Introduction to Transformational Grammar, LINGUIST 601
September 16, 2008

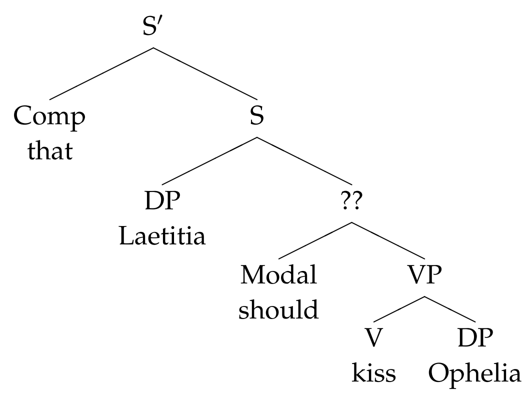
Clause Structure and *do*-support

1 The head of S

S is a phrase i.e. it is an XP. But if XP = S, what is X^0, the head of S?

We know that every XP has to have a head *of the same kind* i.e. an XP cannot be headed by Y^0. This property is know as **endocentricity**.
Now let us consider how we have been analyzing cases like (1).

(1) Mark believes that Laetitia should kiss Ophelia.



Neither S nor S′ are endocentric. How can we reformulate S and S′ so that they are endocentric and fit within the X′-schema?

We know that VPs like *kiss Ophelia* do not have the same distribution as S's. So we should not identify VP as S and V^0 should not be the head of S.

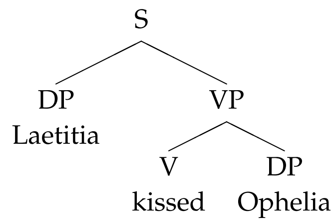
• **Approach 1**: The element which we have labeled 'Modal' could be head of S. This is the most natural approach because:
(i) heads are atmost lexical items (there may be heads that are smaller than words).
(ii) Out of the immediate constituents of S, 'Modal' is the only lexical item

What then about cases which don't have a modal such as (2a, b)?

(2) a. Mark believes that Laetitia is kissing Ophelia (right now).
b. Mark believes that Laetitia kissed Ophelia (yesterday).

(2a) is easier to take care of. We can just create a class of *Auxiliary* verbs which includes all modal verbs, *be* and one kind of *have*. But cases like (2b) pose a greater challenge. One option is to say what we have been saying up until now i.e. the following structure:

(3)



The immediate problem for this representation is that there is no candidate for the head of S. The immediate constituents of S are NP and VP and neither of them are heads. So we seem to be stuck.

At this point we should look to cases of VP-preposing (VP-topicalization) - some kinds of VPs can be preposed but others can't:

(4) a. [$_{VP}$ Kiss Ophelia], Laetitia did.
b. *[$_{VP}$ Kissed Ophelia], Laetitia.
c. *[$_{VP}$ Kissed Ophelia], Laetitia did.

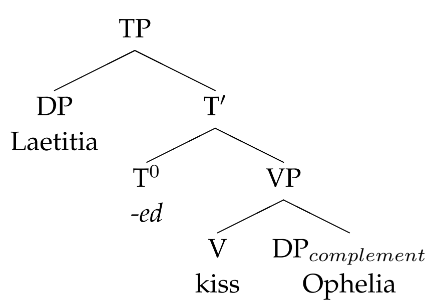
What distinguishes the grammatical (4b) from the ungrammatical (4a)?

The grammatical case involve a VP without tense/person/number marking. The verb appears in its bare form. The VP in the ungrammatical case involves a verb marked for tense/person/number marking. In the case at hand, the verb *kissed* is marked for Past Tense.

We want to distinguish between these two kinds of VPs and yet also retain a link between them.

• **Approach 2**: We postulate node **Tense** where the tense/inflectional information associated with a verb could be stored. This node Tense will head a phrase Tense Phrase (TP) which will be equivalent to an S. TP is also often referred to as the Inflection Phrase (IP).

(5) Laetitia kissed Ophelia.



Clearly, there has to be a way for the *-ed* suffix under T^0 and the verb *kiss* to combine.

Inflection Proposal: An T^0 and a V^0 that heads the complement VP of the T^0 combine in the phonological output i.e. when you try to pronounce the above tree, the T^0 node and the V^0 node combine and are pronounced together.

Cases like (4b) are bad because they would involve topicalization of an T′ and only full phrases can be moved around. (4c) is bad because there are two sets of tense/agreement markings floating around while there is only one T^0 to supply the information.

1.1 Specifier of TP

The tree in (5) introduces for an additional level of projection: the X′. The head combines with a WP (the complement), projects to an intermediate level the X′, and then combines with a YP (its specifier) and projects once again to XP (or X″).

(6) a. $\mathrm{T}' \rightarrow \mathrm{T}\ \mathrm{VP}_{Complement}$

b. $\mathrm{T}'' \rightarrow \mathrm{DP}_{Specifier}\ \mathrm{T}'$

(7) Relational Definitions:

a. X^0 - where things start projecting - minimal projection

b. XP - where things stop projecting - maximal projection

c. X′ - in between - neither minimal nor maximal

- so in principle, elements can be both minimal and maximal. One candidate for this is pronouns.

In many languages, the notion 'subject of a sentence' involves the structural relationship *specifier*: the 'subject of a sentence' is the DP that occurs in the [Spec, TP].

In English (and many other languages), the subject of a sentence agrees with the verb. What it means for a subject to agree with its verb is illustrated in (8).

(8) a. John eats pizza.

b. *John eat pizza.

c. I eat pizza.

d. *I eats pizza.

This relationship between the verb and its subject can be stated extremely locally as the reflex if the Specifier-head relationship.

(9) **Agreement Rule**: Copy the person-number features of the NP in [Spec, TP] on the T^0.

The person-number features of an NP are also referred to as its ϕ-features (phi-features). The ϕ-features of some pronouns are shown below:

(10) a. I = [+1st person, +singular]

b. we = [+1st person, +plural]

c. you = [+2nd person]

d. s/he = [+3rd person, +singular]

e. they = [+3rd person, +plural]

In English, gender is not part of the verbal agreement system, so *she* and *he* can be taken to have the same ϕ-features but in languages where they are part of the agreement system, they would also need to be represented.

1.2 What can go under T^0?

In sentences without any auxiliary element, the inflection is all there is in T^0. However, other elements can also appear under T^0.

(11) a. I **must/should/could** [eat some waffles]. (Modals)
b. I **am** [eating some waffles]. (*be*)
c. I **have** [eaten some waffles today]. (auxiliary *have*)
d. I **did** [not eat the waffles]. (auxiliary *do*)
e. I want **to** [eat waffles].(infinitival *to*)

Earlier we saw that the process of VP Topicalization was sensitive to the presence of inflection. Another grammatical process that is sensitive to the presence of inflection is VP Ellipsis. VP Ellipsis in English involves a silent tenseless VP together with an overt realization of T^0.

(12) a. Jerry shouldn't leave town. Bill **should** [$_{VP}$ leave town].
b. Tyrone isn't eating waffles today, but Ken **is** [$_{VP}$ is eating apples].
c. Max hasn't finished his homework, but Jose **has** [$_{VP}$ finished his homework].
d. Ana doesn't want to leave, but Mona wants **to** [$_{VP}$ leave].
e. Chunghye doesn't like unicorns, but Maribel **does** [$_{VP}$ like unicorns].
(*Chunghye doesn't like unicorns, but Maribel [$_{VP}$ likes unicorns].)

Each of the elements in (11) has distinct properties. Let us consider them individually. To provide contrast, we will start by looking at one verbal element that cannot occur in T^0, namely a main verb.

1.2.1 Main Verbs

Main verbs have non-tensed forms: past participles, present participles, and infinitival forms.

(13) a. Talvin ate the pizza.
b. Talvin has eaten the pizza. (past participle)
c. Talvin is eating the pizza. (present participle)
d. Talvin wants to eat the pizza. (infinitival form)

When negated or questioned, a form of the verb *do* is needed. Otherwise, the sentence is ungrammatical.

(14) a. Talvin didn't eat the pizza.
b. *Talvin eatn't the pizza.
c. Did Talvin eat the pizza?
d. *Eat Talvin the pizza?
e. Why did Talvin eat the pizza?
f. *Why ate Talvin the pizza?

Cases such as these can be explained by noting that the presence of the negation disrupts the local relationship needed by the T^0 and the V^0 in order to combine together. [1] Crucially main verbs stay in V^0 and do not move to T^0.

The verb *do* comes in and saves the day by giving a realization to the suffix in T^0, which could not have been pronounced on its own. This process is called **do support**.

1.2.2 Modals

Modals are set apart by the fact that they can never occur in non-tensed environments.

(15) a. *Talvin wants to must/should/could win this game.
     b. *[To must/should/could play baseball] is fun.

Modals *invert* in questions and precede negation.[2]

(16) a. Must/should/could Talvin win this game?
     b. Why must/should/could Talvin win this game?
     c. Talvin must/should/could not win this game.

The facts follow if we assume that Modal verbs are always generated in a [+Tensed] T^0. Since modal verbs are generated in T^0, they can realize whatever features T^0 has and the T^0 does not need to be 'close' to V^0.

1.2.3 Auxiliaries: *be* and *have*$_{Perfect}$

Unlike Modals, auxiliaries can occur in non-finite environments.

(17) a. Talvin wants to **be** popular.
     b. Talvin wants to **have** been popular.

However, like modals, auxiliaries invert in questions and precede negation. [3]

(18) a. Is Talvin winning this game?
     b. Has Talvin won this game?
     c. Why is Talvin winning this game?
     d. Why has Talvin won this game?
     e. Talvin isn't winning this game.
     f. Talvin hasn't won this game.

The above examples suggest that the auxiliaries *have/be* are generated in V^0 (like main verbs) but can move up to T^0 (unlike main verbs).

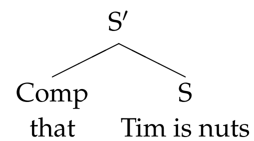
• **to**: only occurs in [-tense] T^0.
• **do**: only occurs in [+tense] T^0 when the T^0 is unable to combine locally with V^0.

[1] The structure is something like [T^0 [Negation [VP]]]. Where do adverbs go?
[2] In fact, *do*-support is not a possibility here.
[3] *Do*-support is not a possibility here either. Consider what happens with *have to*, possessive *have*.

2 The head of S′

S′ as it stands is an **exocentric** projection i.e. it is not headed by a head of its own category. Actually, things are even worse. It is quite unclear whether S′ has a head.

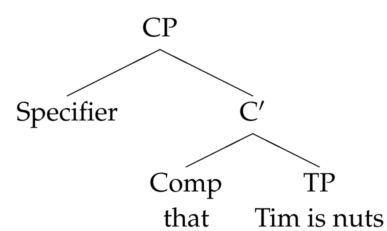
(19)



A neat solution, and one that is compatible with X′-theory is to take Comp as the head of S′. In fact this solution is forced upon us since the only potential head among the immediate constituents of S′ is Comp. We cannot look inside the S/TP for a head because the TP is a complete phrase by itself.

Assuming the IP to be a complement of Comp, we have the following tree.

(20)



What goes into the [Spec, CP]? We will answer this question when we discuss *wh*-movement (questions, relative clauses etc.).

3 Elementary Operations

This discussion is based on Chomsky (1998):49-52.

3.1 Merge

Merge is the most basic syntactic operation. We will distinguish between two kinds of Merge: set-merge, which introduces arguments, and pair-merge, which introduces adjuncts.

(21) Let K be the result of Merging α and β.

a. Set-Merge: K = set-merge(α,β) = $\{\Gamma, \{\alpha, \beta\}\}$.
where Γ is the label of K, which is determined by α and β.

When α and β set-merge, it is to satisfy requirements of one of them. If the requirements of α are being satisfied, α projects i.e. Γ = label(K) = label(α).

requirements of α: can be uninterpretable subcategorization features, as well as semantic requirements such as θ-roles.

b. Pair-Merge: $K = $ pair-merge(α,β) = $\{\Gamma, <\alpha, \beta>\}$.
where Γ is the label of K, which is determined by α and β.

Pair-Merge is inherently asymmetric - if the operation of Pair-Merge adjoins α to β to form $\{\Gamma, <\alpha, \beta>\}$, we can conclude that β projects i.e. Γ = label(K) = label(β).

- For any lexical item α, label(α) = α
- If the label information is predictable, we do not need to explicitly represent it.

(22) Let label(K) $= \alpha$ and β be a term of K introduced by set-merge.

a. β is a complement of α iff β is a sister of α.

b. β is a specifier of α iff β is not a complement of α and β is a sister of α' s.t. label(α') = label(K) = α.

(β is a term of $K = \{\gamma, \delta\}$ if $\beta = \gamma$ or $\beta = \delta$, or else β is a term of γ or δ.)

3.2 Agree

Agree is another important syntactic operation.

Consider agreement between a subject and its predicate. An uninterpretable feature F (ϕ-features) on a syntactic object Y (the predicate) is determined by another syntactic object Z (the subject) which bears a matching feature F (the subject's ϕ-features).

The operation of Agree will play an important role in our syntactic calculus and will extend beyond phenomena traditionally thought of as involving agreement.

(23) Agree is the operation by which a head X^0 (the Probe) with a set of unvalued uninterpretable features identifies the closest Y^0/YP in its c-command domain with the relevant set of matching (i.e. nondistinct) interpretable features (the Goal), and uses the features of Y^0/YP to value its uninterpretable features and vice versa.

- Even though the above definition is stated in terms of unvalued features, Agree may involve pure feature checking if the features involved are privative.

The following options are in principle available:

(24) . . . indicates c-command.

a. Simple Feature Checking 1:
X[uG] . . . Y[G] $\longrightarrow$ X[~~uG~~] . . . Y[G]

b. Simple Feature Checking 2:
X[uG] . . . Y[uG] $\longrightarrow$ X[~~uG~~] . . . Y[~~uG~~]

c. Feature Valuing 1:
X[uF:] . . . Y[F:val] $\longrightarrow$ X[~~uF~~:val] . . . Y[F:val]

d. Feature Valuing 2:
$X[uF:] \ldots Y[uF:] \longrightarrow$???

The following cases have also been used in the literature, but they do not fall under the definition in (23).

(25) a. Simple Feature Checking 3:
$X[G] \ldots Y[uG] \longrightarrow X[G] \ldots Y[\cancel{uG}]$

b. Feature Valuing 3:
$X[F{:}val] \ldots Y[uF:] \longrightarrow X[F{:}val] \ldots Y[\cancel{uF}{:}val]$

One possibility that has been explored is that the options in (25) might go hand in hand with the options in (24). The assignment of nominative to the subject by T^0 and agreement between T^0 and the subject could be seen as a case in point.

A locality constraint on Agree:

(26) $^{*}X[uF:] \ldots Y[F{:}val1] \ldots Z[F{:}val2] \longrightarrow X[\cancel{uF}{:}val2] \ldots Y[F{:}val1] \ldots Z[F{:}val2]$

4 Clausal Architecture

4.1 The Hierarchy of Projection

(27) a. John must leave now.
b. John must be leaving for the airport right now.
c. John must have left for the airport by now.
d. *John must is/been/being/has/had/having/ate/eaten/eating.

We have identified the location of modals with the location of finite Tense. This yields the following hierarchies:

(28) a. Tense > V_{bare}
b. Tense > $\textit{be}_{Prog}$
c. Tense > $\textit{have}_{Perfect}$

We can conclude that the only restriction T^0 imposes on its complement is that it requires its complement to be bare. This is also true for the infinitival marker *to*.

(29) a. To leave now would not be fun.
b. To be leaving for the airport right now, John must have started early.
c. To have left for the airport by now, John must have started early.
d. *To is/been/being/has/had/having/ate/eaten/eating.....

This pattern can be summarized as follows:
T^0 must take a bare VP complement, where VP covers verbal projections headed by main verbs as well as auxiliaries.

There is now a question of which direction the selection goes in.

(30) Two Options:

a. Option 1: T^0 selects a verbal head that has the property of being inflectionally bare.

i. At point of Merge: T^0[uBare] . . . V^0[Bare]

ii. After Agree: T^0[~~Bare~~] . . . V^0[Bare]

b. Option 2: T^0 selects a verbal head that is inflectionally unspecified and specifies its inflection to be bare. This would be a property of T^0.

i. At point of Merge: T^0[Bare] . . . V^0[uInfl:—]

ii. After Agree: T^0[Bare] . . . V^0[~~uInfl~~:Bare]

(the points above generalizes to the progressive auxiliary *be* and the perfect auxiliary *have*.)

Both options are attested in the analyses of natural language phenomena - (30a) in agreement and (30b) in case-assignment. In what follows, we will adopt the option in (30a).

• A fully decompositional option is also conceivable.

4.2 Selection by Perf and Prog

Just like T^0 imposes selectional constraints on their complement, so do Perf and Prog.

(31) a. Gina has eaten/*eating/*ate/*eat the apple.

b. Gina is eating/*eaten/*ate/*eat the apple.

The above selectional constraint can be represented as follows (along the lines in (30a):

(32) a. Selection by Perf:
At point of Merge: have[...,uPerf] . . . eat[Perf]
After Agree: have[...,~~uPerf~~] . . . eat[Perf]
eat[Perf] is realized as 'eaten'.

b. Selection by Prog:
At point of Merge: be[...,uProg] . . . eat[Prog]
After Agree: be[...,~~uProg~~] . . . eat[Prog]
eat[Prog] is realized as 'eating'.

Some additional constraints:

(33) a. Perf > Prog:
Maya has been eating pizza all day.

b. *Prog > Perf:
*Maya is having been eating pizza all day.

We could, of course, encode the ungrammaticality of (33b) using selection. But the exact source of the ungrammaticality of (33b) remains unclear - it could be semantic in nature. Empirically though we end up with the following hierarchy:

(34) T^0 > (Perf) > (Prog) > V

A complete derivation:

(35) Angela must have been eating pizza all day.

a. [eat[Prog] all day]

b. be[Perf,uProg] [eat[Prog] all day]

c. Agree: be[Perf,~~uProg~~] [eat[Prog] all day]

d. have[Bare,uPerf] [be[Perf,~~uProg~~] [eat[Prog] all day]]

e. Agree: have[Bare,~~uPerf~~] [be[Perf,~~uProg~~] [eat[Prog] all day]]

f. must[Tns,uBare] [have[Bare,~~uPerf~~] [be[Perf, ~~uProg~~] [eat[Prog] all day]]]

g. Agree: must[Tns,~~uBare~~] [have[Bare,~~uPerf~~] [be[Perf, ~~uProg~~] [eat[Prog] all day]]]

Each of the heads as an uninterpretable feature and an interpretable feature - the interpretable feature specifies a property of the head and the uninterpretable feature a selectional constraint.

4.3 The Location of Negation

Where can negation appear?

(36) a. John might not leave.

b. John did not leave.

c. John has not left.

d. John is not leaving.

(37) a. Lisa might not have been talking to Bill.

b. Lisa might have not been talking to Bill.

c. Lisa might have been not talking to Bill.

Out of (37a-c), only (37a) is felt to have a status different from (37b-c), and is often referred to as sentential negation as opposed to (37b-c) which are said to involve constituent negation.

Constituent negation can appear on a wide range of syntactic categories.

(38) a. PP: Minjoo was sitting not on the chair, but on the bar stool.

b. NP: Angela was reading not a comic, but a newspaper.

c. AP: One can be not happy and not unhappy at the same time.

The cut between sentential and constituent negation is ultimately a semantic one. But we can give the following syntactic characterization of the distinction:

(39) a. Sentential Negation: T^0 [Neg [....

b. Constituent Negation: every other instance of negation.

A minimal pair:

(40) a. You can't always do that. (sentential)

b. You can always not do that. (constituent)

c. You can't always not do that. (sentential and constituent)

• We will treat *not* as having its own projection NegP.
Two reasons for this:

(41) a. *n't*, a variant of *not*, can appear as a suffix on the verb:

i. Makoto hasn't left.

ii. Hasn't Makoto left?

b. a contrast between *not* and the negative adverb *never*:

i. Makoto did not leave./*Makoto not left.

ii. Makoto never left./*Makoto left never.

5 Basic Verb Movement

The Hierarchy of Projection:

(42) $\text{T}^0 > (\text{Neg}_{sentential}) > (\text{Perf}) > (\text{Prog}) > \text{V}$

According to the hierarchy of projection the perfect auxiliary *have* and the progressive auxiliary *be* are below negation. This seems right for some cases but not for others.

(43) a. Aniko might not have been eating pizza.

b. Aniko has not been eating pizza.

c. Aniko is not eating pizza.

d. Aniko did not eat pizza./*Aniko ate not pizza.

Similar facts hold with the negative adverb *never*.

(44) a. Aniko might never have been eating pizza, but for...

b. Aniko has never been eating pizza.

c. Aniko is never eating pizza.

d. Aniko never ate pizza./*Aniko ate never pizza./*Aniko did never eat pizza.

The facts about *do*-support are actually more general than the above discussion might indicate. *do*-support is triggered by polarity items other than *not* also, such as *so* and *too*.

(45) Negation and other polarity items

a. Danny does not like Sasha.
(*Danny not likes Sasha.)

b. Danny does so like Sasha.
(*Danny so likes Sasha.)

c. Danny does too like Sasha.
(*Danny too likes Sasha.)

This can be represented by modifying the hierarchy of projection as follows.

(46) The Hierarchy of Projection (revised):
$T^0 > (Pol) > (Perf) > (Prog) > V$
(Pol^0 projects PolP, sometimes also referred to as $\Sigma/\Sigma P$)

The generalizations that we can infer from the above set of facts (assuming the hierarchy of projection) are:

(47) a. If we can insert lexical material under T^0 (e.g. modals and *to*), everything else stays put.
b. If nothing is directly inserted under T^0 and T^0 has PerfP/ ProgP as its sister, then *have/be* must move to T^0 and realize the features of T^0.
c. If T^0 has VP as its sister, then the features of T^0 are realized on V^0.
d. If T^0 has PolP as its sister, we have two subcases:
   i. PolP immediately dominates PerfP/ProgP: *have/be* moves to T^0 and realizes the features of T^0.
   ii. NegP immediately dominates VP: *do* is inserted under T^0 and realizes the features of T^0.

do-support has a Last Resort nature - it only applies when all other options have failed. If we insert a *do* in environments where *do*-support is not forced, we get ungrammaticality.

(48) a. *John doesn't be eating pizza. (vs. John isn't eating pizza.)
b. *John does be eating pizza. (vs. John is eating pizza.)
c. *John doesn't have eaten pizza. (vs. John hasn't eaten pizza.)
d. *John does have eaten pizza. (vs. John has eaten pizza.)

Give that *John eats pizza* is acceptable, why is the following still acceptable? and why does the *do* have an emphatic reading?

(49) John does eat pizza. (only emphatic reading is available)

One way of thinking about these facts is as follows:

(50) a. The features of T^0 need to be expressed on an overt host.
b. If a modal is merged into T^0, the features of T^0 have a host.
c. If the highest verb is auxiliary *have/be*, the verb moves into T^0 and provides a host to the features of T^0. The presence of Pol^0 does not block this movement.
d. If the highest verb is a main verb, the main verb cannot move to T^0. Now there are two options:
   i. If Pol^0 does not intervene between T^0 and V^0, the features of T^0 are realized on V^0.
   ii. If Pol^0 intervenes between T^0 and V^0, a *do* is inserted under T^0 and the features of T^0 are realized on *do*.

(roughly the proposal in Bobaljik (1995))

An implementation of the above idea given our assumptions about Agree:

Basic intuition: the realization of the features of T^0 is distinct from the categorial selection of T^0 for a bare VP complement.

Assumption 1: The features of T^0 can be realized only on a verbal head that is the sister of T^0 or the head of the sister of T^0.

Assumption 2: Modals are generated under V^0, but must combine with finite T^0 to be pronounced.

Assumption 3: *not/so/too* occupy the [Spec,PolP], *-n't* occupies the head of PolP. *never* does not involve projection of a PolP.

Assumption 4: Certain kinds of features cannot be checked by Agree alone - they require movement. Such features are called strong features, sometimes indicated by *. Thus F* would be the strong version of F.

(51) a. The [unInfl:Tense] feature is strong for *have, be* and modals and weak for main verbs.

b. The presence of a NegP does not block T^0 from causing verbs with strong uInfl:Tense features (modals, *have, be*) from moving up to T^0. Main verbs have weak features and stay put.

c. Now the features of T^0 are realized on its verbal sister or the verbal head of its sister. If a verb has moved to T^0, it counts as a sister of T^0 and the features of T^0 are realized on this head. If nothing has moved to T^0 but T^0 has a verbal complement, then the features of T^0 are realized on this verbal head.

d. In the case where the complement of T^0 is a PolP and no verb has moved into T^0, neither of the above options are available. In this case, a *do* is inserted under T^0 and the features of T^0 are realized on *do*.

An unsolved mystery:

We can say the following:

(52) a. You can't always do that. (sentential)

b. You can always not do that. (constituent)

c. You can't always not do that. (sentential and constituent)

We can also say:

(53) You didn't always not do that.

But what is the positive version of (53)? We can say (54), but that seems to be emphatic only.

(54) You did always not do that.

It seems constituent negation blocks realization of features of T^0 on the V^0, but does not trigger *do*-support leading to ineffability. See Embick and Noyer (2001) for details.

References

Bobaljik, J. D. (1995) *Morphosyntax: The Syntax of Verbal Inflection*, Doctoral dissertation, Massachusetts Institute of Technology, Cambridge, Massachusetts. Distributed by MIT Working Papers in Linguistics.

Chomsky, N. (1998) *Minimalist Inquiries: The Framework*, MIT Occasional Papers in Linguistics 15, MITWPL, Cambridge, MA.

Embick, D., and R. Noyer (2001) "Movement Operations after Syntax," *Linguistic Inquiry* 32:4, 555–598.