Edge Features on Phase Heads or Moving Elements?*

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Abstract: Building on work by Chomsky (2000, 2001) and Bošković (2007), this paper discusses how successive cyclic movement is to be triggered and constrained. Modifying a proposal by Nunes (2014), I argue that the features that trigger successive cyclic movement (edge features) may be lexically encoded on phase heads or on elements that may undergo movement and that this difference is responsible for much of the crosslinguistic variation involving *wh*-movement.

1. Introduction

Chomsky (2000, 2001) has provided an interesting answer to the question of why A'-movement proceeds in series of short steps. The idea is that the computational system does not wait until the whole syntactic structure is formed before sending it to the interfaces, but ships chunks of structure in a piecemeal fashion as the derivation unfolds. More specifically, the derivation proceeds phase-by-phase, where a phase is either a vP or CP, and the complement of a phase head is transferred to the interfaces when a new phase head is introduced into the derivation (the Phase Impenetrability Condition). That being so, an element X buried within a lower phase may become inaccessible to an element Y sitting in a higher phase. If X and Y must establish a syntactic relation to ensure the convergence of the derivation, X must then move out of the domain that is to be transferred so that it has a chance to interact with Y, yielding successive cyclicity.

Assuming that this proposal provides a reasonable answer to *why* A'-movement is successive cyclic, this paper addresses the question of *how* to technically implement it. The paper is organized as follows. In section 2 I discuss Chomsky's (2000, 2001) proposal that successive cyclic movement is triggered by an EPP-type of feature associated with phase heads, Bošković's (2007) proposal that the relevant feature is hosted by the element that undergoes A-movement, and Nunes (2014) hybrid alternative according to which languages may differ with respect to the possibilities sketched by Chomsky and Bošković. Although the approach proposed by Nunes (2004) broadens the empirical coverage by extending the analysis to interactions between *wh*-movement and adjunct control in Brazilian Portuguese, it ends up inheriting problems found in Chomsky's and Bošković's proposals. In section 3, I then explore a modification of Nunes's

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(2014) proposal that circumvents the problems noted. I contend that the features that trigger successive cyclic movement (edge features) may be lexically specified on phase heads or on the elements that may undergo movement and that this difference lies at the heart of the crosslinguistic variation regarding *wh*-movement. In particular, this proposal opens a new avenue to account for ECP-effects of the *that*-trace sort. Section 4 concludes the paper.

2. Three Approaches to Successive Cyclic Movement

2.1. Chomsky (2001): Edge Features on Phase Heads

To account for long distance movement in consonance with the Phase Impenetrability Condition in (1), Chomsky (2001) proposes that the head of a strong phase may be optionally assigned an EPP-type of feature, which triggers movement to the edge of the phase.

(1) Phase Impenetrability Condition:
The domain of H [the head of a strong phase HP; JN] is not accessible at ZP [the smallest strong phase dominating HP; JN]; only H and its edge are accessible to such operations.

In the derivation of a sentence such as (2), for instance, the computational system assigns this EPP-like feature to each phase head after the phase is completed, as sketched in (3).

(2) What did John say that Mary bought?

(3)
a. $[_{vP}$ Mary **v**+bought what$]$ $\rightarrow_{\text{EPP assignment}}$
b. $[_{vP}$ Mary $\mathbf{v_{EPP}}$+bought what$]$
c. $[_{vP}$ $\mathbf{what_i}$ $[_{v'}$ Mary $\mathbf{v_{\underline{\underline{EPP}}}}$+bought $\boldsymbol{t_i}]]$
d. $[_{CP}$ **that** $[_{TP}$ Mary_k $[_{vP}$ what_i $[_{v'}$ t_k $v_{\underline{\underline{EPP}}}$+bought $t_i]]]]$ $\rightarrow_{\text{EPP assignment}}$
e. $[_{CP}$ $\mathbf{that_{EPP}}$ $[_{TP}$ Mary_k $[_{vP}$ what_i $[_{v'}$ t_k $v_{\underline{\underline{EPP}}}$+bought $t_i]]]]$
f. $[_{CP}$ $\mathbf{what_i}$ $[_{C'}$ $\mathbf{that_{\underline{\underline{EPP}}}}$ $[_{TP}$ Mary $[_{vP}$ $\boldsymbol{t_i}$ $[_{v'}$ Mary $v_{\underline{\underline{EPP}}}$+bought $t_i]]]]]$
g. $[_{vP}$ John **v**+say $[_{CP}$ what_i $[_{C'}$ $\text{that}_{\underline{\underline{EPP}}}$ $[_{TP}$ ...$]]]]$ $\rightarrow_{\text{EPP assignment}}$
h. $[_{vP}$ John $\mathbf{v_{EPP}}$+say $[_{CP}$ what_i $[_{C'}$ $\text{that}_{\underline{\underline{EPP}}}$ $[_{TP}$ ...$]]]]$
i. $[_{vP}$ $\mathbf{what_i}$ $[_{v'}$ John $\mathbf{v_{\underline{\underline{EPP}}}}$+say $[_{CP}$ $\boldsymbol{t_i}$ $[_{C'}$ $\text{that}_{\underline{\underline{EPP}}}$ $[_{TP}$ ...$]]]]]$
j. $[_{CP}$ did+**Q** $[_{TP}$ John_m $[_{vP}$ what_i $[_{v'}$ t_m $v_{\underline{\underline{EPP}}}$+say $[_{CP}$ ...$]]]]]$ $\rightarrow_{\text{EPP assignment}}$
k. $[_{CP}$ did+$\mathbf{Q_{EPP}}$ $[_{TP}$ John_m $[_{vP}$ what_i $[_{v'}$ t_m $v_{\underline{\underline{EPP}}}$+say $[_{CP}$ ...$]]]]]$
l. $[_{CP}$ $\mathbf{what_i}$ $[_{C'}$ did+$\mathbf{Q_{\underline{\underline{EPP}}}}$ $[_{TP}$ John_m $[_{vP}$ $\boldsymbol{t_i}$ $[_{v'}$ t_m $v_{\underline{\underline{EPP}}}$+say $[_{CP}$ ...$]]]]]]$

Although this approach is able to technically accommodate the well motivated short steps involved in A'-movement, it faces some conceptual and empirical problems. First, it tacitly seems to invoke parametrization of the computational system. For instance, the EPP assignment operation is taken to be available in English, but should be unavailable in languages like Chinese in order to account for their lack of *wh*-movement. In addition, assignment of EPP features in the course of the derivation violates the Inclusiveness Condition, for these features are not present in

the relevant numerations. Finally, as stressed by Bošković (2007), the optionality of EPP-assignment leads to overgeneration. A sentence such as (4), for instance, is incorrectly ruled in if the EPP is assigned to the two lowest phase heads, as illustrated in (5).

(4) * Who thinks what Mary bought?

(5) [$_{CP}$ who Q~~$_{EPP}$~~ [$_{TP}$ *t* [$_{vP}$ *t* v thinks [$_{CP}$ **what** C~~$_{EPP}$~~ [$_{TP}$ Mary [$_{vP}$ *t* [$_{v'}$ Mary v~~$_{EPP}$~~ bought *t*]]]]]]]]]

To circumvent problems like this one, Chomsky (2001) suggests that a phase head is assigned an EPP feature only if that has an effect on outcome. Applied to (5), this suggestion prevents EPP assignment to the two lowest phase heads, as it does not contribute to convergence. However, this suggestion involves lookahead and global computations, undermining the whole localist phase-based approach.

2.2. Bošković (2007): Edge Features on Moving Elements

For Bošković (2007), the key of the problem in Chomsky's (2001) system is that the EPP feature is hosted by the potential target of movement and not by the moving element itself. He then proposes an alternative account according to which the uninterpretable feature that triggers successive cyclic movement (*uF)* is hosted by the moving element and must function as a probe in order to be licensed. This amounts to saying that a *wh*-phrase specified for uF must end up in the specifier of an interrogative C, from where it can probe C and be appropriately licensed. As far as crosslinguistic variation goes, Bošković proposes that in languages like English, where *wh-in situ* is allowed in multiple questions, the *wh*-phrases are optionally specified for uF.

Under this approach, the contrast between (2) and (4) is captured in the following way. If a *wh*-phase in English bears uF, it must move all the way to the Spec of an interrogative C, in order to be licensed. This is the case of *what* in (2), as sketched in (6) below, but not in (4), as sketched in (7). In order for the *wh*-phrase of (4) to move, it must have come into the derivation specified for uF; otherwise, it would simply remain *in situ*. However, if it bears uF, it must move to the Spec of an interrogative C and this is not what happens. An advantage of this alternative, as Bošković (2007) points out, is that lack of convergence may be detected in a local fashion. The presence of uF in the lower chunk of structure in (7), for example, tells the system that that is not a convergent object, regardless of further computations down the road.

(6) [**What**$_{\surd \mathbf{uF}}$ did John [t say [*t* that Mary [*t* bought *t*]]]]

(7) * [Who thinks [**what**$_{\mathbf{uF}}$ Mary bought *t*]]

Although compatible with the Inclusiveness Condition and able to rule out partial *wh*-movement in a local fashion, Bošković's (2007) account provides no basis to capture the potential blocking effect that some phase heads impose on A'-movement. In his system, there is no

way to account for the fact that subject extraction in English, for instance, is somehow dependent on the properties of the local phase head, as the *that*-trace effect in (8) illustrates.

(8) Who did you say (*that) saw Mary?

Notice that if *who* in (8) were endowed with *uF*, it should move as far as the matrix Spec,CP to check uF and the presence or absence of *that* in the embedded clause should be completely irrelevant.

In sum, *that*-trace effects and similar ECP effects do not fit snugly in Bošković's system. Upon reexamination, Chomsky's (2001) approach looks more prone to incorporating these effects as it crucially takes A'-movement to be dependent on features of phase heads. This in turn seems to suggest that it may be worth considering a hybrid approach, combining aspects of both proposals.

2.3. Nunes (2014): A hybrid approach

One such attempt towards a hybrid approach to successive cyclic movement was developed in Nunes (2014), as summarized in (9).

(9) a. Brazilian Portuguese *wh*-phrases: uF is lexically optional
b. English *wh*-phrases: uF is optionally assigned during the computation (subject to Last Resort)

Like in Bošković's (2007) system, uF in this proposal is always associated with the moving element and hence, unwanted cases of partial *wh*-movement are ruled out. But like in Chomsky's (2001) approach, the assignment of uF can take place in the course of the computation and is subject to parametrization: it holds in English, but not in Brazilian Portuguese.

The empirical motivation for this putative difference between English and Brazilian Portuguese has to do with adjunct control. In English, adjunct control invariably involves subject control, as illustrated in (10) below. In Brazilian Portuguese, on the other hand, object control is allowed in addition to subject control when the matrix object undergoes *wh*-movement, as illustrated in (11) (see Modesto 2000, Rodrigues 2004, and Nunes 2014 for relevant discussion).

(10) a. John_i greeted Mary_k after [$ec_{i/*k}$ entering the room]
b. Who_k did John_i greet t_k after [$ec_{i/*k}$ entering the room]?

(11) *Brazilian Portuguese:*
a. [O João]$_i$ cumprimentou quem$_k$ depois de [$ec_{i/*k}$ entrar na sala]
the João greeted who after of enter in-the room
'Who did João greet after entering the room?'

b. Quem$_k$ [o João]$_i$ cumprimentou t_k depois de [*ec*$_{i/k}$ entrar na sala]
who the João greeted after of enter in-the room
'Who$_k$ did João$_i$ greet after he$_{i/k}$ entered the room?'

Assuming Hornstein's (2001) general analysis of adjunct control in terms of Merge-over-Move, Nunes (2014) proposes that the lexical optionality of uF on *wh*-elements in Brazilian Portuguese may render Merge-over-Move computations inapplicable. Let us examine the details. Given the derivational step in (12) below, for instance, Hornstein argues that Merge-over-Move enforces merger of *who* in the object of *greeted* (cf. (13)) before the embedded subject undergoes sideward movement in the sense of Nunes (2001, 2004) (cf. (14)), giving rise to a subject control reading for the sentence in (10b) (cf. (15)).

(12) N = {**who$_1$**, …}
K = [**John** entering the room]
L= greeted

(13) N' = {**who$_0$**, …}
K = [John entering the room]
M = [greeted **who**]

(14) K = [**John** entering the room]
P = [**John** greeted who]

(15) [$_{CP}$ Who did [$_{TP}$ John [$_{vP}$ [$_{vP}$ ~~**John**~~ greeted ~~**who**~~] [$_{PP}$ after ~~**John**~~ entering the room]]]

Nunes (2014) argues that the ambiguity of a sentence such as (11b) in Brazilian Portuguese arises depending on whether or not *quem* is lexically specified for uF (cf. (9a)). If it is, as sketched in (16) below, the presence of uF renders Merge-over-Move inapplicable and *quem* undergoes sideward movement to the object position of *cumprimentou*. The intuition behind this reasoning is that uF in (16) has already probed its domain and was not licensed. Hence, at this stage the computational system already has the information that if the element bearing uF does not move, the derivation will crash (Following Bošković 2007, Nunes (2014) assumes that uF must function as a probe in order to be licensed). *Quem* in (16) then undergoes sideward movement, as sketched in (17), followed by merger of *o João*, as shown in (18). Put differently, the case of (12) in English instantiate the ideal situation with all things being equal and economy is called to duty to choose between Merge and Move to satisfy the selection requirements of *greeted*. In contrast, in the case of (16), things are not equal, for uF signals that the *wh*-element must get out of its position, which renders Merge-over-Move inapplicable.

(16) N = {**João**$_1$, …}
K = [**quem**$_{\mathbf{uF}}$ entrar na sala]
who enter in-the room
L= cumprimentou
greeted

(17) N = {**João**$_1$, …}
K = [**quem**$_{\mathbf{uF}}$ entrar na sala]
M = [cumprimentou **quem**$_{\mathbf{uF}}$]

(18) N' = {**João**$_0$, …}
K = [quem$_{uF}$ entrar na sala]
M = [**o João** cumprimentou quem$_{uF}$]

Possible continuations of (18) may then yield (19a) or (19b). (19a) crashes because *uF* has not been checked, as opposed to (19b); hence the contrast between (11a) and (11b) under the object control reading.

(19) a. * [o João [[cumprimentou **quem**$_{\mathbf{uF}}$ [~~quem~~$_{\mathbf{uF}}$ depois de entrar na sala]]]]
the João greeted who after of enter in-the room
b. [**quem**$_{\sqrt{\mathbf{uF}}}$ o João [[cumprimentou ~~quem~~$_{\mathbf{uF}}$ [~~quem~~$_{\mathbf{uF}}$ depois de entrar na sala]]]]
'Who did João greet after entering the room?'

To put in general terms, Nunes (2014) subsumes the complex pattern of adjunct control in Brazilian Portuguese to the familiar contrast between full and partial *wh*-movement in English, illustrated in (20), which Bošković (2007) analyzes in terms of whether or not uF has been checked:

(20) a. * [Who thinks [**what**$_{\mathbf{uF}}$ Mary bought *t*]]
b. [**what**$_{\sqrt{\mathbf{uF}}}$ did John [t say [*t* that Mary [*t* bought *t*]]]]

Although Nunes's (2014) hybrid approach enlarged the empirical domain under discussion and provided a unification between two different phenomena (successive cyclicity and adjunct control), his analysis inherits the problems detected in the analyses by Chomsky (2001) and Bošković (2007): it tacitly assumes some parametrization of the computational system (cf. (9b)), violates Inclusiveness, and does not have means to capture ECP effects such as the *that*-trace effect in English.

In the next section, I explore an alternative hybrid approach that is able to account for all the data discussed so far without incurring in the aforementioned problems.

3. An Alternative Hybrid Approach to the Locus of Edge Features

Let us call the feature that triggers successively cyclic movement an *edge feature* (henceforth, *EF*). Assuming with Bošković (2007) that edge features must function as probes in order to be licensed,[1] I would like to propose that the description of the parametric variation in (9) should be reinterpreted along the lines of (21) and (22).

(21) Parametric variation concerning the locus of edge features:
An edge feature EF may be lexically encoded on:
(a) *wh*-elements or
(b) (strong) phase heads.
If (b) obtains, the phase head may assign EF to an element in its probe domain.

(22) a. Brazilian Portuguese: EF is lexically optional on *wh*-elements
b. English: EF is lexically optional on phase heads

The crucial difference between (9) and (22) is that edge features in (22) are taken to be lexically specified. Although small, this difference has both conceptual and empirical consequences. On the conceptual side, it complies with Inclusiveness and does not need to assume parametrization of the computational system. The difference between, say, English and Chinese, is not in the availability of the rule that assigns EF in the course of the computation (available in English but not in Chinese), as in Chomsky's (2001) and Nunes's (2014) proposals. Rather, the computational system is always specified to react to the presence of EFs; what happens is that some languages may simply not have the relevant features (EFs) that activate the computational system. Internally to a single language, the computational system is activated by the features of the lexical items that feed the derivations in consonance with Inclusiveness. The obligatory presence, absence, or optionality of EF is just a matter of lexical encoding and the computational system responds accordingly in a uniform way.

On the empirical side, the reformulation in (22) is able to incorporate the adjunct control cases discussed in Nunes (2014) and also provides an account of the fact that successively cyclic A'-movement is to some extent dependent on the properties of local phase heads. Let us then examine some of the empirical consequences of (21) and (22).

4. Analysis

4.1. Upward movement of objects

As shown in (23), *wh*-movement in Brazilian Portuguese is optional, but once a *wh*-element undergoes A'-movement, it cannot stop before reaching the Spec of an interrogative C:

[1] In fact, Bošković (2007) proposes that every uninterpretable feature must function as a probe in order to be licensed. For purposes of presentation, I will restrict the discussion below to edge features.

(23) *Brazilian Portuguese:*

a. O João acha que a Maria viu **quem**?
the João thinks that the Maria saw who

b. **Quem** o João acha que a Maria viu?
who the João thinks that the Maria saw

c. * O João acha **quem** que a Maria viu?
the João thinks who that the Maria saw
'Who does João think that Maria saw?'

From the perspective of (21) and (22), there are two scenarios to consider. If *quem* is not associated with EF as it enters the numeration, there will be no *wh*-movement (cf. (23a)). By contrast, if it is, full *wh*-movement will be required and partial *wh*-movement will be blocked, as illustrated in (24):

(24) a. [**Quem**$_{\sqrt{\textbf{EF}}}$ Q [o João [***t*** acha [***t*** que a Maria [***t*** viu ***t***]]]]]
b. * [Q [o João acha [**quem**$_{\textbf{EF}}$ que a Maria [***t*** viu ***t***]]]]

Let us now consider the English paradigm in (25).

(25) a. * John thinks (that) Mary saw who?
b. Who does John think (that) Mary saw?
c. * John thinks who (that) Mary saw?
d. * John who thinks (that) Mary saw?

According to (21) and (22), EF in English is lexically optional on phase heads. Thus, if the lower *v* does not have EF, there is no *wh*-movement and Q cannot have its *wh*-feature checked due to the PIC, as sketched in (26):

(26) * [**Q**$_{\textbf{u}\textit{wh}}$ [John thinks [(that) Mary [saw who]]]]

By contrast, if the lower *v* has EF, it assigns this feature to the *wh*-element in its domain. The *wh*-element must then move to a position where EF can be checked. Again, full *wh*-movement is enforced and partial *wh*-movement is ruled out:

(27) a. [**Who**$_{\sqrt{\textbf{EF}}}$ does+Q$_{\sqrt{\text{wh}}}$ [John [***t*** think [***t*** that [Mary [***t*** saw ***t***]]]]]]
b. * [Q$_{\text{u}wh}$ [John [$_{\text{vP}}$ thinks [**who**$_{\textbf{EF}}$ that [Mary [***t*** saw ***t***]]]]]]
c. * [Q$_{\sqrt{\text{wh}}}$ [John [$_{\text{vP}}$ **who**$_{\textbf{EF}}$ thinks [***t*** that [Mary [***t*** saw ***t***]]]]]]

Notice, in particular, that (27c) is excluded because EF has not been checked, for the uninterpretable *wh*-feature associated with the interrogative complementizer can be checked in consonance with the PIC.

So far, we have seen that English and Portuguese pattern alike with respect to object *wh*-movement despite their different parameter settings in (22). In fact, the predictions made here are not different from the ones made by Bošković's (2007) system. Below we will see that the situation changes when subject *wh*-movement is at stake. But before we get to that, let us first examine sideward movement of objects in English.

4.2. Sideward Movement of Objects: Parasitic Gap Constructions in English

In the *GB* model, contrasts such as the one in (28) below were taken to show that parasitic gaps must be licensed at S-Structure (see Chomsky 1982).[2] Since then, many of the *GB* assumptions have been dropped, including the postulation of S-Structure as a syntactic level of representation. The question, of course, is how the contrast in (28) is to be accounted for within a leaner system.

(28) a. [Which paper]$_i$ did you file t_i without my reading PG$_i$ first?
b. * Who filed [which paper]$_i$ without my reading PG$_i$ first?

Under the proposal entertained here, this contrast should be subject to an analysis analogous to the object control reading in adjunct control constructions in Brazilian Portuguese (cf. (11)). Schematically, both parasitic gap constructions in (28) involve the steps in (29)-(31).

(29) a. [$_{vP}$ my **v$_{EF}$** [reading [which paper] first]]
b. [$_{vP}$ my v [reading **[which paper]$_{EF}$** first]]
c. [$_{vP}$ **[which paper]$_{EF}$** [my v [reading ***t*** first]]]

(30) K = file

(31) [$_{vP}$ ***t*** [my v [reading *t* first]]]
M = [file **[which paper]$_{EF}$**]

In (29a), the light verb is lexically specified for EF and assigns this feature to the *wh*-phrase in its domain (cf. (21)). The *wh*-phrase then moves to the edge of vP. In (30), *file* is introduced into the derivation and Merge-over-Move is pre-empted due to the presence of EF. The *wh*-phrase bearing EF then undergoes sideward movement to the object position of *file* (cf. (31)). From then on, a convergent derivation will result only if EF is appropriately checked, as sketched in (32) and (33); hence the contrast in (28).

(32) [$_{CP}$ **[which paper]$_{\sqrt{EF}}$** did+Q [$_{TP}$ you [$_{vP}$ *t* [[~~you~~ v file *t*] [$_{PP}$ without [my [$_{vP}$ *t* [~~my~~ v reading *t* first]]]]]]]]

[2] The availability of null objects in Brazilian Portuguese makes it difficult to detect the so-called S-Structure condition on parasitic gap licensing. See Ferreira 2000 and Nunes and Santos 2009 for ways to tease the relevant structures apart.

(33) * [$_{CP}$ who Q [$_{TP}$ ~~who~~ [$_{vP}$ [$_{vP}$ ~~who~~ v filed **[which paper]$_{EF}$**] [$_{PP}$ without [my [$_{vP}$ *t* [~~my~~ v reading *t* first]]]]]]]

To sum up, from the present perspective the so-called S-Structure condition on parasitic gap licensing is just another case of an unlicensed instance of EF and forms a natural class with the unavailability of partial *wh*-movement in English and lack of object control into adjunct clauses by a *wh-in situ* in Brazilian Portuguese.

4.3 Upward Movement of Subjects

Let us now examine *wh*-movement of subjects, starting with Brazilian Portuguese. If EF is lexically optional on *wh*-elements in Brazilian Portuguese, we should expect subjects and objects to behave alike regarding *wh*-movement. That is, the *wh*-word *quem* in (34) below, for instance, may optionally bear EF. If it does, movement of *quem* to the Spec of the interrogative complementizer is required to license EF (cf. (35c)) and partial *wh*-movement causes the derivation to crash due to the unchecked EF in the embedded Spec,CP (cf. (35b)). On the other hand, if *quem* does not have EF, it stays put (cf. (35a)).

(34) *Brazilian Portuguese:*

a. O João acha que **quem** criticou a Maria?
the João thinks that who criticized the Maria

b. * O João acha **quem** que criticou a Maria?
the João thinks who that criticized the Maria

b. **Quem** o João acha que criticou a Maria?
who the João thinks that criticized the Maria
'Who does João think criticized Maria?'

(35) a. [Q [o João acha [que **quem** criticou a Maria]]]

b. * [Q [o João acha [**quem$_{EF}$** que ***t*** criticou a Maria]]]

c. [$_{CP}$ **quem$_{\sqrt{EF}}$** Q [o João [***t*** acha [que ***t*** criticou a Maria]]]

By contrast, in English EF is lexically optional on phase heads (cf. (22)). This means that a (non-ECM) subject in English can only receive an EF from C. In the case of external arguments, the subject is not generated in the probe domain of *v** and therefore cannot receive an EF from *v**. In turn, in the case of internal arguments, the subject is generated in the probe domain of some *v* but this *v* is not a strong phase head. The fact that English has an overt and a null version of declarative C raises the possibility that each version has a different specification regarding EF. Exploring this possibility, I would like to propose that declarative *that* in English is not specified for EF, but null declarative C may be so:

(36) a. C_{that}: is not specified for EF

b. $C_{\emptyset}$: is optionally specified for EF

Assuming this to be correct, let us consider standard *that*-trace effects such as the one illustrated in (37), which shows that only the local *that* creates problems for *wh*-movement of subjects.

(37) Who do you think (that) Peter said **(*that)** saw Mary?

If the lower vP of (37) is as represented in (38), we have a nonstarter: a phase head can only assign EF to an element in its probe domain (cf. (21)) and *who* is not in the probe domain of the light verb.

(38) [$_{vP}$ who [$_{v'}$ **v$_{EF}$** saw Mary]

Thus, a convergent derivation of (37) must start with a light verb with no EF, as sketched in (39):

(39) [$_{TP}$ who [$_{vP}$ *t* [$_{v'}$ **v** saw Mary]]]

Now comes the crucial part. Suppose that the next step following (39) involves the merger of *that*, as illustrated in (40a) below. Given the assumption in (36a), *that* does not have an EF to assign to *who* and, consequently, *who* cannot move. Once it does not move, the uninterpretable *wh*-feature of the matrix interrogative complementizer remains unchecked, as shown in (40b), and the derivation crashes. Note that even if the intermediate *v* or C$_{Ø}$ in (40b) had EF, the PIC would prevent it from being assigned to *who*.

(40) a. [$_{CP}$ **that** [who [$_{vP}$ *t* [$_{v'}$ v saw Mary]]]]
b. * [$_{CP}$ do+**Q$_{wh}$** [you [$_{vP}$ v think [$_{CP}$ (that) Peter v said [$_{CP}$ that [who [$_{vP}$ *t* [$_{v'}$ v saw Mary]]]]]]]]

The convergent continuation of (39) must therefore merge a null complementizer, which according to the assumption in (36b) can bear EF. If it does indeed, we obtain the configuration in (41a) below. C can then assign EF to *who* in its probe domain and from then on, *who* can (and must) move as far as the matrix Spec of CP to have its acquired EF checked.

(41) a. [$_{CP}$ **C$_{EF}$** [who [$_{vP}$ *t* [$_{v'}$ v saw Mary]]]]
b. [$_{CP}$ C [**who$_{EF}$** [$_{vP}$ *t* [$_{v'}$ v saw Mary]]]]
c. [$_{CP}$ **who**$_{\surd EF}$ do+Q$_{\surd wh}$ [you [$_{vP}$ ***t*** [~~you~~ v think [$_{CP}$ ***t*** (that) [Peter [$_{vP}$ ***t*** [~~Peter~~ v said [$_{CP}$ ***t*** C [*t* [$_{vP}$ *t* [$_{v'}$ v saw Mary]]]]]]]]]]]]

Notice that once *who* is endowed with EF, the type of C it crosses becomes irrelevant, for it has already acquired the relevant fuel for moving. Hence, the intermediate C may be overt or null (cf. (37)).

4.4. Relativization of Subjects in English

Assuming that (36) is correct, relative Cs in English have the opposite specifications of their declarative cousins:

(42) a. Rel_{that}: is optionally associated with EF
b. $Rel_{\emptyset}$: is not associated with EF.

This amounts to saying that only the overt version of the relative C can license relativization of a local subject. In (43a) below, for instance, the light verb assigns its EF to the object, which can then raise regardless of whether or not the relative complementizer is overt. In turn, relativization of the subject in (43b) is only licensed if the relative complementizer assigns EF to the subject; hence, the overt version of the relative complementizer must be employed. Finally, the most embedded subject in (43c) can only move if it receives EF from the local complementizer, which must then be null (cf. (36)). Once it has received EF, the subject then moves and is completely oblivious as to whether the relative complementizer is overt or null.

(43) a. the book (that) I bought
b. the person *(that) saw me
c. the man (that) Mary said (*that) saw me

4.5. EFs and Morphological Realization

The account of *that*-trace effects in English in terms of lexical encoding of EF is just the tip of the iceberg. It is not uncommon to encounter some allomorphy on complementizers and verbs when A'-movement is involved. From the perspective explored here, such allomorphy is related to the fact that in some languages edge features are lexically associated with phase heads rather than *wh*-elements. In the following sections, I will briefly discuss a sample of illustrative cases.

4.5.1. Special Comps for Local Subjects

The correlation between overt and null realization with EFs is not an idiosyncratic property of English. We may find it also in Norwegian, for example. The data in (44) below show that the embedded interrogative complementizer must be realized as *som* when a local undergoes *wh*-movement, but must be null otherwise. From the perspective of the current proposal, that indicates that *som* is lexically associated with EF, but not its null counterpart.

(44) *Norwegian (Taraldsen 1986):*

a. Vi vet hvem **(*som)** Marit snakker med
we know who that Marit talks with
'We know who Marit talks to.'

b. Vi vet hvem ***(som)** snakker med Marit
we know who that talks with Marit
'We know who talks to Marit'

And, of course, the relevant allomorphy does not have to always involve a null and an overt version. The well-known *que-to-qui* effect in French illustrated in (45) (see e.g. Kayne 1976, Rizzi 1990) can be subsumed under the present proposal if *qui* is obligatorily specified for EF, but not *que*.

(45) *French (Rizzi 1990):*

l'homme	que	je	pense	**que/*qui**	Jean	croit	**qui/*que**	viendra
the-man	that	I	think	that	John	believes	that	will-come

'the man that I think that John believes will come'

4.5.2 Specialized Cs

So far we have seen special Cs for local *wh*-moved subjects only. Let us reconsider (45), for instance. In order for the most embedded subject to undergo *wh*-movement, it must receive EF from the local C. Thus, a convergent derivation must employ *qui* in the lowest clause so that this complementizer may assign EF to the subject. Things change in the next higher clause. If *qui* is employed, it does not have an element to assign its EF to and the derivation crashes. The EF-inert *que* must be used, instead.

Although the allomorphy of C depending on a local subject is the most common case (see the Norwegian example in (44)), there are languages that are not so restricted. Irish is the canonical representative of this class of languages. According to McCloskey (2002), the three types of Comp found in Irish finite clauses have their PF output determined along the lines of (46) below. Thus, (47a) involves C_{go} for there is no A'-movement crossing it; (47b) involves two instances of C_{aL} as a relative element crosses them; and, finally, in (47c) the higher complementizer is a form of C_{aN} as it hosts a base-generated element in its Spec.

(46) McCloskey (2002:189):

a. "In absence of any A'-binding, we have (…) a form of the particle *go*";
b. "If the clause hosts A'-binding of a trace (…), it is headed by the particle *aL*";
c. "If the clause hosts A'-binding of a resumptive pronoun, it is headed by the particle conventionally represented as *aN*".

(47) *Irish (McCloskey 2002):*

a.

Creidim	**gu**-r	inis	sé	bréag
I-believe	**GO**-[PAST]	tell	he	lie

'I believe that he told a lie.'

b.

an t-ainm	**a**	hinnseadh	dúinn	**a**	bhí	ar	an áit
the name	***aL***	was-told	to-us	***aL***	was	on	the place

'the name that we were told was on the place'

c.

an t-ór	seo	**ar**	chreid	corr-dhuine	**go**	raibh	se	ann
the gold	DEMON	***aN***	thought	some-people	**GO**	was	it	there

'the gold that some people thought was there'

Under the present system, the description in (46) can be interpreted along the lines of (48):

(48) a. C_{aL}: always bears EF and may assigns it to an element in its probe domain or have it checked by another EF
b. C_{go}: does not have EF and does not license a Spec
c. C_{aN}: does not have EF and establishes a predication relationship with the element in its Spec

Bearing (48) in mind, the derivation of long distance extraction of objects should proceed along the lines sketched in (49):

(49) a. $[_{vP}$ SU $\mathbf{v_{EF}}$ V OB$]$ $\rightarrow_{\text{EF assignment}}$
b. $[_{vP}$ SU v V $\mathbf{OB_{EF}}]$
c $[_{vP}$ $\mathbf{OB_{EF}}$ [SU v V $\boldsymbol{t}]]$
d. $[_{CP}$ $\boldsymbol{aL_{EF}}$ $[\ldots[_{vP}$ OB_{EF} $[\ldots$ t $]]]]$
e. $[_{CP}$ $\boldsymbol{aL_{\surd EF}}$ $[\ldots[_{vP}$ OB_{EF} $[\ldots$ $t]]]]$
f. $[_{CP}$ $\mathbf{OB_{EF}}$ $aL_{\surd EF}$ $[\ldots[_{vP}$ $\boldsymbol{t}$ $[\ldots$ $\boldsymbol{t}]]]]$
g. $[_{CP}$ $\mathbf{OB_{\surd EF}}$ $[aL_{\surd EF}$ … $[_{vP}$ $\boldsymbol{t}$ v … $[_{CP}$ $\boldsymbol{t}$ $[aL_{\surd EF}$ … $[_{vP}$ t v …]]]]]]

In (49b), the light verb assigns EF to the object, which then moves to the edge of vP in (cf. (49c)). After C_{aL} is merged (cf. (49d)), it checks its EF against the EF of the moved object (cf. (49e)). The same process applies to any intervening *aL* complementizer and the object then keeps moving until it reaches a position where can check its own EF.

A similar situation applies to long distance extraction of subjects, as shown in (50), with the only difference being that the subject receives EF from the local *aL* complementizer:

(50) a. $[_{CP}$ $\boldsymbol{aL_{EF}}$ $[\ldots$ $[_{vP}$ SU v OB$]]$ $\rightarrow_{\text{EF assignment}}$
b. $[_{CP}$ $\boldsymbol{aL}$ $[\ldots$ $[_{vP}$ $\mathbf{SU_{EF}}$ v V OB$]]]$
c. $[_{CP}$ $\mathbf{SU_{EF}}$ aL $[\ldots$ $[_{vP}$ $\boldsymbol{t}$ v V OB$]]]$
d. $[_{CP}$ $\boldsymbol{aL_{EF}}$ $[\ldots[_{vP}$ SU_{EF} … $[_{CP}$ t aL $[\ldots$ $[_{vP}$ t v V OB$]]]]$
e. $[_{CP}$ $\boldsymbol{aL_{\surd EF}}$ $[\ldots[_{vP}$ SU_{EF} … $[_{CP}$ t aL $[\ldots$ $[_{vP}$ t v V OB$]]]]$
f. $[_{CP}$ $\mathbf{SU_{\surd EF}}$ $[aL_{\surd EF}$ … $[_{vP}$ $\boldsymbol{t}$ v … $[_{CP}$ t $[aL$ … $[_{vP}$ t v …$]]]]]]$

The proposed system can also account for mixed patterns such as $[_{CP}$ *aL* …. $[_{CP}$ *aN* …]]], for example. The derivation of the sentence in (51), for instance, should proceed along the lines of (52), where the *wh*-movement is launched from the Spec of the *aN* complementizer thanks to the EF assigned by the local light verb.

(51) *Irish (McCloskey 2002):*

an galar	**a**	chuala	mé	**ar**	cailleadh	bunadh	an oileáin	leis
the disease	***aL***	heard	I	***aN***	died	people	the island[GEN]	by-it

'the disease that I heard that the people of the island died of (it)'

(52) a. [… $\mathbf{v_{EF}}$ … [$_{CP}$ XP *aN*…]]→$_{EF\ assignment}$
b. [$_{vP}$ … v … [$_{CP}$ $\mathbf{XP_{EF}}$ *aN*…]]
c. [$_{vP}$ $\mathbf{XP_{EF}}$ [… v … [$_{CP}$ ***t*** *aN*…]]]
d. [$_{CP}$ $\boldsymbol{aL_{EF}}$ … [$_{vP}$ XP_{EF} … v … [$_{CP}$ *t aN* …]]]
e. [$_{CP}$ $\boldsymbol{aL_{\sqrt{EF}}}$ … [$_{vP}$ XP_{EF} … v … [$_{CP}$ *t aN* …]]]
f. [$_{CP}$ $\mathbf{XP_{\sqrt{EF}}}$ $aL_{\sqrt{EF}}$ … [$_{vP}$ ***t*** … v … [$_{CP}$ *t aN* …]]]

In short, the interesting and complex allomorphy exhibited by complementizers in Irish can receive a uniform account in terms of edge features.

4.5.3. Specialized *v*s

Some languages may display allomorphy sensitive to A'-movement similar to what is found in Irish, but in the verbal domain instead. Take the Bahasa Indonesia data in (53), for example, which respectively illustrate *wh*-in situ and *wh*-movement constructions in this language.

(53) *Bahasa Indonesia* (Saddy 1991)

a.

Bill	**men**-gira	Tom	**men**-harap	Fred	**men**-cintai	siapa?
Bill	TR-thinks	Tom	TR-expects	Fred	TR-loves	who

b.

Siapa	yang	Bill	∅-kira	Tom	∅-harap	Fred	∅-cintai?
who	FOC	Bill	think	Tom	expect	Fred	love

'Who did Bill think (that) Tom expects (that) Fred loves?'

Men- in (53a) is a prefix used with transitive verbs. The relevant point for us here is that this prefix is deleted if *wh*-movement takes place. Details aside, the dropping of the prefix is interpreted as a morphological reflex of the movement of the *wh*-phrase to the edge of each *v*P phase. Under the present system, this verbal allomorphy may be captured along the lines of what was proposed for Irish, if *men-* and ∅ are allomorphs of a transitive *v* (a strong phase head), as sketched in (54):

(54) a. *men-*: does not license an A'-Spec and is not associated with EF
b. ∅: licenses an A'-Spec and is associated with EF, which may be assigned or checked by another EF

Let us now consider the more complex Defaka data below. (55a) is a discourse neutral sentence, (55b) involves focus on the subject, and (55c) focus on the object. Focused local sub-

jects are immediately followed by the particle *ko* (cf. (55b)), while other types of focused phrases are followed by the particle *ndo* (cf. (55c)).

(55) *Defaka (Bennett, Akinlabi, and Connell 2012):*

a. ì Bòmá ésé-kà-rè
I Boma see-FUT-NEG
'I will not see Boma.' (discourse-neutral)

b. ì **kò** Bòmá ésé-kà-rè
I F.SBJ Boma see-FUT-NEG
'I will not see Boma' (focused subject)

c. Bòmá **ndò** ì ésé-kà-rè-**kè**
Boma FOC I see-FUT-NEG-KE
'I will not see Boma.' (focused object)

If the focus-moved phrase is anything other than a local subject, a special post-verbal clitic *-kè* appears, obligatorily, as illustrated in (55c). Interestingly, this *-kè* particle must surface on any verb crossed by the focus-moved phrase, as shown in (56) and (57).

(56) *Defaka (Bennett, Akinlabi, and Connell 2012):*

a. Bòmá **ꜜkó** fàà-mà-**(*kè)** [ándù$_i$ **ndò** ìní t_i été-**kè**]
Boma F.SBJ say-NFUT-KE canoe FOC they have-KE
'Boma said it's a canoe that they have' (embedded object in embedded FocP)

b. ándù$_i$ **ndò** Bómá fàà-**kè** [ìní t_i été-kè]
canoe FOC Boma say-KE they have-KE
'It's a canoe that Boma said they have' (embedded object in matrix FocP)

(57) *Defaka (Bennett, Akinlabi, and Connell 2012):*

a. Bòmá fàà-mà [nà ìní$_i$ **ꜜkó** t_i ándù été-mà-è-**(*kè)**]
Boma say-NFUT that they F.SBJ canoe have-NFUT-E-KE
'Boma said that they have a canoe' (embedded subject in embedded FocP)

b. Bruce$_i$ **ndò/*kò** Bòmá jírí-***(kè)** [t_i á ésé-mà]
Bruce FOC/*F.SBJ Boma know-KE her see-NFUT
'Boma knows (that) Bruce saw her' (embedded subject in matrix FocP)

The data in (56) and (57) looks like Irish upside-down. In other words, the allomorphy restrictions seen on C in Irish are arguably seen in *v* in Defaka. This is a natural state of affairs if one of the parametric options for the locus of edge features is a strong phase head, as defended here (see (21)). More concretely, the Defaka data seen above can received a unified account if its light verbs display an allomorphy along the lines of (58).

(58) a. $v_{kè}$: always bears EF, which may be assigned or checked by another EF

b. $v_{\emptyset}$: does not have EF and does not license a Spec

Given the specifications in (58), the derivations involving long object movement (cf. (56b)) and long subject movement (67b)) should proceed along the general lines of (59) and (60), respectively:

(59) *Derivation of long object movement (cf. (56b)*:

a. $[_{vP} \ldots$ **v-ke$_{\mathbf{EF}}$** … OB] $\rightarrow_{\text{EF assignment}}$
b. $[_{vP} \ldots$ v-ke … **OB$_{\mathbf{EF}}$**]
c. $[_{vP}$ **OB$_{\mathbf{EF}}$** [… v-ke … ***t***]]
d. $[_{vP} \ldots$ **v-ke$_{\mathbf{EF}}$** … $[_{CP}$ OB$_{EF}$ C … $[_{vP}$ *t* … v-ke … *t*]]]]
e. $[_{vP} \ldots$ **v-ke$_{\sqrt{\mathbf{EF}}}$** … $[_{CP}$ OB$_{EF}$ C … $[_{vP}$ *t* … v-ke … *t*]]]]
f. $[_{FocP}$ **OB$_{\sqrt{\mathbf{EF}}}$** ndo … $[_{vP}$ ***t*** … v-ke$_{\sqrt{EF}}$ … $[_{CP}$ ***t*** C … $[_{vP}$ *t* … v-ke … *t*]]]]

(60) *Derivation of long subject movement (cf. (57b)*:

a. $[_{CP}$ **C$_{\mathbf{EF}}$** [SU …]] $\rightarrow_{\text{EF assignment}}$
b. $[_{CP}$ C [**SU$_{\mathbf{EF}}$** …]]
c. $[_{CP}$ **SU$_{\mathbf{EF}}$** C [***t*** …]]
d. $[_{vP} \ldots$ **v-ke$_{\mathbf{EF}}$** … $[_{CP}$ SU$_{EF}$ C [*t* …]]]
e. [$[_{vP} \ldots$ **v-ke$_{\sqrt{\mathbf{EF}}}$** … $[_{CP}$ SU$_{EF}$ C [*t* …]]]
f. $[_{FocP}$ **SU$_{\sqrt{\mathbf{EF}}}$** ndo … $[_{vP}$ ***t*** … v-ke$_{\sqrt{EF}}$ … $[_{CP}$ ***t*** C $[_{SubP}$ *t* …]]]]

5. Concluding Remarks

Modifying a proposal by Nunes (2014), in this paper I have argued in favor of a hybrid proposal to successive cyclic movement, taking the proposals by Chomsky (2001) and Bošković (2007) not to be excluding, but complementary. More specifically, I argued that whether edge features are located on phase heads or moving elements is a matter of parametric variation (or even variation within a single language). Such an approach allowed us to keep the advantageous properties of each of the proposals, circumventing their problems, and substantially enlarging the empirical coverage. It not only excluded illicit cases of partial *wh*-movement, but also accounted for the interaction between *wh*-movement and adjunct control in Brazilian Portuguese, derived the S-Structure condition on parasitic gap licensing, accounted for ECP-effects of the *that*-trace sort and more generally, the allomorphy involving C and *v* contingent of A'-movement.

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