–28). This can be seen by looking at cases where another auxiliary precedes the first auxiliary of the clause, but is embedded, for instance in the subject:

- (63) a. Can [people who have died and gone to heaven]  $t_{\text{can}}$  see what we are doing here on earth?  
b. \*Have [people who  $t_{\text{have}}$  died and gone to heaven] can see what we are doing here on earth?

The auxiliary that inverts is the highest auxiliary of the clause that is questioned, not the first auxiliary in linear order. The inversion rule, however it is stated, refers to the structure of the clause, and not to linear order.

At issue is whether infants acquiring language can learn this structure-dependence on the basis of experience alone, or whether the language component of the human mind is inherently constrained, such that it only ever considers structure-dependent rules. The fact is that children know the structure-dependent rule at the earliest ages they have been tested and do not mistakenly front the linearly first auxiliary (Crain and Nakayama 1987), while the crucial sentences that show that the rule is structure-dependent, like those in (63a), may not be present in sufficient numbers in the input to learners (Legate and Yang 2002, contra Pullum and Scholz 2002). A recent reference on the debate is Berwick, Pietroski, Yankama, and Chomsky (2011).

## 6 Conclusion

It appears from some of the data discussed above (in section 3.3) that subject auxiliary inversion in English is not a unitary phenomenon. Some instances can only invert one auxiliary, while others can invert multiple auxiliaries. The most prominent theoretical account of subject auxiliary inversion, head movement of Infl (or T) to C, is only compatible with the first type. Some data discussed above instead diagnoses a lower position for the subject in the type that inverts the subject with multiple auxiliaries. Additionally, the adjacency requirement has proven problematic for numerous theoretical accounts, including analyses based on Rizzi’s (1997) expanded CP. Subject auxiliary inversion also relates, directly or indirectly, to numerous other topics in syntax and cognitive science more

<sup>11</sup>These page numbers refer to the first edition of Chomsky 1968. In the enlarged edition, the pages are 61–62; in the third edition, 54.

broadly: *do* support, contraction and negation, the composition of the left periphery of the clause, the question of whether grammatical roles are primitives, and the learnability debate.

SEE ALSO: Conditionals, Contraction, Imperatives, Left Periphery of the Clause, Locative Inversion, Modals, Subject Clitics and Complex Inversion, VP-Ellipsis

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