On the Domain of Minimal Search for Labeling*

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Abstract

Chomsky (2013, 2015) proposes that a label of a syntactic object is provided via minimal search, but the notion of "minimal search" has not been clarified, and there remains a question of how far it locates a head that provides a label. This article addresses this issue, proposing that only the structure being of the form {XP, YP} = {{$X_{[F]}$, WP}, {$Y_{[F]}$, ZP}} provides a label via feature-sharing. The proposed condition provides a unified account of freezing effects and *wh*-islands. The condition also predicts that there are no multiple-Spec configurations created by feature sharing, and hence this article re-examines constructions that have been analyzed in terms of multiple-Specs.

***Keywords*:** labeling, minimal search, freezing effects, *wh*-islands, multiple-Specifiers

1. Introduction

Chomsky (2013, 2015) proposes labeling as a process of providing information on interpretation of a syntactic object (SO) at the interfaces. An SO is labeled by a fixed algorithm, Labeling Algorithm (LA), which "licenses SOs so that they can be interpreted at the interfaces, operating at the phase level" (Chomsky (2013: 43)). Taking labeling to be minimal search, Chomsky (2013: 43) assumes that "the relevant information about SO will be provided by a single

designated element within it: a computational atom, […] a lexical item LI, a head," and that "[t]his LI should provide the label found by LA […]." Chomsky states that LA works in the following way.

(1) "Suppose SO = {H, XP}, H a head and XP not a head. Then LA will select H as the label, […]. The interesting case is SO = {XP , YP}, neither a head […]. Here minimal search is ambiguous, locating the heads X, Y of XP, YP, respectively." (Chomsky (2013: 43))

He argues that there are two cases to provide a label to the {XP, YP} structure. One case is when SO is modified "so that there is only one visible head." To be specific, movement of XP out of {XP, YP} makes the lower copy of XP "invisible" to LA, since not every occurrence of XP is in the domain of {XP, YP}. Then, the {XP, YP} structure is labeled YP. Another case is when "X and Y are identical in a relevant respect, providing the same label." Suppose that X and Y, heads of XP and YP, involve agreement features [F]. Then, LA simultaneously finds heads X and Y, providing a label <F, F>, a pair of features shared between X and Y. Since LA "licenses SOs so that they can be interpreted at the interfaces," an SO that remains unlabeled crashes at the conceptual-intentional (CI) interface and externalization.

As noted above, LA is an instantiation of minimal search. However, the notion of "minimal search" in this sense is not formally defined in Chomsky (2013, 2015). In particular, the search domain of LA is still unclear. Consider (2).

(2) a. $\{XP, YP\} = \{\{X_{[F]}, WP\}, \{Y_{[F]}, ZP\}\}$
b. $\{XP, YP\} = \{\{UP, \{X_{[F]}, WP\}\}, \{Y_{[F]}, ZP\}\}$
c. $\{XP, YP\} = \{\{SP, \{UP, \{X_{[F]}, WP\}\}\}, \{Y_{[F]}, ZP\}\}$

In (2a), LA finds out the heads X and Y, loci of agreement features [F], providing the pair of the features <F, F> as the label of the SO. A question arises when a locus of [F] is "deeply" embedded, as in (2b, c). If LA may pick out a relevant head in any depth, it finds out $X_{[F]}$, providing a label <F, F>. On the other hand, if minimal search cannot locate a head "deeply" embedded in the structure, (2b, c) provides no label. Consideration of computational efficiency would prefer the latter scenario to the former, since the latter narrowly restrict the search domain of LA, but the question on the domain of LA has hardly ever been addressed in previous literature. Chomsky (2015: 6) postulates that "LA seeks heads H within its search domain (observing the Phase Impenetrability Condition PIC)," but this claim has not been empirically examined in previous works.

This article attempts to answer this question, arguing for the locality condition on minimal search in (3).

(3) Only the structure being of the form {XP, YP} = {{$X_{[F]}$, WP}, {$Y_{[F]}$, ZP}} provides a label via feature-sharing.

Informally speaking, (3) states that minimal search cannot detect a head "deeply" embedded in a structure. Formally speaking, (3) dictates that heads of XP and YP provide a label via feature-sharing only if X is a member of the set XP and Y is also a member of the set YP. In other words, when X is a member of the members of the set XP, a member of a member of the members of the set XP, and so on, it cannot provide a label via feature sharing. If (3) is correct, it will be suggested that the PIC is too weak to constrain minimal search for labeling, contra Chomsky (2015), and a stricter locality condition like (3), presumably a third factor constraint, renders the domain of LA minimal.[1]

This article is organized as follows. Section 2 demonstrates that (3) is empirically supported by ban on extraction out of moved elements (aka. freezing

effects). It argues that freezing configurations create structures like {XP, YP} = {{UP, {$X_{[F]}$, WP}}, {$Y_{[F]}$, ZP}}, where {$X_{[F]}$, WP} is a moved category and UP a sub-extracted category, so that they result in labeling failure owing to the condition in (3). Section 3 accounts for *wh*-islands in terms of labeling, arguing that *wh*-islands create configurations like {$Wh_{[Q]}$, {Wh, {$C_{[Q]}$, TP}}}, which cannot provide the label <Q, Q> owing to the condition in (3). Section 4 examines *prima facie* counterexamples to the condition in (3). It predicts that there are no multiple-Spec configurations created by feature-sharing (i.e., structures like {$UP_{[F]}$, {$XP_{[F]}$, {$Y_{[F]}$, ZP}}}, where UP and XP are multiple Specs-Y). Thus, section 4 examines some novel constructions that have been analyzed in terms of multiple-Specs: Multiple Nominative Constructions in Japanese, embedded Topicalizaion and Focalization in English, Transitive Expletive Constructions in Germanic languages, and Multiple *Wh*-Fronting in Slavic languages. Section 5 is a conclusion.

2. Freezing Effects

This section demonstrates that the locality condition on minimal search in (3) accounts for freezing effects like (4), where extraction out of an A- or A'-moved category leads to degradation in acceptability.[2]

(4) a.*?Who$_i$ do you think that [pictures of t_i]$_j$ t_j are on sale?
b.??Who$_i$ do you wonder [which picture of t_i]$_j$ Mary bought t_j?
(Lasnik and Saito (1993: 101-102))

Section 2.1 briefly reviews a previous label-based analysis of freezing effects by Bošković (2018), pointing out its conceptual and empirical problems. Section 2.2 proposes an alternative analysis of freezing effects on the basis of the locality condition in (3).

2.1. A Previous Analysis: Bošković (2018)

Bošković (2018) tries to deduce freezing effects within the phase theory (Chomsky (2000, 2001)) and the theory of labeling (Chomsky (2013, 2015)), postulating the condition in (5).

(5) Only phases undergo movement.

(5) states that phases are mobile, whereas non-phases are immobile. Following Bošković's (2014) contextual approach to phase-hood, he defines a phase as the highest phrase in the extended projection of a lexical category. For Bošković, crucially, the notion of phase is defined in terms of a label: if an SO is labeled *v*P, for example, it constitutes a phase since it is the highest extended projection of VP. On the other hand, an SO that has no label does not count as a phase under such label-based definition of phase. Thus, (6) follows from (5).

(6) Unlabeled SOs cannot undergo movement.

With these assumptions in place, Bošković tries to account for freezing effects like (4a). Since DP (the highest extended projection of NP) is a phase, *who* in the subject DP must be extracted to the edge of the DP before the subject is introduced to Spec-*v*; otherwise, extraction of *who* violates the Phase Impenetrability Condition (PIC), whereby movement out of the phase-head-complement (PHC) is barred after completion of a phase. Given that, the subject in (4a) must have the structure in (7a), and then it undergoes External Merge (EM) into Spec-*v* as in (7b).

(7) a. {who, {D, {pictures, {of, t_{who}}}}}

b. {{who, {D, {pictures, {of t_{who}}}}}, {*v*, …}}

Note that, crucially, the subject in Spec-*v* does not have a label since there is no feature-sharing between *who* and D; hence, it does not constitute a phase. EM of T yields {T, {{who, {D, …}}, {*v*, …}}}, but the subject cannot undergo Internal Merge (IM) to Spec-T since it is immobile owing to (6). Thus, (4a) cannot be derived.

Although Bošković's (2018) deduction is tempting, one conceptual problem arises: the condition in (5) is imposed on IM but not on EM. Chomsky (2004, 2007, 2008, 2013, 2015) argues that IM and EM are two possible instances of a single rule, Merge (α, β) = {α, β}: Merge (α, β) is called IM when α is internal to β; Merge (α, β) is called EM when α is external to β. Since IM and EM are two instances of the single rule, to bar either type requires stipulation. Notice that Bošković's (2018) analysis bars IM of a non-phasal category, though it allows EM of a non-phasal one (e.g., the derivation in (7b)). Thus, his analysis leaves it unclear why one of the two types of the single rule is constrained. Unless his analysis gives a principled explanation on prohibition of IM without stipulation, it precludes unification of EM and IM into the single rule, Merge.

An empirical problem with Bošković's (2018) analysis is that it cannot account for extraction out of focused elements. The following sentences illustrate that *wh*-phrases are successfully extracted out of focused constituents:

(8) a. Of whom$_i$ did Lee say that [only to mothers t_i]$_j$ will she talk t_j?

b. Of whom$_i$ did Robin say [only with children t_i]$_j$ can he communicate t_j? (Maeda (2010: 237))

Assuming with Bošković (2014) that a phase is the highest phrase in the extended projection of a lexical category, *only to mothers of whom* and *only with children of*

whom are phases (the highest phrases in the extended projection of PP), and hence *of whom* must be extracted to the phase-edge before they are merged with other structures owing to the PIC. Extraction of *of whom* to the edge creates structures being of the form {{of, whom}, {only, …}}, an XP-YP structure without feature-sharing. Since these structures have no labels, (6) prohibits these phrases from undergoing movement from the base positions. Thus, his analysis incorrectly predicts that the sentences in (8) are not derivable.

2.2. A Proposed Analysis

This subsection proposes an alternative analysis of freezing effects on the basis of the locality condition on minimal search in (3), without recourse to stipulation to bar IM. Let us first consider how the proposed locality condition for LA in (3) accounts for ban on extraction out of A-moved elements like (4a), repeated here as (9).

(9) ?*Who$_i$ do you think that [pictures of t_i]$_j$ t_j are on sale?

(9) is derived in the following way.

(10) a. {D, {pictures, {of, who}}}
b. {who, {D, {pictures, {of, who}}}}
c. {{who, {D, …}}, *v*P}
d. {T, {{who, {D, …}}, *v*P}}
e. {{who, {D, …}}, {T, {{who, {D, …}}, *v*P}}}
f. {C, {{who, {D, …}}, {T, …}}}
g. {who, {C, {{who, {D, …}}, {T, …}}}}

(10a) shows the stage of the derivation before the subject is introduced to Spec-*v*.

Assuming that D is a phase head, *who* must be extracted to the edge of D as in (10b); otherwise, *wh*-extraction violates the PIC. Then, the subject is externally merged into Spec-*v*, yielding (10c). After introducing T as in (10d), the subject internally merges into Spec-T, yielding (10e). The derivation reaches a phase-level when C is introduced as in (10f). In (10g), *who* undergoes IM to Spec-C, the SOs in the phase-head-complement (PHC) of C gets labeled, and the PHC gets transferred. Crucially, the masked SO in (10g), repeated here as (11), cannot be labeled owing to the locality condition of minimal search for LA in (3).

(11) {{who, {$D_{[\varphi]}$, …}}, {$T_{[\varphi]}$, …}}

To label (11), LA must find the phi-features on T and the ones on D. However, LA cannot locate the phi-features in D, since (11) is not of the form {{$X_{[F]}$, WP}, {$Y_{[F]}$, ZP}} (in other words, D is "deeply" embedded within the structure). Thus, the derivation results in labeling failure, causing crash at the interfaces. [3]

One might claim that (9) can be derived without labeling failure if it undergoes the following derivation.

(12) a. {T, {{who, {D, …}}, *v*P}}
b. {{D, …}, {T, {{who, {D, …}}, *v*P}}}
c. {C, {{D, …}, {T, {{who, {D, …}}, *v*P}}}}
d. {who, {C, {{D, …}, {T, {{who, {D, …}}, *v*P}}}}}

(12a) shows the stage of the derivation where T is introduced to the structure. A crucial difference with (10) is that in (12b), {D, …} is extracted to Spec-T, leaving *who* behind. After introduction of C as in (12c), who is extracted to Spec-C. Given this derivation, the SO generated in (12b) is labeled <φ, φ>. However, this derivation also results in crash at the interfaces, since the SO = {who, {D,

…}} cannot be labeled. Because neither *who* nor {D, …} are lower copies, the SO provides no label. In other words, the PHC of (12d) is represented as {{D, …}, {T, {{t_{who}, t_{DP}}, *v*P}}}, which involves a problematic trace-trace structure. Thus, the derivation in (12) also causes labeling failure.

One might also claim that LA can locate the D in (11), since the lower copy *who* is "invisible" to LA. To reply this, consider formal status of the SO = {t_{XP}, YP}, where t_{XP} is a lower copy of XP. Given LA, t_{XP} does not provide a label, since not every copy of XP is in the domain of the SO. However, this does not mean that t_{XP} is eliminated from the structure: since IM leaves a copy behind, {t_{XP}, YP} does not re-analyzed into a singleton set {YP}. Let us next consider whether {XP, YP} = {{t_{UP}, {$X_{[F]}$, WP}}, {$Y_{[F]}$, ZP}} can provide a label in accordance with (3). (3) states that X provides a label via feature-sharing only if X is a member of the set XP. That is, X cannot provide a label if it is a member of the members of XP. In {XP, YP} = {{t_{UP}, {$X_{[F]}$, WP}}, {$Y_{[F]}$, ZP}}, X is not a member of XP but a member of the members of XP. Thus, (3) blocks minimal search to find out X. Although a lower copy is "invisible" to LA, it behaves as a "blocker" of minimal search for labeling, since a lower copy is an element of a two-membered set, and the condition in (3) is defined in terms of set-membership.

The proposed analysis also accounts for freezing effects in A'-movement like (4b), repeated here as (13).

(13) ??Who$_i$ do you wonder [which picture of t_i]$_j$ Mary bought t_j?

Owing to the PIC, *who* must be extracted to Spec-D before the object DP is merged with the verb. Given that, *wh*-movement of the object to Spec-C yields the structure in (14).

(14) {{who, {$D_{[Q]}$, {pictures, …}}}, {$C_{[Q]}$, TP}}

Again, LA cannot find D involving [Q], since it is "deeply" embedded within {who, {$D_{[Q]}$, {pictures, …}}}. Thus, the structure cannot provide a label.[4]

Let us next consider extraction out of objects. (15) illustrates that a *wh*-phrase cannot be moved out of a shifted object, whereas it is successfully extracted out of a non-shifted one.

(15) a. *Who did Mary call [friends of *t*] up?
b. Who did Mary call up [friends of *t*]? (Lasnik (2001: 110))

Lasnik (2001) argues that shifted objects obligatorily undergo movement to Spec-AgrO, but non-shifted objects may remain in the base position. Following Chomsky (2008), where the landing site of object movement is Spec-V, let us assume that the shifted object in (15a) moves from the base position to Spec-V, whereas the non-shifted object in (15b) remains in Comp-V. Then, the sentences in (15) are structured as follows.

(16) a. {{who, {$D_{[\varphi]}$, {pictures, …}}}, {$V_{[\varphi]}$, t_{Obj}}}
b. {$V_{[\varphi]}$, {who, {$D_{[\varphi]}$, {pictures, …}}}}

(16a) is an XP-YP structure. The condition in (3) prohibits (16a) from providing a label via feature-sharing, since LA cannot locate the phi-features in D. In contrast, there arises no labeling failure in (16b), since it is of the form H-XP. Thus, the contrast between (16a) and (16b) is accounted for in terms of labeling.

The proposed analysis also explains the subextraction asymmetry between objects and ECM subjects like (17).

(17) a. Which artist do you admire [paintings by *t*]?

b.?/*Which artist do you expect [paintings by *t*] to sell the best?

(Lasnik (2001: 110))

Polinsky (2013: 580) notes that (17a) is unproblematic, whereas (17b) is "marginal at best, and many native speakers reject this extraction altogether." Suppose that the direct object in (17a) optionally moves to Spec-V, whereas the ECM subject in (17b) obligatorily moves from Spec-T to the Spec-V. Then, (17a) does not result in labeling failure, since the verb phrase is of the form V-DP. In contrast, (17b) creates a DP-VP configuration like (18).

(18) {{{which, …}, {$D_{[\varphi]}$, …}}, {$V_{[\varphi]}$, TP}}

To label this structure, LA must find out the phi-features of D, on the one hand, and the one in V, on the other. However, minimal search looking for these features violates the locality condition in (3), since D is "deeply" embedded in the structure. Thus, the derivation crashes at the interfaces.

The proposed analysis also explains the finite/non-finite asymmetry with respect to extraction out of clausal subjects like (19).

(19) a. *Who does [that she can bake ginger cookies for *t*] give her great pleasure?

b.??Who does [(for her) to be able to bake ginger cookies for *t*] give her great pleasure?

c. ?Who does [being able to bake ginger cookies for *t*] give her great pleasure? (adapted from Kluender (2004: 118-119))

Kluender (2004: 118) observes that extraction out of the non-finite subject clauses in (19b, c) is better than extraction out of the finite clause in (19a).[5] Let us first

consider (19a). (20) illustrates the stage of the derivation where the subject clause in (19a) internally merges into Spec-T (notice that *who* is extracted to Spec-C before EM of the subject into Spec-*v*, since C is a phase-head).

(20) {{who, {$C_{[\varphi]}$, {she, …}}}, {$T_{[\varphi]}$, *v*P}}

Assuming that C involves phi-features to agree with T, LA must locate C to provide a label <φ, φ>. However, LA cannot locate C owing to the condition in (3), resulting in labeling failure. Let us next consider (19b, c). Suppose that non-finite C is not a phase-head (Kanno (2008)). Then, *who* does not have to be extracted to Spec-C before the subject clause is merged with the independent SO. Given that, (19b, c) have the following structures at some point of their derivations.

(21) a. {{$C_{[\varphi]}$, {her, {to, {who, {*v*, …}}}}}, {$T_{[\varphi]}$, *v*P}}
b. {{$C_{[\varphi]}$, {PRO, {being, {who, {*v*, …}}}}}, {$T_{[\varphi]}$, *v*P}}

In (21a, b), *who* is located in Spec-*v*, the highest phase-edge of the subject clause. Since they are of the form {{$X_{[F]}$, WP}, {$Y_{[F]}$, ZP}}, LA locates C and T simultaneously, providing the label <φ, φ>. Thus, (19b, c) does not result in labeling failure.

Additional support for the proposed analysis comes from Japanese scrambling. (22) illustrates that scrambling out of a scrambled CP is possible in Japanese.

(22) Sono hon-o$_i$ John-ga [$_{CP}$ [$_{CP}$ Mary-ga t_i katta to]$_j$
that book John-Nom Mary-Nom bought Comp
[$_{TP}$ Bill-ga t_j itta] to] omotteiru.
Bill-Nom said Comp think
'That book$_i$, John thinks that [Mary bought t_i]$_j$, Bill thinks t_j'
(Bošković and Takahashi (1998: 357))

This sentence has the structure in (23) when the CP *Mary-ga sono hon-o kata to* 'that Mary bought that book' internally merges with the embedded TP (note that, again, *sono hon-o* 'that book' is extracted to the edge of C before the subject clause is introduced to the structure).

(23) {{Sono hon-o, {C, …}}$_{[\lambda]}$, {T, *v*P}}

Assuming with Saito (2016) that a scrambled category involves an anti-labeling feature [λ], which makes it "invisible" to LA.[6] Then, (23) gets labeled TP since {Sono hon-o, {C, …}} is "invisible" to LA, whereas {T, *v*P} is not. Thus, (22) does not cause labeling failure.

3. *Wh*-Island Effects

This section attempts to account for *wh*-island effects in terms of labeling. (24) illustrates that a *wh*-phrase cannot be extracted out of a finite clause when its Spec-C is occupied by another *wh*-phrase.

(24) *Which pasta$_i$ do you wonder [how$_j$ the famous Italian chef cooked t_i t_j]? (Ishii (2006: 217))

Let us consider how the sentence in (24) is derived. Owing to the PIC, *which*

pasta must undergo successive-cyclic movement to the embedded Spec-C, creating configurations like (25), where the two *wh*-phrases occupy multiple Specs-C of the embedded clause.

(25) a. {how$_{[Q]}$, {which pasta , {C$_{[Q]}$, TP}}}
b. {which pasta, {how$_{[Q]}$, {C$_{[Q]}$, TP}}}

Notice that, given free Merge, no principle of narrow syntax precludes extraction of *which pasta* toward inner Spec-C as in (25a), or outer Spec-C as in (25b). Then, in order to explain *wh*-island effects, we have to consider what excludes both of these derivations.

Let us first consider (25a). In order to label the structure in (25a), LA must locate *how* involving [Q], on the one hand, and C with [Q], on the other. However, the structure in (25a) does not satisfy the condition in (3), since it is not of the form {{X$_{[F]}$, WP}, {Y$_{[F]}$, ZP}} (i.e., C is "deeply" embedded in the structure). Thus, (25a) cannot provide a label, causing crash at the CI interface.

Let us next consider (25b). This structure does not cause labeling failure since SO$_i$ = {how$_{[Q]}$, {C$_{[Q]}$, TP}} is labeled <Q, Q>, satisfying the condition in (3). SO$_j$ = {which pasta, SO$_i$} is an XP-YP structure, but is labeled <Q, Q> since the lower copy of *which pasta* is "invisible" to LA. Thus, every term in (25b) is successfully labeled. This article, however, suggests that (25b) results in anomalous interpretation at the CI interface. Assuming with Chomsky (2013) and Epstein et al. (2015) that an SO labeled <Q, Q> is interpreted as a *wh*-question at the CI interface. Then, it seems to be natural to postulate that the SO with the label <Q, Q> is interpreted as an operator-scope configuration at CI. Suppose, for example, we have a sentence like *which pasta did you eat?*, which is of the form {which pasta$_{[Q]}$, {C$_{[Q]}$, …}}. Then, the CI interface interprets *which pasta* as a *wh*-operator, and {C$_{[Q]}$, …} as the scope of the operator. Given this much,

consider (25b) again. It is an XP-YP structure with the label <Q, Q>. Then, XP = *which pasta* must be interpreted as a *wh*-operator, and YP = {how$_{[Q]}$, {C$_{[Q]}$, TP}} as the scope of XP. However, this results in anomalous interpretation at the CI interface: since *which pasta* is an intermediate copy, it cannot behave as an operator. Although the CI interface must interpret (25b) as an operator-scope configuration in accordance with its label <Q, Q>, it contains no *wh*-element that qualifies as an interrogative operator. Thus, (25b) is also correctly ruled out at the CI interface.[7]

It is observed that *wh*-extraction out of an infinitival indirect question like (26) is relatively better than extraction out of a finite one (Ross (1968), Chomsky (1986), and Cinque (1990), among others).

(26) Which pasta$_i$ do you wonder [how$_j$ to cook t_i t_j]? (Ishii (2006: 219))

This fact is accounted for by the proposed condition in (3). Under the assumption that non-finite C is not a phase head (Kanno (2008)), *which pasta* does not have to move toward the embedded Spec-C. Then, the embedded clause has the structure in (27), where *which pasta* is located in the highest phase-edge, Spec-*v*:

(27) {how$_{[Q]}$, {C$_{[Q]}$, {PRO, {T, {which pasta, *v*P}}}}}

This structure is labeled <Q, Q>, since minimal search locates interrogative Q features in D and C simultaneously, observing the locality condition in (3). Thus, (26) is successfully interpreted at the CI interface.

4. On Multiple Speficiers

This section explores another consequence of the locality condition on

minimal search in (3): ban on building multiple-Specs via feature sharing. Under the theory of Bare Phrase Structure (BPS) by Chomsky (1995a, 1995b), presence of a multiple-Spec configuration is a null hypothesis. The BPS defines Merge as an operation to take two SOs α and β and yield SO = {γ, {α, β}}, where γ is the label of the SO. The label γ constructed from one or the other of α, β: the label of either α or β becomes the label of {γ, {α, β}}. Given this formulation of Merge, nothing precludes generation of a structure with multiple-Specs. Suppose that we have SO_i = {γ_2, {XP, {γ_1, {H, YP}}}}, where $\gamma_1 = \gamma_2$ = HP. Then, Merge (UP, SO_i) yields SO_j = {γ_3, {UP, {γ_2, {XP, {γ_1, {H, YP}}}}}}, where γ_3 is the label of SO_j. Since γ_2 (= HP) is the label of SO_i, it may serve as the label of SO_j. In this configuration, XP and UP are multiple Specs-H (Spec-H is defined in the BPS as every maximal projection within HP other than the Comp-H). Thus, multiple-Specs follow from the way of label determination under the BPS. Under the simplest Merge (Chomsky (2004, 2007, 2008, 2013, 2015)), whereby Merge is defined as an operation to take two SOs α and β and yield SO = {α, β}, and the theory of labeling by Chomsky (2013, 2015), whereby the label of an SO is determined by an independent algorithm, LA, availability of multiple-Specs is not self-evident: it crucially relies on how far minimal search will locate heads or features that provide labels. To see this, consider the structure like (28), where U and X (the heads of UP and XP) involve features to be shared with Y.

(28) $\{UP_{[F]}, \{XP_{[F]}, \{Y_{[F]}, ZP\}\}\}$

If the search domain of LA unbounded, minimal search may locate Y, providing <F, F> as the label of (28). On the other hand, if the search domain of LA is narrowly restricted so as to bar it from locating a head “deeply” embedded in the structure, a structure involving multiple-Spec is not available. The locality condition on minimal search in (3) rules out structures like (28), since it is not of

the form {{$X_{[F]}$, WP}, {$Y_{[F]}$, ZP}} (in other words, Y is "deeply" embedded in the structure).

Thus, the proposed system predicts that there are no multiple-Spec configurations created by feature sharing, thereby requiring reanalysis of construction analyzed in terms of multiple-Specs. Vermeulen (2005: 169-170) gives a list of constructions that have been analyzed in terms of multiple-Specs as follows: Multiple Nominative Constructions in Japanese (Ura (1993, 1994) and Koizumi (1995)), Transitive Expletive Constructions in Germanic languages (Chomsky (1995b)), embedded Topicalization and Focalization in English (Koizumi (1995)), and *wh*-islands (Sabel 2002).[8] This list should include Multiple *Wh*-Fronting in Slavic languages, which has been analyzed in terms of multiple Specs-C (Koizumi (1995), Pesetsky (2000), and Richards (2001), among others). Since *wh*-islands have already been examined in section 3, we must examine whether Multiple Nominative Constructions, embedded Topicalization and Focalization, multiple *wh*-fronting, and Transitive Expletive Constructions pose problems to the proposed condition in (3).

4.1. Multiple Nominative Constructions

In languages like Japanese, more than one nominative subjects may co-occur.

(29) Bunmeikoku-ga dansei-ga heikin-zyumyoo-ga mizikai
civilized countries-Nom men-Nom average life-span-Nom short
(adapted from Kuno (1973: 71))

Sentences like (29) are called Multiple Nominative Constructions (MNCs). Ura (1993, 1994)) and Koizumi (1995) analyze MNCs in terms of multiple Specs-T, arguing that an MNC has the structure like (30), where the three subjects are

substituted into multiple Specs-AgrS to be licensed by AgrS.

(30) $\{Subj_1, \{Subj_2, \{Subj_3, \{AgrS, \ldots\}\}\}\}$

If this multiple-Spec analysis is correct and (30) is derived via feature sharing among the subjects and Agr (or T), it poses a problem to the proposed condition in (3).

Saito (2016) proposes that the Case particle in Japanese involves an anti-labeling feature [λ] that makes a constituent invisible to LA.

(31) $\{Subj_1\text{-}Nom_{[\lambda]}, \{Subj_2\text{-}Nom_{[\lambda]}, \{Subj_3\text{-}Nom_{[\lambda]}, \{T, \ldots\}\}\}\}$

Given this, SO_i = $\{Subj_3\text{-}Nom_{[\lambda]}, \{T, \ldots\}\}$ in (31) is labeled TP, since $Subj_3\text{-}Nom_{[\lambda]}$ is invisible to LA. Similarly, SO_j = $\{Subj_2\text{-}Nom_{[\lambda]}, \{Subj_3\text{-}Nom_{[\lambda]}, \{T, \ldots\}\}\}$ and SO_k = $\{Subj_1\text{-}Nom_{[\lambda]}, \{Subj_2\text{-}Nom_{[\lambda]}, \{Subj_3\text{-}Nom_{[\lambda]}, \{T, \ldots\}\}\}\}$ are labeled TP owing to the anti-labeling features on the subjects. Thus, Saito's analysis makes it possible to analyze MSCs without multiple feature-sharing. If it is on the right track, MNCs do not pose a problem to the proposed condition in (3).

4.2. Embedded Topicalization and Focalizaiton

In English, a topicalized phrase and a focalized one may co-occur within an embedded clause, as shown in (32).

(32) Becky said that these books, only with great difficulty can she carry.
(Koizumi (1995: 140))

Koizumi (1995) gives (32) the structure like (33), where the topicalized phrase

these books occupies the outer-Spec of Polarity Phrase (PolP), a dedicated position for the focused phrase *only with great difficulty*.

(33) {C, {{these, …}, {{only, …}, {Pol, AgrSP}}}}

If this multiple-Spec analysis is the only way to accommodate the data like (32) (and Pol shares features with the elements in the multiple-Specs), the proposed condition in (3) is no longer tenable.

One alternative to a multiple-Spec configuration is provided by the cartographic analysis of the left periphery (Rizzi (1997, 2004), among others). According to it, a topicalized phrase and a focalized one occupy Spec-Top and Spec-Foc, respectively. Given this, (32) is structured without multiple-Specs, as shown in (34).

(34) {Force, {{these, …}, {Top, {{only, …}, {Foc, FinP}}}}}

Another possibility, the one that I explore here, is that Topicalization and Focalization form an unlabelable structure, but lack of a label does not cause crash at the CI interface thanks to their semantic-pragmatic property. Chomsky et al. (2019: 25) state that "informational notions such as "topic" or "focus" […] are properties of configurations and their syntactic/discursive context," and "they should neither be represented in the lexicon, nor in the narrow syntactic derivation." This means that the lexicon does not involve topic features or focus features, and they are not introduced to syntactic derivation. Instead, information such as topic or focus is "read off" from its configuration: a category that occupies a certain syntactic position is interpreted as a topic/comment or focus/background at the CI interface.

On the basis of this idea, this article proposes that the XP-YP configuration

created by focus movement provides no label since there is no feature-sharing between XP and YP. Consider (35a), which is structured as in (35b).

(35) a. Only with great difficulty can she carry these books.
b. {{only, …}, {C, …}}

The SO created by Focalization as in (35b) provides no label, since there is no feature to be shared between {only, …} and {C, …}. However, the CI interface interprets (35b) as a semantic unit being of the form [[$_{\text{Focus}}$ …][$_{\text{Background}}$ …]]. The phrase headed by *only* behaves as a focus operator owing to its inherent property, so it is construed as a focus at CI. {C, …} is interpreted as a background at CI, since it is the sister constituent of the focused phrase. Thus, the semantic interpretation of (35b) is uniquely determined by its syntactic configuration. Notice that, crucially, the focus-background articulation is obtained without recourse to a label, as the CI interface may give (35b) a relevant interpretation in accordance with its syntactic configuration. For this reason, I suggest that the XP-YP structure created by Focalization does not lead to crash at the CI interface, even though it provides no label.[9]

This analysis is naturally extended to Topicalizaion. Consider (36a), which is structured as in (36b).

(36) a. These books, she can carry.
b. {{these, …}, {C, …}}

The structure in (36b) has no label, since it is an XP-YP structure without feature-shading. The CI interface, however, may uniquely determine its semantic interpretation in accordance with its syntactic configuration: *these books* is discourse-given, and {C, …} is its sister constituent; then the CI interface

interprets (36b) as a semantic unit being of the form [[$_{\text{Topic}}$ …][$_{\text{Comment}}$ …]]. Thus, although (36b) lacks a label, it does not cause crash at the CI interface. Returning to co-occurrence of topic and focus like (32), the label-free analysis gives it the structure like (37).

(37) {C_1, {{these, …}, {{only, …}, {C_2, …}}}}

SO_i = {{these, …}, {{only, …}, {C_2, …}}} and SO_j = {{only, …}, {C_2, …}} cannot provide their labels owing to absence of shared features, the CI interface interprets SO_i as a [[$_{\text{Topic}}$ …][$_{\text{Comment}}$ …]] structure, and SO_j as a [[$_{\text{Focus}}$ …][$_{\text{Background}}$ …]] structure. Notice that these configurations do not pose a problem to the proposed locality condition in (3), since it does not involve feature-sharing.

The proposed label-free analysis brings about welcome consequences for insensitivity to freezing effects in Focalization. As we have seen in (8), repeated here as (38), *wh*-phrases are successfully extracted out of a focused element.

(38) a. Of whom$_i$ did Lee say that [only to mothers]$_j$ will she talk t_j?
b. Of whom$_i$ did Robin say [only with children t_i]$_j$ can he communicate t_j?

Given the contextual approach to phase-hood by Bošković (2014), *only to mothers of whom* and *only with children of whom* are phases since they are the highest phrases in the extended projection of PP. Accordingly, *of whom* must be extracted to the phase edge before introduction of *only with children to whom* to the structure. Focalization yields the structure in (39).

(39) {{{of, whom}, {only, …}}, {C, TP}}

This structure yields no label since there are no agreement features, but it is successfully interpreted at the CI interface as a unit being of the form [[$_{\text{Focus}}$ …][$_{\text{Background}}$ …]]. Thus, sentences in (38) do not lead to severe degradation in acceptability.

4.3. Multiple *Wh*-Fronting

In Slavic languages like Bulgarian, more than two *wh*-phrases obligatorily undergo fronting.

(40) Koj kogo običa? (Bulgarian)
who whom loves
'Who loves whom?' (Bošković (2002: 353-354))

Some researchers analyze Bulgarian Multiple *Wh*-Fronting (MWF) in terms of multiple Spec (Koizumi (1995), Pesetsky (2000), and Richards (2001), among others): the multiple *wh*-phrases are substituted into multiple Specs-C, forming structures like {Wh_1, {Wh_2, {C, TP}}}. If MWF in Bulgarian is derived by feature sharing among the multiple *wh*-phrases and C, it poses a problem to the proposal of this article, since minimal search cannot locate a feature on C to be shared with the outer *wh*-phrase owing to the locality condition on minimal search in (3).

However, there have been analyses where MWF in Slavic languages is driven not by the interrogative feature but by focus. For example, Stjepanović (1999) argues that *wh*-phrases in Serbo-Croatian are inherently contrastively focused, and obligatorily undergo focus movement to the initial position. This focus movement analysis is extended to Bulgarian (Bošković (1999), Lambova (2001), and Bošković (2002)). Bošković (2002) points out that *wh*-phrases in Bulgarian do not have to undergo fronting when they are D-linked.

(41) Koj e kupli koja kniga?
who is bought which book
'Who bought which book?' (Bošković (2002: 360))

Bošković (2002: 360) claims that "the range of reference of D-linked *wh*-phrases is […] discourse given," so that "such *wh*-phrases are not inherently focused, hence should not be subject to focus movement."

This focus movement analysis makes it possible to deal with MWF without feature sharing among multiple-Specs and C. As discussed in section 4.2, the SO created by focus movement does not provide a label, but is exempted from crash at the CI interface. Given this, the structure created by MWF like {Wh_1, {Wh_2, {C, TP}}} poses no problem to the proposed locality condition on minimal search in (3), since it does not involve feature sharing.

4.4. Transitive Expletive Constructions

In some Germanic languages, an expletive and an external argument (EA) of a transitive predicate may co-occur, as shown in (42).

(42) Það hafa margir jólasveinar borðað buðinginn.
there have many Christmas-trolls eaten the pudding
'Many Christmas trolls have eaten the pudding.' (Joans (1996: 168))

Sentences like this are called Transitive Expletive Constructions (TECs). Chomsky (1995b) gives TECs the structure like (43).

(43) {C, {Expl, {EA {T, {*v*, …}}}}}

In this structure, the expletive and the EA occupy the outer Spec-T, and inner Spec-T, respectively (Chomsky postulates that *hafa* 'have' subsequently undergoes PF-movement so as to yield the Expl-have-EA-*v*P order). This multiple-Spec analysis would pose a problem to the locality condition on minimal search in (3).

A problem with Chomsky's (1995b) analysis is that it sheds little light on cross-linguistic difference in availability of TECs. TECs are available in languages like Icelandic, German, Dutch, whereas it is unavailable in languages like English, Danish, Norwegian, Swedish. To account for this contrast, Chomsky (1995b: 354) simply stipulates that languages with TECs may check the EPP feature on T twice, whereas languages without a TEC cannot check it more than once.

How is the cross-linguistic difference captured without stipulating the EPP feature on T? A common view seems to be that in languages with TECs, two-layer functional projections in the IP area provide positions for an expletive and an EA, whereas in languages without TECs, the Spec position for an EA is not available (Bobaljik and Joans (1996), Bobaljik and Thráinsson (1998), Koeneman and Neelman (2001), and Koster and Zwart (2001)). For example, Bobaljik and Thráinsson (1998) claim that Icelandic, a language with TECs, has a split-TP structure like (44).

(44) {C, {Expl, {I, {EA, {F, {*v*, …}}}}}}

In this structure, the TP-domain is split into two distinct projections, and the expletive and the EA occupy Spec-I and Spec-F, respectively (F is some abstract functional head). If this split-IP analysis is preferable to the multiple-Spec analysis, TECs pose no problem to the condition in (3). Vermeulen (2005: 179) argues for single-Spec analyses of TECs and against the multiple-Spec analysis, claiming that split-TP analyses accounts for cross-linguistic correlation between

verb movement and TECs: a language with FP (Icelandic) provides the positions for raised verb (F) and an EA (Spec-F), whereas languages without FP (English, Danish, Norwegian, Swedish) do not allow V-to-F movement and merger of an EA into Spec-F (see Bobaljik and Thráinsson (1998) for discussion). In contrast, the multiple-Spec analysis by Chomsky (1995) must simply stipulate the co-relation between V-to-T movement and availability of TECs. Thus, the multiple-Spec analysis of TECs should be dispensed with.

5. Conclusion

Chomsky (2013, 2015) proposes that a label of an SO is provided via minimal search to locate relevant heads. However, the notion of "minimal search" is not clarified in Chomsky (2013, 2015), and previous researches pay little attention to the question how far minimal search locates a head that provides a label. This article has addressed this issue, proposing that only the structure being of the form {XP, YP} = {{$X_{[F]}$, WP}, {$Y_{[F]}$, ZP}} provides a label via feature-sharing. This condition provides a unified account of ban on extraction out of moved elements (freezing effects) and *wh*-islands. Since the proposed condition predicts that there are no multiple-Spec configurations created by feature sharing, this article has examined *prima facie* counterexamples, such as Multiple Nominative Constructions, embedded Topicalization and Focalization, multiple *wh*-fronting, and Transitive Expletive Constructions, demonstrating that none of these constructions poses problem to the proposed condition. If this proposal is on the right track, it is suggested that the domain of minimal search for labeling is not unbounded; it is narrowly restricted so as not to allow "deeply" embedded head to provide a label.

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Notes

1) One might claim that Agree (Chomsky (2000, 2001)) poses a problem to the proposed condition in (3): since both LA and Agree are two instantiations of minimal search to find two relevant heads, LA and Agree should be constrained by the same locality condition. If Agree is constrained by the PIC, as Chomsky (2000, 2001) proposes, it is unnatural to postulate that LA is subject to a constraint stricter than the PIC like (3).

This article assumes with Epstein et al. (2018) that Agree is eliminable from narrow-syntax. They point out that Agree is a composite operation consisting of (i) probe-goal search and (ii) feature-valuation, and propose that the former is reduced to minimal search for labeling (simultaneous search for relevant heads into an XP-YP structure), and the latter to feature-assignment at the morpho-phonological component. Suppose, for example, we have an SO created by free Internal Merge of an external argument into Spec-T, {{D, NP}, {T, *v*P}}. Then, minimal search simultaneously finds D and T involving phi-features, and feature assignment takes place between these two heads at the morpho-phonological component: unvalued phi-features on T gets valued, based on the minimal search relation between D and T. Thus, Agree is eliminated from narrow-syntax, and the problem noted above disappears.

2) Although Lasnik and Saito give the diacritic mark ?? to the sentence involving

extraction out of an A'-moved element like (4b), Corver (2017: 1739, fn. 7) notes that "other people judge these examples as completely ungrammatical (i.e., *)."

3) One may claim that the locality condition of minimal search for labeling in (3) incorrectly rules out the sentence like *John's pictures are (beautiful)* on the ground that it is of the form {{John, {$D_{[\phi]}$, pictures}, {$T_{[\phi]}$, …}}, where the genitive phrase occupies Spec-D. In this structure, LA cannot locate the phi-features on D owing to the condition (3).

This article speculates that genitive subjects are adjuncts in some relevant sense, and they are introduced to structure counter-cyclically (Lebeaux (1988)), or introduced by pair-Merge (Chomsky (2004)). Consider (i).

(i) a. *Which report [that John$_i$ was incompetent] did he$_i$ submit *t*?
b. Which report [that John$_i$ revised] did he$_i$ submit *t*? (Freidin (1986:179))

(i) shows that the *wh*-phrase involving an argument CP does not bleed Binding Condition C in the base position, whereas the one with an adjunct CP does. This contrast suggests that an adjunct, but not an argument, is counter-cyclically introduced to the structure (Lebeaux (1988)), or undergo SIMPL (Chomsky (2004)) after *wh*-movement.

With this much, consider (ii).

(ii) a. *That guy$_i$ he$_i$ says Eva loves *t*.
b. ?That guy$_i$'s mother he$_i$ really hates *t*. (Safir (1999: 598))

(ii) illustrates that Topicalization of DP does not bleed Binding Condition C in the base position, whereas it bleeds Binding Condition C if an R-expression is a genitive subject of the DP. This contrast suggests that a genitive subject is an adjunct, and it

is introduced counter-cyclically, or undergo SIMPL after Topicalization. On the basis of this observation, this article suggests that *John's pictures are (beautiful)* is of the form {{$D_{[\phi]}$, pictures}, {$T_{[\phi]}$, …}} when it undergoes labeling, observing the condition in (3). After that, the genitive subject *John's* is introduced to the structure counter-cyclically, or undergoes SIMPL to yield {{John, {$D_{[\phi]}$, pictures}, {$T_{[\phi]}$, …}}. If this analysis is correct, genitive subjects pose no problem to the proposed condition.

4) One might wonder how the sentences involving pied-piping like *To whom did John talk t?* are derived in accordance with the condition in (3). If this sentence is of the form {{P, {$D_{[Q]}$, …}}, {$C_{[Q]}$, …}}, the proposed condition incorrectly rule out it, since minimal search cannot locate D involving Q.

This problem is solved if we adopt Cable's (2010) Q-system, according to which a pied-piped phrase is headed by a question particle Q, which is the locus of the interrogative Q feature (Chomsky (2013)). Given this, *To whom did John talk t?* is structured as {{$Q_{[Q]}$, {P, DP}}, {$C_{[Q]}$, …}}. Then, minimal search locates Q involving the interrogative feature and C simultaneously, observing the condition in (3).

5) Although Kluender (2004) notes that (19b, c) is noticeably better than (19a), and (19b) is more ferocious than (19c), he gives no diacritic marks to these sentences. I gave ? to (19b) and ?? to (19c) to show relative acceptability among (19a, c).

6) Saito (2016) claims that the locus of the anti-labeling feature is a Case particle. So, one might wonder whether it is really involved in the CP in (22). Saito argues that Case feature is diagnosed by the genitive Case within a nominal projection: PP *toshokan-kara* 'from the library,' which may undergo scrambling as in (ia), is marked as Genitive within the nominal projection as in (ib).

(i) a. Toshokan-kara Hanako-ga *t* hon-o karidashita
Library-from Hanako-Nom book-Acc checked.out
'Hanako checked out a book from the library'

b. Hanako-no toshokan-kara-no hon-no karidashi
Hanako-Gen library-from-Gen book-Gen checked.out
'Hanako's check-out of a book from the library.'

(adapted from Saito (2016: 142))

Although CP lacks overt Case-marking, a Genitive Case marker that appears in CP within a nominal category in (ii) suggests that CP also involves a Case feature.

(ii) John-no [Mary-ga hon-o katta to]-no shuchou
John-gen Mary-Nom book-Acc bought Comp-Gen claim
'John's claims that Mary bought a book'

Thus, it is reasonable to assume the anti-labeling feature within the CP in (22).

7) More precisely, to interpret a *wh*-phrase as an interrogative operator, it must enter into agreement with C to receive an interrogative feature value (see also fn. 9). Since an intermediate copy does not establish agreement relation with C, it does not qualify as an interrogative operator. However, the interpretive requirement at CI forces (25b) to be interpreted as an operator-scope configuration, owing to its label <Q, Q>. Thus, <Q, Q> labeling without agreement yields anomalous interpretation at CI.

8) Vermeulen's (2005) list includes LF Super-Raising in Japanese (Ura (1994)). This article, however, does not address the question whether LF-movement really exists, and it leaves open the question whether it is problematic to the proposed

condition.

9) One may claim that the proposed analysis incorrectly derives *wh*-questions without labeling, since the CI interface may interpret the SO = {{$D_{[Q]}$, …}, {$C_{[Q]}$, …}} created by *wh*-movement as a semantic unit [[$_{\text{operator}}$ …] [$_{\text{scope}}$ …]] in accordance with the inherent property of the *wh*-phrase and its syntactic configuration. This article, however, suggests that a *wh*-phrase cannot be interpreted at the CI interface without labeling. Suppose, following Chomsky (2015: 13, fn. 16), that feature valuation takes place between a valued Q feature and an unvalued one on D, and through this process the interpretation of a *wh*-phrase, such as interrogative, exclamative, or relative, is determined (in other words, a *wh*-phrase lacks its own interpretation, and is determined by a relevant head through feature-valuation). Assume further with Epstein et al. (2018) that minimal search for labeling is prerequisite for feature-valuation: valuation takes place between two relevant heads after minimal search simultaneously finds these two heads, the one involving a valued feature and the one involving unvalued feature (see also fn. 1). Then, interpretation of a *wh*-phrase cannot be determined without labeling: labeling must be done before determining whether a *wh*-phrase is interpreted at the CI interface as an interrogative, exclamative, or relative.

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