Types of criterial freezing

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Abstract: Movement chains are delimited by criterial positions: when a moved phrase meets a criterion we observe a freezing effect, and the phrase is no longer available to further movement. In this article I will discuss and analyze several examples of freezing effects in simple and complex configurations resulting from wh-movement in an indirect question. Exploring freezing properties will also lead, among other things, to a discussion of the conditions under which a NP can be extracted from a DP, which will be addressed through the tools offered by phase theory. The final part of the paper will be devoted to the possibility of deducing the freezing effects from the labeling algorithm and a maximality principle.

1   Locality and delimitation

Locality conditions *stricto sensu* tell us how far a movement step can go. But a comprehensive theory of movement chains must also specify under what conditions movement can start, and under what conditions it must stop; such conditions are sometimes referred to as "delimitation conditions". So, a theory of locality on movement, broadly construed, must contain at least three rubrics: impenetrability (Subjacency, the Phase Impenetrability Condition, etc.), intervention (Relativized Minimality and related principles), and delimitation (dealing primarily with freezing effects). This article is devoted to the latter theme, which has attracted a significant attention in the recent literature.

A possible way to conceptualize the issue of delimitation is to inspect a simple movement chain, for instance in a wh-movement construction:

(1)   I wonder which student Bill met __ yesterday

Here the movement chain connects a thematic position, the position of the thematic object of *meet*, and the position of the wh-operator in the embedded clause. Chomsky (2000) calls the latter kind of position a "scope-discourse" position; such positions are called "criterial" in the

terminology and approach which led to the cartographic study of the periphery of the clause (Rizzi 1996; 1997, etc.).

This state of affairs appears to hold quite generally, at least for A' chains (but not only): the movement chain is a device to connect a thematic position and a criterial (or scope-discourse) position.

There is a certain division of labour here. Thematic and criterial positions express two distinct kinds of semantic properties: argumental semantics, expressing who does what to whom in the state of affairs referred to by the sentence (thematic roles), and scope-discourse semantics, the scope of operators and the discourse-related informational properties of topicality, focus, etc.

Now, empirical evidence suggests that the positions dedicated to the two types of semantic interpretation also act as delimiting positions: the chain starts at a thematic position and ends at the first criterial position that is encountered in movement. Here I will only focus on the delimiting effect of criterial positions.

Let us dwell for a moment on the notion of criterial position. The idea here is that the left periphery of the clause, the CP zone (and, to a more limited extent, also the low periphery of the vP: Belletti (2004; 2009)) is populated by functional heads expressing such properties as Q (question), Rel (Relatives), Top (responsible for topic – comment configurations), Foc (yielding Focus – Presupposition configurations), etc. Such heads act as probes, in the sense of Chomsky (2000) and search their domain to identify a position with a matching feature, the goal. Then, the goal (or a larger element containing the goal in cases of pied-piping) is internally merged with the whole structure, thus yielding a configuration in which the moved phrase and the criterial head form a Spec-head configuration, agreeing in the criterial feature. I.e., criterial configurations have the following general form:

(2) $XP_F \, Y_F \, ...$

where F is a criterial feature (Q, Rel, Foc, etc.). Under the assumption that functional heads enter syntax as simple entities, consisting in the normal case of a single characterizing feature (as is normally assumed in cartographic studies: see Cinque & Rizzi (2010), Rizzi & Cinque (2016), Rizzi (2017) for recent discussion), Y_F reduces in fact to F, i.e., in questions the relevant head is not C_Q , but directly Q. As criterial specifiers often are operators of various kinds, we may think of criterial heads as scope-markers, indicating the positions where the scope-discourse elements involved (operators like wh-elements and foci, but also non-operators like topics., etc.) are to be interpreted at LF. Such criterial positions have delimiting properties in that a specifier entering into a criterial configuration is frozen in that configuration, and not accessible to

further movement. In this article, I will illustrated various such freezing effects (sections 2-7), and then will review a possible line of explanation of the freezing effects which capitalizes on the labeling algorithm.

2   Criterial Freezing: simple cases

A simple illustration of the delimiting effect of criterial positions is provided by the fact that a wh-element satisfying the criterial requirements of an embedded question cannot continue to the main complementizer system, i.e., given (3)a, wh-movement cannot apply again to move the wh-phrase to the many clause and yield (3)b, a fact originally discussed by Lasnik & Saito (1992):

(3)   a.   Bill wonders [[which$_Q$ book] Q [John published _ this year]]
        b.   *Which$_Q$ book does Bill wonder [__ Q John published _ this year]]

One can describe this state of affairs by stipulating a principle like the following (analogously, Lasnik & Saito 1992 stipulated a system of filters yielding the result of excluding (3)b):

(4)   Criterial freezing: An element satisfying a criterion is frozen in place (Rizzi 2006; 2010)

In (3) a phrase endowed with the Q feature enters into a Spec-head configuration with criterial head Q, thus satisfying the Q criterion. According to (4), the phrase is frozen in the criterial position, and cannot move further.

   Do we actually need to stipulate a formal principle like (4) to capture the freezing effect?

   For these simple cases, a rather straightforward interpretive alternative comes to mind, which can take different forms according to the version of trace theory that is adopted.

   If one assumes a traditional, GB-style, theory of traces as radically empty categories, (3)b would be excluded as a violation of the selectional requirements of *wonder*, if such requirements are directly satisfied by the Q-marked operator, which is not in the required local configuration with *wonder* in (3)b. Alternatively, if the selectional requirements of *wonder* are satisfied by the Q head (as a restrictive theory of selection based on local head – head relations would lead us to expect), (3)b would be ruled out through an extra step: the selectional requirements of *wonder* are satisfied by the Q head, but the latter acts as a kind of scope marker for the Q-marked phrase, which is not in the right position in (3)b. In other

words, the Q-criterion (the relevant case of the criterion for Q heads) would be violated at LF in this case.

If one adopts the copy-theory of traces, things are somewhat different. The LF representation of (3)b is something like (5), with $which_Q$ book attracted by the lower Q head, and then by the higher Q head in the main clause:

(5)   *$Which_Q$ book Q does Bill wonder [< $which_Q$ book > [Q John published __ this year]]

Here there would be no obvious way to ascribe the ill-formedness to a violation of the selectional requirement and/or of the Q criterion at LF, which could be satisfied by the lower copy of *which book*.

Still, the hypothesis that this structure is interpretively deviant remains plausible, as it is far from obvious what meaningful explicit paraphrase we could offer for it. More precisely, if both copies are interpreted as wh-operators at LF, a representation like "for which x, x a book, Bill wonders for which x, x a book, John published x this year" would violate the ban against vacuous quantification, Chomsky (1986), and Koopman and Sportiche's (1982) Bijection Principle, as two operators would bind a single variable. If only the higher copy of $which_Q$ book is interpreted at LF, the structure would violate the selectional requirement of *wonder*, as before; if only the lower copy of $which_Q$ book is interpreted, the extra movement of the phrase to the main C-system would be unmotivated, in violation of economy considerations.

There is a straightforward formal counterpart to the interpretive problems just discussed, which appeals to the notion of "inactivation". Chomsky (1995) proposed that A-movement requires the presence of an unchecked uninterpretable feature on the Goal, typically a case feature, otherwise the Goal is inactive and cannot be attracted (this explains, e.g., the impossibility of raising from finite clauses *John seems __ is tired*).

There are straightforward extensions of this idea to the A' system (e.g., Pesetsky & Torrego 2001) assuming that a wh-phrase, to be attracted to the left periphery, must have an unchecked A'-feature, say uQ. This inspired Boskovic's (2008a, 2008b) inactivation approach to cases like (5): once uQ is checked in the low CP system, *which book* is inactivated, hence it cannot be moved further, and (5) cannot be derived.

3   Criterial freezing: complex cases

These approaches may adequately account for simple cases like (3)b. Nevertheless, there are more complex cases which seem to fall outside their reach. Consider for instance a case in which the same complex

phrase contains two criterial features F1 and F2, for instance the Q feature on the specifier, and the corrective focus feature on the lexical restriction (in the sense of the typology of focal features introduced in Bianchi, Bocci & Cruschina (2014)):

(6)   [quanti$_Q$ ARTICOLI$_{Foc}$]
           How many ARTICLES

In these cases, we could expect that the complex phrase moves to the closest criterial position, F1, satisfying the F1 criterion, and then moves further to the next criterial position F2, satisfying the F2 criterion, etc. But this never happens: as soon as the phrase has moved to the first criterial position, it gets stuck there, and further movement is barred. In other words, we observe freezing effects in such more complex cases, too (Rizzi 2006, 2010).

Let us consider in more detail a case involving structure (6). When a lexically restricted DP bears a corrective focus feature on the lexical restriction and is not in a criterial position, it can remain *in situ*, for instance in an object position, or can be moved to the front of the main clause, as in (7)b:

(7)   a.   Mi hanno detto che hanno pubblicato molti ARTICOLI, non
              molti libri
              'They told me that they have published many ARTICLES, not
              many books
         b.   Molti ARTICOLI mi hanno detto che hanno pubblicato _, non
              molti libri
              'Many ARTICLES they told me that they have published, non
              many books'

How focalization (apparently) *in situ* is realized remains to be determined. Just to fix ideas, I will assume that in both (7)a and b ARTICOLI enters into an agree relation with a Foc head in the main left periphery, and then it can remain *in situ*, as in (7)a, or can be internally merged in the specifier of Foc, as in (7)b. This kind of optionality may seem surprising in an economy-based system, but it should not be more surprising than the cases in which wh-movement and wh-*in situ* are both viable options, as with main questions in French. This analysis of *in situ* cases like (7)a may well be too simplistic, but let us assume it for concreteness.

The relevant point here is that once *quanti ARTICOLI* is moved to the embedded C-system, as in (8)a, it is stuck there. The phrase cannot be further attracted by a Foc head in the main clause (with *ARTICOLI* attracted by the main Foc and the whole DP pied-piped), as (8)b is ungrammatical:

(8)   a.   Non so [quanti ARTICOLI] Q abbiano pubblicato _ , non quanti libri
           'I don't know how many ARTICLES they have published, not how many books'

      b.   *[Quanti ARTICOLI] **Foc** non so _ **Q** abbiano pubblicato _ , non quanti libri
           'How many ARTICLES I don't know they have published, not how many books'

Notice that (8)b should not raise inactivation problems: if uninterpretable features are involved in these A'-constructions, once uQ is checked in the embedded complementizer system, the phrase would still contain the unchecked uFoc feature, which should permit movement of the phrase to the Spec of the Foc head, much as it does in (7)b.

Nevertheless, this can't happen, as (8)b is ungrammatical. So, freezing cannot be reduced to inactivation in these more complex cases.

Moreover, no obvious interpretive problem would arise in (8)b: under the copy theory of traces, the trace in the embedded C-system would contain an occurrence of the Q-operator *quanti*, which could be interpreted there, whereas the focalized lexical restriction could be interpreted in the main C-system (possibly, after the application of readjustment rules of the kind assumed in Fox (2000)):

(9)   Quanti ARTICOLI **Foc** non so <quanti ARTICOLI> **Q** abbiano pubblicato _, non quanti libri
      'How many ARTICLES I don't know <how many ARTICLES> Q they have published, not how many books'

One could consider stipulating that traces (lower copies) are disregarded for interpretation, but this would not be very different from stipulating criterial freezing. More importantly, it would certainly be incorrect to exclude lower copies from interpretation in general. There are well-known cases in which an intermediate trace (a copy) must be visible for interpretation, e.g., for anaphor binding, as in Barss' (1988) famous reconstruction cases:

(10) a. $John_i$ thinks that $Bill_k$ likes this picture of $himself_k$
      b.   Which picture of $himself_{i, k}$ does $John_i$ think _ that $Bill_k$ likes _
      c.   Which picture of $himself_{i, k}$ does $John_i$ think <which picture of $himself_{i, k}$> that $Bill_k$ likes <which picture of $himself_k$>

In (10)b *himself* admits *John* as an antecedent, and this is expected if the trace in the embedded C-system in representation (10)c can be visible,

as here *John* is the closest c-commanding subject for *himself*.

In conclusion, a complex phrase like (6), endowed with more than one criterial feature, cannot satisfy one criterion "in passing" and move to the next higher criterial position. Rather, it gets stuck at the first criterial position it reaches.

4   A digression: extraction of NP from DP?

At this point one may ask the question of what would happen in the complex cases just considered if the carrier of the second criterial feature, i.e., the lexical restriction in (6), was subextracted and moved to the Foc position in the main clause. In this particular case the option does not produce well-formed results because an NP normally cannot be subextracted from a DP. Eg, in an object position, a correctively focused lexical restriction can be focused *in situ*, but not extracted from the DP and moved to the left periphery:

(11)   a.   Hanno letto molti ARTICOLI, non libri
              'They have read many articles, not books'
        b.   *ARTICOLI hanno letto molti, non libri
              'ARTICLES they read many, not books'

I speculate that (11)b may be excluded because NP is not a phasal node: non-phasal nodes may apparently undergo only local movements: consider, for instance, Cinque's (2005) roll-up movements within the DP, where DP-internal NP movement is in fact the engine responsible of word order variation; or Kayne's (1994) analysys of C-final languages, in which the IP locally moves the the Spec of a C head, etc. So, local movements of elements that are not phases is possible, but typically a non-phasal node cannot be extracted from a lower phase: Cinque's NP movement (with or without pied-piping options), is DP-internal, Kayne's IP movement cannot extract the IP from the CP stranding the complementizer, etc.. Here I am adopting for simplicity Chomsky's (2001) original phase theory, with CP and vP as phases, and with the addition of DP (Krapova & Cinque 2013) and possibly of other nodes as phasal, as we will see in a moment.

Let us take a second look at (11). In Italian, direct extraction of the NP is not possible, as (11) shows, but the NP can in fact be extracted provided that it is resumed by clitic *ne* (of it/them), with preposition *di* (of) optionally introducing the nominal element in the left periphery:

(12)   (DI) ARTICOLI ne hanno letti molti, non (di) libri
        '(Of) ARTICLES of-them they-have read many, not of books'

Presumably here the NP gets genitive/partitive case, acquiring PP-like, or KP-like status, with preposition *di* optionally cropping up to introduce the extracted NP, and the partitive/genitive clitic *ne* resuming it. If PP's, or KP's, are phases, as is sometimes proposed, the extractability of the lexical restriction from the DP phase can be expected in this configuration (on extraction from nominal expressions and phase theory see also the comparative analysis in Bošković (2016)).

Many possible lines of analysis come to mind at this point. For concreteness I will assume that the NP first moves DP-internally to the Spec of D (or of some other functional head) where it receives partitive case (Belletti 1988), which turns it into a KP, which I now assume to be a phasal node. At this point, *qua* phasal node, it is extractable from the DP. I consider doubling through *ne*-cliticization to be a reflex of the assignment of partitive case (as plausibly is the optional presence of the partitive preposition *di* in the left periphery).

5 Subextraction of NP from a criterial DP.

In the equivalent of (8)a, the lexical restriction can be subextracted and moved to the Foc position of the main clause if it is clitic-resumed by *ne*, again with preposition *di* optionally appearing:

(13)   (DI) ARTICOLI Foc non so quanti_ Q ne abbiano pubblicati, non (di) libri
         '(OF) ARTICLES I don't know whow many they of-them have published, not (of) books'

With the same configuration (obligatory clitic resumption and optional appearance of *di*) the lexical restriction can also be topicalized:

(14)   (Di) articoli Top non so quanti _ Q ne abbiano pubblicati
         '(Of) articles, I don't know how many they of-them published'

That in (14) the initial element is a topic, not a focus, is shown by its interface properties: interpretation and intonation (lower prominence, and "hilly" contour of the comment, as opposed to the higher prominence of the corrective focus and the flattened contour of the presupposition in (13): see Bocci (2013), Rizzi & Bocci (2017) for discussion of these properties).

Cases like (13)-(14) differ from ordinary cases of topicalization and left peripheral focalization in that the clitic resumption by *ne* is obligatory in the focal and in the topical interpretation. On the contrary, in ordinary cases of object topicalization or focalization, we observe a

complementary pattern. Clitic resumption (by an accusative clitic) is, respectively, obligatory with topicalization and impossible with focalization:

(15)   L'ARTICOLO (*lo) ho letto, non il libro
        'THE ARTICLE I (*it) read, not the book'

(16)   L'articolo, *(lo) ho letto ieri
        'The article, I *(it) read yesterday'

Why is this clear distinctive property of topics vs foci neutralized in (13)-(14)? According to the analysis of Cinque (1990), the pattern in (15)-(16) is due to interface reasons: the clitic is required in (16) because an IP internally unbound gap would be interpreted as a variable, and the topic is not an operator, so that the mediation of the clitic is required; and, reciprocally, the focus is an operator-like element, hence it needs a gap as a bindee, a syntactic variable, not a pronominal. Along the lines of the tentative analysis proposed in section 4, these considerations suggest that the presence of the clitic in (13)-(14) is due to purely formal reasons: the nominal element moved to the left periphery and the doubling clitic *ne* are not a bare NP but a KP/PP, and the KP/PP status is required to make extraction possible, plausibly for reasons connected to the phasal status of KP/PP.

Going back to the freezing effect: if subextraction of the lexical restriction for a criterial configuration is possible in (13)-(14), then the formulation of criterial freezing in (4) must be revised: apparently, it is not the case that the whole specifier of the criterial head is frozen. The selective possibility of subextraction suggests the following approach (Rizzi 2010). Movement attracted by a criterial head is characterizable as a run-of-the-mill case of movement triggered by a pre-established probe-goal relation: the criterial head, the probe, searches the structure to identify an element carrying the criterial feature, the goal:

(17)   Q they have published [how many$_Q$ articles]
        Probe   Goal

Once this relation is established, a phrase containing the Goal (selected through the mechanism which governs pied-piping) is internally merged with the whole structure, thus creating the criterial configuration:

(18)   [how many$_Q$ articles] Q they have published $<$how many$_Q$
        Goal   Probe
        articles$>$

We can now phrase a version of criterial freezing which is selective

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enough to permit subextraction:

(19)   Criterial Freezing (revised): In a criterial configuration, the criterial probe is frozen in place.

i.e, when a criterial configuration is created, the element carrying the criterial feature in the moved phrase, the criterial goal, is not accessible to further movement. On the other hand, an element internal to the criterial specifier but distinct from the criterial goal can be subextracted, if other principles are not violated. So, if the lexical restriction is turned into a KP/PP by *ne*-cliticization (an operation presumably giving the lexical restriction phase-like properties), it can be subextracted by focalization or topicalization, as in (13) and (14). *Ne*-cliticization here is a purely formal reflex of the assignment of partitive case to the NP, so it is compatible with and required by both focalization and topicalization. This distributional property is in clear contrast with ordinary object clitics like *lo*, etc., whose occurrence in left-peripheral constructions is constrained by interface requirements, which make it selectively compatible with, and required by topicalization, but not focalization (along the lines of Cinque 1990, see also Rizzi 2013).

6   Subextraction of a wh-phrase out of a wh-phrase in criterial position

Along similar lines, Epstein, Kitahara & Seely (2015) argue that subextraction from a criterial configuration is possible. They discuss the following contrast in relative acceptability in English, which I will interpret here in terms of the criterial apparatus (whereas they opt for an interface analysis). Example (20)a is very marginal, but (20)b is detectably worse:

(20)   a. ??[Which dog] do you wonder [[which picture of _] Q John likes _] ?
         b. *[Which picture of which dog] do you wonder [_ Q John likes _] ?

Here the derivation would start from a representation like (21)a (for simplicity, here I assume a GB-style derivation, but nothing hinges on that), from which the intermediate representation (21)b would be derived

(21)   a. Q you wonder [Q John likes [which$_Q$ picture of which$_Q$ dog]]
         b. Q you wonder [[**which$_Q$** picture of which$_Q$ dog] **Q** John likes _]

In terms of principle (19), subextraction of *which dog* is permitted from (21)b, while pied-piping of the whole complex DP *which picture of which dog* is barred by freezing because also the criterial goal (in bold in (21)b) would be moved. (20)a is marginal because some other violations are incurred (for instance, extraction takes place from a wh-island, in violation of intervention locality), but criterial freezing (as formulated in (19)) is not violated. Hence the contrast (20)a-b is captured.

7   Subextraction of a relative pronoun from a wh-phrase in a criterial configuration.

Cases of subextraction like (20)a are marginal, but there are structurally similar cases that sound fully acceptable. Consider for instance a complex phrase introduced by a wh-specifier and containing a relative pronoun in Italian:

(22)   [quanti$_Q$ libri   del quale$_{Rel}$]
          How many books by whom

Let us take as a baseline the following sentence, containing an indirect question with a complex wh-phrase:

(23)   Piero non è riuscito a capire [[**quanti libri di questo autore**] Q [siano stati pubblicati nel 1967]
          'Piero didn't manage to understand how many books by this author have been published in 1967'

If **questo autore** (this author) is relativized, the relative PP **del quale** (of/by whom) can be subextracted from a complex wh-phrase corresponding to structure (22), as in (24)a, but the whole phrase (22) cannot be pied-piped to the relative C, as in (24)b:

(24)   a.   Parlami di questo autore, **del quale** Rel Piero non è riuscito a capire [[**quanti libri __**] Q [siano stati pubblicati nel 1967]…
               'Tell me about this author, by whom Piero didn't manage to understand how many books __ Q have been published in 1967,…'
         b.   *Parlami di questo autore [**quanti libri del quale**] Rel Piero non è riuscito a capire [__ Q [siano stati pubblicati nel 1967]…
               'This author, how many books by whom Piero didn't manage to understand [__ Q have been published in 1967'

Example (24)a sounds fully acceptable, which is probably related to the high acceptability in Italian of extraction of a relative pronoun from a wh-island (Rizzi 1982: ch. 2). Analogously, examples corresponding to the structure of (20)a, *mutatis mutandis* sound almost fully acceptable in Italian, which is possibly related to the fact that extractions from a wh-island appear to be globally more acceptable in Italian than in English (Rizzi 1982, op. cit.). Notice also that pied piping of the whole complex wh-phrase *quale capitolo di che libro* remains fully excluded, much as the equivalent English configuration (20)b, as is expected under freezing:

(25) a. (?) Di che libro Q non sai [[quale capitolo _] Q Gianni abbia scritto _]?
          'Of which book don't you know which chapter Gianni wrote?'
      b. *Quale capitolo di che libro Q non sai [_ Q Gianni abbia scritto _]?
          'Which chapter of which book don't you know Gianni wrote?'

As for the milder deviance of (25)a, it should also be noticed that example (25)a differs from the more marginal (20)a in English (apart from lexical choices) in that the preposition *di* is pied-piped by the extractee in (25)a, preposition stranding being excluded in Italian. So, this raises another possible interpretation for the accrued deviance of the English example. It is sometimes said that in (24)a, (25)a perhaps there is no genuine extraction, but some looser construal between the PP and the complex wh-phrase. In fact in some clear cases, this kind of non-movement construal between a clause-initial PP and a clause-internal argument seems to be required:

(26)   Dei tuoi amici, apprezzo soprattutto Gianni
          'Of your friends, I specially like Gianni'

In which the initial PP is clearly not extracted from the direct object, realized as a proper name.

But are (24)a, (25)a akin to (26)? I think there is some evidence that we have genuine extraction in (24)-(25). Kayne (1975) observed that a PP can be extracted from a DP, whereas extraction of a PP out of another PP is barred, a fact that he analyzed as an A-over-A effect:

(27) a. Un autore del quale ho acquistato [molti libri _]
          'An author by whom I bought many books'
      b. *Un autore del quale ho discusso [su [molti libri _]]
          'An author by whom I discussed on many books'

If PP defines a phase, the impossibility of (27)b could now be traced back to phase impenetrability, if PP's have no "escape hatch", or at least no escape hatch available to another PP. In any event the contrast in (27) is very clear, and it seems to be reasonably utilizable as a diagnostic for movement. Consider now (28)

(28)   Non so [[su quanti libri di Gianni] Q abbiano voluto discutere _]
         'I don't know on how many books by Gianni they wanted to discuss'

Here the possible extraction site for the relative (or interrogative) pronoun is a complex PP, from which genuine extraction should not be possible. In fact, extraction is barred:

(29)   *Un autore del quale non so [su [quanti libri _]] [abbiano voluto discutere _]
         'An author by whom I don't know on how many books they wanted to discuss'

On the contrary, the looser construal involved in cases like (26) does not seem to be sensitive to the DP/PP distinction, as the following is fully acceptable:

(30)   Dei tuoi amici, parlo soprattutto con Gianni
         'Of your friends, I speak mostly with Gianni'

So, there seems to be genuine extraction involved in such cases as (24)a, (25)a. In conclusion, subextraction from a criterial phrase seems to be possible, as in (24)a, (25)a, whereas movement of the whole complex criterial phrase is barred, as in (24)b, (25)b. This is expected under the revised version of criterial freezing in (19).

The principle also predicts that, if other requirements are not violated, an entire criterial configuration can be moved as a whole, for instance, an indirect question can be clefted or topicalized:

(31)   a.   E' [[**quanti$_Q$ libri di questo autore**] **Q** [siano stati pubblicati nel 1967]] che non è chiaro _
              'It is how many books by this author have been published in 1967 that it isn't clear'
         b.   [[**Quanti libri di questo autore**] **Q** [siano stati pubblicati nel 1967]] non lo so davvero _
              'How many books by this author have been published in 1967, I really don't know

The point is that a criterial configuration cannot be "undone" by further

movement of the specifier. When this happens, as in (8)b, (20)b, (24)b, (25)b, severe ill-formedness results.

8 Deriving freezing effects from labeling and maximality: Simple cases.

In (Rizzi 2015a;b, Rizzi 2016) I have proposed to derive the observed freezing effects from the labeling algorithm and a principle of maximality. According to Chomsky's (2013, 2015) approach to labeling, a phrase created by merge receives the label of the closest head; moreover, labeling must be complete when the structure reaches the interfaces, i.e., at the end of each phase. Building on that idea, I have formalized the labeling algorithm as follows:

(32)   A node α created by merge receives its label from head H1, internal to α, when there is no other head H2, internal to α, which c-commands H1.

In (32), "closest" is defined, essentially, in terms of intervention locality, or Relativized Minimality (Rizzi 1990, 2004, Starke 2001 and much subsequent work): a head is the closest head to a node when there is no other head, within the same node, which c-commands it.

The algorithm interacts with the different kinds of merge: head – head, head – phrase, phrase - phrase. The problematic case which is relevant for us now is the case of phrase-phrase merge, where the heads of the two phrases would qualify for labeling the newly created node α, an ambiguity that the system does not tolerate:

(33)

$$\alpha$$

Phrase$_1$ Phrase$_2$

H$_1$ ...   H$_2$ ...
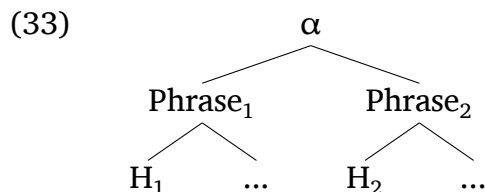
Here, Chomsky's approach foresees two options for solving the labeling problem. The first option is that one of the two phrases, for instance Phrase 1, moves further, thus leaving the head of the other phrase (here H2) without competitor for the labeling of α (the idea is adapted from Moro 2000).

The second option is that (33) is a criterial configuration. In that case, Phrase1 and Phrase2 will share the criterial feature, which by assumption in the criterial approach is a categorial feature, a possible syntactic label. Then, it is this feature that H1 and H2 have in common which

labels the structure.

Then, back to the cases of freezing. From an underlying structure like (34) (again, in a GB-style derivation), (35) is derived via wh-movement:

(34)   John wonders [Q [Bill read [which$_Q$ book]]]

(35)   John wonders [$_\alpha$ [which$_Q$ book] [Q [Bill read __]]]

In (35), a criterial Phrase – Phrase configuration is created, with both phrases headed by a Q element. Then, node α can be labeled as Q, a question (the whole cartographic representation will be more complex here, along the lines of Rizzi & Bocci 2017, but we can omit these details). Then (35) can surface as such, with all nodes properly labeled. Here the issue of freezing arises: why is it that (37) cannot be derived from (36), equivalent to (35) after labeling of the embedded clause? I.e., why is the criterial position the final halting point for the wh-phrase?

(36)   John wonders [$_Q$ [which$_Q$ book] [Q [Bill read __]]]

(37)   *[which$_Q$ book] [Q [John wonders [$_Q$ __ Q [Bill read]]]

The proposal developed in (Rizzi 2015a-b, Rizzi 2016) appeals to a maximality principle.

It is a rather uncontroversial fact that phrasal movement can only involve maximal projections. I.e. given the traditional X-bar notation, XP can be moved, but the non-maximal projection X' is inert for movement: there is DP movement, AP movement, VP movement, CP movement, but no D', A', V', C' movement. For instance an A' constituent cannot be moved alone, stranding the specifier:

(38)   a.   He certainly is [very [proud of this result]]
         b.   [Very [proud of this result]], he certainly is _
         c.   *[Proud of this result] he certainly is [very __]

The impossibility of moving non-maximal projections is often tacitly assumed and left in the background, but it may be worthwhile to focus on it and explicitly express it in the form of a principle:

(39)   Maximality: only maximal objects with a given label can be moved.

We may think of this principle as constraining phrasal movement, or perhaps movement *tout court,* if head movement is made consistent with it (e.g., along the lines of Rizzi 2016). In any event, movement of intermediate projections is systematically banned under Maximality.

Under a bare phrase structure approach (Chomsky 1995), being a **"maximal projection"** is not a rigid inherent property of a node, as ex-

pressed by the XP label in standard X-bar notation. In bare phrase structure, maximality can be thought of as a **dynamic** notion in the obvious sense that α is a maximal node if the node immediately dominating it does not have the same label.

Then in the criterial configuration [XP YP], if the label is inherited from both XP and YP, neither is maximal, in the sense just defined: only the whole category [XP YP] is maximal; so, further movement of either XP or YP alone is excluded by the ban on movement of a non-maximal projection (39). This captures the freezing effect: in (36), after the embedded clause has been labeled as Q, *which$_Q$ book* ceases to be maximal with respect to this categorial label, hence it is unmovable under (39).
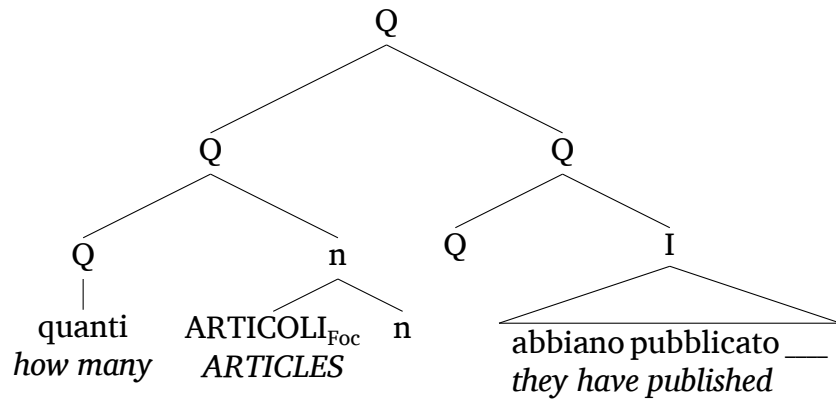
Of course, *which$_Q$ book* will have other categorial features not in common with its sister XP *[Q [Bill read __]]*, e.g. the D feature; these features will not be transmitted to the mother node, hence *which$_Q$ book* will continue to be maximal w.r.t. D, etc. So, for the system to work, I must assume a strict interpretation of maximality: a phrase is accessible to movement under (39) when it is maximal w.r.t. all its categorial features. In (36) *which$_Q$ book* is non-maximal w.r.t. the Q feature, hence it is not accessible to movement under this strict interpretation of (39), and (37) cannot be derived.

9 Deriving freezing effects from labeling and maximality: complex cases

We now have to deal with the more complex cases of freezing discussed in this article, in which more than one criterial feature is specified in a single complex phrase. Consider, for instance the following representation, corresponding to sentence (8)a-b. Here the complex phrase *quanti ARTICOLI*, bearing features Q and Foc, is moved to the embedded complementizer system. A criterial configuration with the Q head is created, and the embedded clause is labeled with the criterial feature Q, thus yielding an indirect question. The Foc criterion here is satisfied through whatever mechanism is involved in focus *in situ*, e.g. through an agree relation with a Foc head in the main clause (or other similar mechanisms), and (8)a is successfully derived.
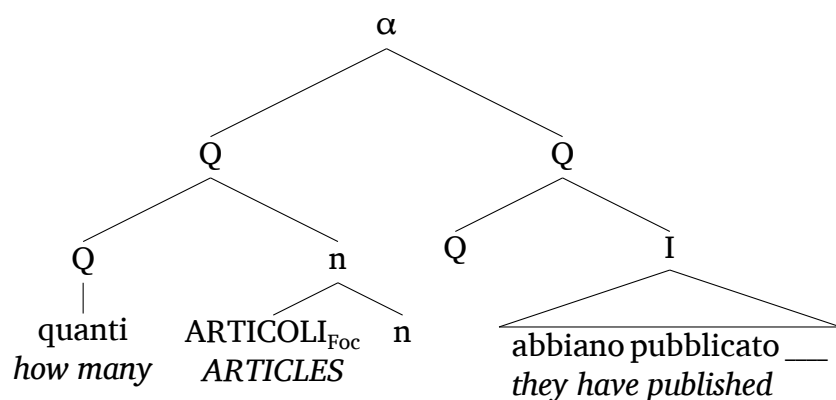
(40)   non so...   Q

                                    Q   Q

                              Q   n   Q   I

                           quanti   ARTICOLI$_{Foc}$ n   abbiano pubblicato __
                          how many   *ARTICLES*   *they have published*

Why can't *quanti ARTICOLI* be attracted to the higher CP system, which
would yields the ungrammatical (8)b? Here I will assume that, even
if the attracted feature is a distinct one (Foc in (40)), *quanti ARTICOLI*
remains non-maximal w.r.t. the Q feature, hence it remains not extract-
able under maximality: in other words, maximality looks at the absolute
categorial nature of an element, and is not relativized to the particular
feature that is attracted.

10   A timing issue

There is at least one issue that arises, though. Consider the represent-
ation of (40) immediately before the labeling of the clausal node as Q,
i.e., the following (41). What prevents the following sequence of events:
labeling of α as Q is delayed (an option that is possible in Chomsky's
2013 system till the end of the phase), so we keep the structure of (41)
with the embedded clause unlabeled:

(41)   non so...   α

                                    Q   Q

                              Q   n   Q   I

                           quanti   ARTICOLI$_{Foc}$ n   abbiano pubblicato __
                          how many   *ARTICLES*   *they have published*

Now, *quanti ARTICOLI* would still be maximal at this point, hence
it could move further, attracted by a higher Foc. As in XP – YP the XP
part has moved further, the head of the YP would project, and α would

be labeled as Q, thus meeting the selectional requirements of the main verb.

But clearly this derivational option must be barred because further extraction of *quanti ARTICOLI* leads to ungrammaticality, as we have seen (ex. (37), etc.). How is this particular timing of events excluded? One possibility is that labeling of the embedded clause cannot be delayed in (41). This would follow from Pesetsky's Earliness Principle (see the discussion in Pesetsky & Torrego 2001)

(42)   Earliness Principle: Perform operations as soon as you can.

So, as labeling is possible in (41), it must apply as soon as this configuration is reached; then movement of *quanti ARTICOLI* is barred by maximality, as desired. (On timing issues in the application of labeling see the thorough discussion in Boskovic 2016).

Conclusion

A phrase moved to the left periphery to meet a criterion is not accessible to further movement. More precisely, the freezing effect concerns the criterial goal, the carrier of the criterial feature, not the whole phrase, so that subextraction from a criterial phrase is possible if other constraints are not violated. In this article, I have reviewed several types of freezing effects, simple and complex, affecting criterial configurations. This has led, among other things, to exploring the limited possibility of subextracting the lexical restriction from a DP, which I have analyzed in terms of the constraints on movement of phasal and non-phasal material. Core cases of criterial freezing are amenable to a deeper explanation in terms of the labeling algorithm, and of a maximality principle which bans movement of non-maximal phrases.

Acknowledgment

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