The Symmetry Condition on Labeling*

Takanori Nakashima†

Abstract: This article provides a unified account of freezing effects, *wh*-island effects, and Proper Binding Condition (PBC) effects in English, based on Chomsky's (2013, 2015) Labeling Algorithm, especially on the Search Algorithm formally defined by Ke (2019, to appear) and the labeling-based feature valuation mechanism proposed by Epstein, Kitahara, and Seely (2022). This article demonstrates that freezing, *wh*-island, and PBC effects are produced by extraction that breaks the symmetry between XP-YP structures, which, in effect, barres feature valuation between heads with valued and unvalued features.

Keywords: Minimal Search, Labeling, freezing effects, *wh*-island effects, Proper Biding Condition effects

1. Introduction

The goal of this article is to provide a unified account for freezing effects such as (1), *wh*-island effects such as (2), and Proper Binding Condition (PBC) effects such as (3) in English.

(1) ??Who$_i$ do you wonder [[which picture of t_i]$_j$ Mary bought t_j]?
(Lasnik and Saito 1993: 101-102)

(2) ??What$_i$ do you wonder [whether John saw t_i]? (Lasnik and Saito 1993: 11)

(3) *[Which picture of t_i]$_j$ do you wonder [who$_i$ John likes t_j]? (Saito 1989: 187)

This article will account for these in terms of a condition on syntactic symmetry between

* This is a revised and extended version of a paper presented at the 35th Conference of the English Linguistic Society of Japan held at Kansei Gakuin University, Japan, November 10, 2019. I am very grateful to Yoshiaki Kaneko and Esturo Shima for their invaluable comments and suggestions. I would also thank Nobu Goto, Takaaki Hirokawa, Satoru Kanno, Hisatsugu Kitahara, Takashi Munakata, Satoshi Oku, Jun Omune, Shogo Saito, Mizuki Sakamoto, Jun Tamura, Takashi Toyoshima, Masashi Totsuka, and Hirokazu Tsutumi for their helpful comments and discussions. All remaining errors and inadequacies are, of course, my own.

† Takanori Nakashima (Hirosaki University)
E-mail: takanori.nakashima.c7@alumni.tohoku.ac.jp

phrases: the Symmetry Condition on Labeling (SCL) in (4).

(4) *Symmetry Condition on Labeling (SCL)*

An XP-YP structure shares features F between X and Y only when the XP-YP is mirror symmetric.

The SCL dictates that an XP-YP structure involving feature sharing must be of the form $\{\{X_{[F]}, \alpha\}, \{Y_{[F]}, \beta\}\}$, where X and Y are Lexical Items (LIs) / heads with agreement features F, and α and β are phrases. This is mirror-symmetric, in that both XP and YP have an H-ZP structure. In contrast, an XP-YP structure of the form $\{\{\gamma, \{X_{[F]}, \alpha\}\}, \{Y_{[F]}, \beta\}\}$, where α, β, and γ are phrases, cannot share features between X and Y because it is not mirror-symmetric in that only YP is of the form H-ZP. This article will show that freezing, *wh*-island, and the Proper Binding Condition Effects involve extraction to break the symmetry between XP and YP in an XP-YP structure, thereby causing feature valuation failure. This article proposes the SCL as a corollary of the Labeling Algorithm (Chomsky 2013, 2015), especially the Search Algorithm formally defined by Ke (2019, to appear) and the feature valuation mechanism proposed by Epstein, Kitahara, and Seely (EKS) (2022), according to which feature valuation is contingent on MS locating the two relevant heads simultaneously. The symmetry-breaking extraction, in effect, barres simultaneous search and valuation between $X_{[F]}$ and $Y_{[F]}$, leading to degradation in acceptability.

The remainder of this paper is organized as follows. Section 2 introduces the Search Algorithm formally defined by Ke (2019, to appear) and the feature valuation mechanism proposed by Epstein, Kitahara, and Seely (EKS) (2022). The subsequent sections provide a unified account of freezing effects (Section 3), *wh*-island effects (Section 4), and PBC effects (Section 5). Finally, Section 6 concludes the study.

2 Symmetry in Labeling and Feature-Valuation

2.1 Labeling Algorithm

This section shows that the SCL follows from Chomsky's (2013, 2015) Labeling Algorithm, accompanied by Ke's (to appear) formal definition of Minimal Search (MS) and the feature

valuation mechanism proposed by EKS (2022).

Chomsky (2013, 2015) proposes Labeling as a process of providing information on the 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). LA is an instantiation of MS to detect an LI/head that provides the label of an SO, applied after a phase head is introduced to the derivation but before the phase head complement (PHC) is transferred to the interfaces. Given SO = {H, XP}, where H is the head and XP is a phrase, LA selects H as the label of the SO because H is the most prominent head. If we have SO = {XP, YP}, where both XP and YP are phrases, MS does not uniquely identify the head of the SO, locating the two heads X and Y of XP and YP, respectively. Chomsky (2013:43) argued that there are two cases in which a label is provided to the XP-YP structure. In one case, the SO is modified "so that there is only one visible head." Specifically, the movement of XP out of {XP, YP} makes the lower copy of XP "invisible" to LA because not every occurrence of XP is in the domain of {XP, YP}. The XP-YP structure is then labeled as YP. Another case is when "X and Y are identical in a relevant respect, providing the same label." Suppose that X and Y, the respective heads of XP and YP, involve agreement features F. Then, LA then simultaneously finds heads X and Y, providing the label <F, F>, the 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.

Although Chomsky does not provide a formal definition of MS and LA, Ke (2019, to appear) formalizes MS as a search algorithm to look for a search target within a search domain, as in (5).

(5) *A formal definition of Minimal Search*

MS = <SA, SD, ST>, where MS = Minimal Search, SA = search algorithm, SD = search domain (the domain that the SA operates on), ST = search target (the features that the SA looks for). *Search Algorithm*

a. Given an SD and an ST, match against every head member of the SD to find the ST.

b. If the ST is found, return the heads bearing the ST and go to Step (c); otherwise, get the set members of the SD and store them as a vector V.

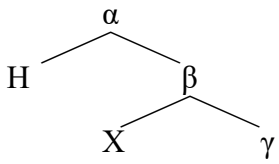
i. If V is empty, search fails and go to Step (c); otherwise,

ii. assign each of the sets in V as a new SD and go to Step (a) for all these new SDs in parallel.

c. Terminate search.

To see how this works, we consider the labeling of an H-XP structure in (6).

(6) {H, XP} =

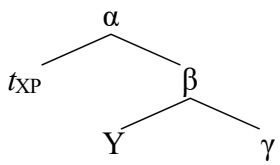


1st run, H is returned.

In the case of Labeling, ST is any head found by the search algorithm. In the first run, SA takes α as the SD and find out H, a head member of α. Subsequently, H is returned as a label of α. The search terminates at this stage, so that SA never returns any heads more deeply embedded than H, say X, as the label of α.

Although Ke does not explicitly show how LA works in an XP-YP structure with XP being a lower copy, LA correctly picks out Y as its label, as far as his algorithm "ignores" a lower copy XP in the following way. Consider (7), where t_{XP} is a lower copy of XP and Y is the head.

(7) $\{t_{XP}, YP\}$ =



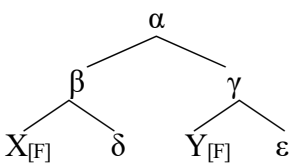
1st run, nothing is returned.

2nd run, Y is returned.

Suppose that a lower copy is "invisible" to LA, in the sense that it is not stored as vector V.[1] In the first run, nothing is matched because α has no head members. Subsequently, β is stored as V, whereas t_{XP} is not. SA then takes β as the SD, locating Y, the head member of β. The search terminates at this point and returns Y as the label of α.

Now, consider the XP-YP structure created by feature sharing such as (8), where heads X and Y share features F, and α, β, γ, δ, and ε are phrases.

(8) {XP, YP} =



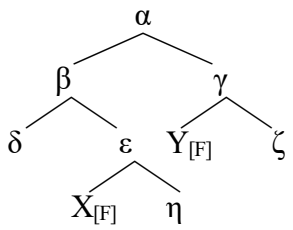
1st run, nothing is returned.

2nd run, X and Y are returned.

This structure is mirror-symmetric, in that both XP and YP are of the form H-ZP. Taking α as the SD, SA returns nothing in the first run because neither β nor γ is a head member. SA then stores *both* β and γ as V, taking them as the new SD in the second run. SA finds out *both* X and Y, returning a pair of heads <X, Y> involving shared features as the label of α.[2] Crucially, the heads X and Y are located by LA *simultaneously* in the second run. Thus, in a mirror-symmetric XP-YP structure, as in (8), heads providing the label are found in the same step of the search algorithm.

This is in sharp contrast with an asymmetric XP-YP structure such as (9), where XP = β consists of two phrases δ and ε, whereas YP = γ is composed of a head Y and a phrase ζ.

(9) {XP, YP} =



1st run, nothing is returned.

2nd run, Y is returned.

Taking α as the SD, the SA looks for the head members in the first run. Since there are no head members in α, it stores β and γ as V, taking them as the new SDs in the second run. SA simultaneously looks for head members of β and γ, returning Y as the label of α. Crucially, SA terminates at this step, so it does not traverse ε to pick out X. Thus, in contrast to a symmetric XP-YP such as (8), an asymmetric XP-YP does not provide the pair of heads <X, Y> but a single head Y as the label because one relevant head is more deeply embedded than another.[3]

2.2 Feature-Valuation

Although Ke argues that Labeling and Agree are independent operations, this article assumes with EKS (2022) 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, proposing that the former is reduced to MS for Labeling (search for relevant heads into an XP-YP structure), and the latter to feature assignment at the morpho-phonological component. Suppose, for example, that we have an SO created by subject raising, as in (10).

(10) $\{\{D_{[v\varphi][uCase]}, NP\}\ \{T_{[u\varphi]}, vP\}\}$

This structure is generated by free Internal Merge (IM) of an external argument from Spec-v

to Spec T. When the derivation reaches a phase level, MS simultaneously finds D and T involving φ-features, providing <φ, φ> as the label. Feature assignment then takes place between these two syntactically accessible heads at the interfaces: unvalued φ-features on T are valued based on the relationship between D and T established by MS. The unvalued structural case feature [uCase] on DP is valued as a reflex of φ-feature valuation.

Next, we examine the valuation of the internal argument, which undergoes IM to the specifier of verbal root R, as in (11).

(11) $\{\{D_{[v\varphi][uCase]}, NP\}\ \{R_{[u\varphi]}, t_{DP}\}\}$

Again, MS simultaneously locates D and R involving φ-features, providing the label <φ, φ>. Φ-valuation occurs between these heads, with uCase valued as a reflex of the φ-valuation.

Wh-movement is analyzed in the same manner. Suppose that (12) is created by free IM of a *wh*-phrase to Spec-C.

(12) $\{\{WH_{[uQ]}, NP\}, \{C_{[vQ]}, TP\}\}$

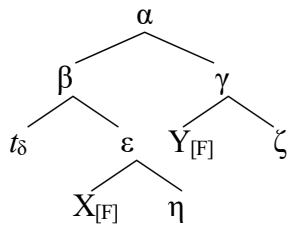
This structure undergoes labeling when it is transferred to the interface. MS simultaneously locates WH and C, which are loci of unvalued and valued interrogative features, respectively, providing <Q, Q> as the label. Then, the values of [vQ] on C are assigned to [uQ] on WH, based on the relationship between the accessible heads WH and C established by MS.

2.3 Deducing the SCL from Labeling

With these in place, I propose the SCL as a corollary of MS and feature valuation. Let us first consider the labeling of a symmetric XP-YP structure, such as (8) = $\{\{X_{[F]}, \delta\}\ \{Y_{[F]}, \varepsilon\}\}$. As discussed above, SA locates heads X and Y simultaneously and returns a pair of shared features <F, F> as the label. Feature valuation takes place between these two heads, X and Y, assigning feature values to the unvalued ones. Thus, the structure is successfully interpreted at the interface. In an asymmetric XP-YP structure such as (9) = $\{\{\delta, \{X_{[F]}, \eta\}\}, \{Y_{[F]}, \zeta\}\}$, SA finds only Y because it halts once Y is retuned in the second run. Although this structure is labeled YP, there is no feature valuation between X and Y because it only takes place between heads accessed by MS. Thus, the features left unvalued cause a crash at the interface.

Note that the SCL holds even when Spec-X is a lower copy. Consider (13), where (α, β, γ, δ, ε, ζ, and η are phrases, and t_δ is a lower copy of δ).

(13) {XP, YP} =



1st run, nothing is returned.

2nd run, Y is returned.

Taking α as the SD, SA looks for head members in the first run and stores β and γ as V. In the second run, where β and γ are the new SDs, SA simultaneously looks for a head member of β and γ, returning Y as the label of α. SA terminates in this step. Crucially, although t_δ is "invisible" to LA (i.e., it is not counted as V), SA never locates X and Y simultaneously, because SA halts in the second run. Thus, feature valuation does not occur between X and Y, and the features left unvalued causes crash at the interfaces. The following sections will demonstrate that freezing effects, *wh*-islands, and PBC effects fall under cases such as (13): They involve symmetry- breaking extraction that leaves t_δ behind.

3 Freezing Effects

3.1 Extraction out of Subjects

This section accounts for the ban on extraction out of moved elements, known as freezing effects. As illustrated in (14), movement out of the raised subject leads to a degradation in acceptability.[4]

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

(Lasnik and Saito 1993: 101-102)

(14a) is derived as follows (I assume that *who* is a phrase, but its internal structure is abstracted away for simplicity of illustration):

(15) a. {D, {pictures, {of, who}}}

b. {who, {D, {pictures, {of, t_{who}}}}}

c. {{who, {D, …}}, vP}

d. {T, {{who, {D, …}}, vP}}

e. {{who, {D, …}}, {T, {$t_{\{who, \{D, \ldots\}\}}$, vP}}}

f. {C, {{who, {D, …}}, {T, …}}}

g. {who, {C, {{t_{who}, {D, …}}, {T, …}}}}

(15a) shows the stage of derivation before the subject is introduced to Spec-v. Assuming that D as well as C and v is a phase head (as an extensive survey of phase theory, see Citko (2014), which concludes that only C, v, and D pass phasehood tests), *who* must be extracted to the edge of D as in (15b); otherwise, *wh*-extraction violates the Phase Impenetrability Condition (PIC), whereby movement out of the PHC is barred after completion of a phase (Chomsky 2000 et seq.).[5]

(16) *Phase Impenetrability Condition*

In phase α with head H, the domain of H is not accessible to operations outside α, only H and its edge are accessible to such operations. (Chomsky 2000: 108)

After completion of the DP phase and labeling of Comp-D, the subject is externally merged in Spec-v, yielding (15c). After introducing T as in (15d), the subject internally merges in Spec-T, yielding (15e). The derivation reaches a phase level when C is introduced as in (15f). In (15g), *who* moves to Spec-C, the SOs in the PHC of C are labeled, and the PHC is transferred. Crucially, the masked SO in (15g), repeated here as (17), is an asymmetric XP-YP structure, where a lower copy of *who* occupies Spec-D.

(17) {{t_{who}, {$D_{[v\varphi]}$, …}}, {$T_{[u\varphi]}$, …}}

SA applied to (17) returns T bearing unvalued φ-features rather than the pair of heads T and D involving φ-features. Since feature valuation occurs only between two heads established by MS in labeling, the φ-values on D cannot be assigned to the unvalued φ-features on T, Thus, (14a) crashes at the interface.[6]

One might claim that (14a) can be successfully derived if it undergoes the following derivation:

(18) a. {T, {{who, {D, …}}, vP}}

b. {{D, …}, {T, {{who, $t_{\{D, \ldots\}}$}, vP}}}

c. {C, {{D, …}, {T, {{who, $t_{\{D, \ldots\}}$}, vP}}}}

d. {who, {C, {{D, …}, {T, {{t_{who}, $t_{\{D, \ldots\}}$}, vP}}}}}

(18a) shows the stage of the derivation where T is introduced into the structure. A crucial difference from (15) is that in (18b), {D, …} is extracted to Spec-T, leaving *who* behind. After introducing C as in (18c), *who* is extracted to Spec-C. Given this derivation, the PHC of C is labeled <φ, φ>, observing the SCL. However, the SO = {t_{who}, $t_{\{D, \ldots\}}$} cannot have a label because both t_{who} and $t_{\{D, \ldots\}}$ are lower copies. Thus, the derivation in (18) results in labeling failure.

3.2 Extraction out of Wh-Phrases

The proposed analysis also accounts for freezing effects in *wh*-movement like (1), repeated here as (14).

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

(Lasnik and Saito 1993: 101-102)

This sentence is derived as follows (again, the internal structure of *who* is abstracted away for simplicity of illustration):

(20) a. {which, {picture, {of, who}}}

b. {who, {which, {picture, {of, t_{who}}}}}

c. {bought, {who, {which, {picture…}}}}

d. {{who, {which, {picture…}}}, {C, TP}}

e. {who, {v, {wonder, {{t_{who}, {which, {picture…}}}, {C, TP}}}}}

Assume that the syntactic category of *which* is D, a phase head, *who* must be extracted to the Spec of *which* as in (20b) before the object is merged with the verb as in (20c), owing to the PIC. (20d) shows the stage of derivation in which *which picture of who* is extracted to the embedded Spec-C. After the introduction of *wonder* and little v, *who* is moved to Spec-v as in (20e). However labeling of the embedded clause in (21) results in an SCL violation.

(21) {{t_{who}, {WH$_{[uQ]}$, {picture…}}}, {C$_{[vQ]}$, TP}}

Since (21) is an asymmetric XP-YP structure, SA does not return the pair of C and *which* but C as its label. Since feature valuation is contingent on MS in labeling, the interrogative feature values on C cannot be assigned to the unvalued features on *which*. Thus, (21) crashes at the

interface.[7]

3.3 Extraction out of Objects

Next, we consider a *prima facie* counterexample to the proposed analysis, extraction out of an object like (22a), which is contrasted with extraction out of a subject like (22b).

(22) a. Who did you select [a picture of *t*]?

b. ?*Who$_i$ was [a picture of *t*] selected? (Lasnik 2001: 109)

If the object is *obligatorily* raised to Spec-R, as assumed in Chomsky (2008, 2013, 2015) and EKS (2022), it creates an asymmetric XP-YP structure like (23), which causes the SCL violation.

(23) $\{\{t_{who}, \{D_{[v\varphi]}, \{picture \ldots\}\}\}, \{R_{[u\varphi]}, t_{Obj}\}\}$

This problem is solved if object shift is *optional* (Lasnik 2001; Bošković 2002). Lasnik (2001) argues for optionality of object shift by showing that in a verb-particle construction, it may remain in situ or be raised in front of the particle:

(24) a Mary called up [friends of John].

b. ?Mary called [friends of John] up. (Lasnik 2001: 111)

To account for this, Bošković (2002) proposes that accusative cases in English can either be structural or inherent. The structural Case requires an object to be licensed to the Case position, forcing object shift. By contrast, the inherent one is licensed in situ under the θ-role assignment from the verb.

Given this, we may derive (22b) without violating the SCL: Extraction out of an object is available only when the object has an inherent case and remains in situ as in (25).

(25) $\{R, \{t_{who}, \{D_{[v\varphi]}, \{picture \ldots\}\}\}\}$

This is an H-XP structure. Since the object has an inherent case, it does not have to enter into φ and Case agreement relation with R. Thus, (25) does not cause the SCL violation.[8]

As observed by Lasnik, extraction out of an object is illicit when raised:

(26) a. Who did Mary called up [friends of *t*]?

b. ?*Who did Mary called [friends of *t*] up? (Lasnik 2001: 111)

This contrast is also accounted for by assuming with Lasnik (2001) and Bošković (2002) that the non-shifted object in (26a) remains in the complement of a verb, whereas the shifted one in (26b) undergoes raising to the specifier of the verb. (26a) and (26b) show the structure of (27a) and (27b), respectively.

(27) a. {R, {t_{who}, {$D_{[v\varphi]}$, {friends …}}}}

b. {{t_{who}, {$D_{[v\varphi]\,[uCase]}$, {friends …}}}, {$R_{[u\varphi]}$, t_{Obj}}}

The object remaining in situ as in (27a) causes no SCL violation. In contrast, object shift in (27b) creates an asymmetric XP-YP structure, thereby resulting in the SCL violation.

The proposed analysis also explains the asymmetry between objects and Exceptional Case Marking (ECM) subjects, as in (28).

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

b.?/*Which artist do you expect [paintings by *t*] to sell the best? (Polinsky 2013: 580)

Polinsky (2013: 580) notes that (28a) is unproblematic, whereas (28b) is "marginal at best, and many native speakers reject this extraction altogether." Since an ECM subject is not θ-marked by an ECM verb, it cannot license an inherent case, thereby causing object shift to the structural Case position, as Bošković (2002) notes. Given this, the ECM subject in (28b) obligatorily undergoes raising to the matrix Spec-R to enter into the φ and Case agreement relation with R, as in (29).

(29) {{$t_{which\ artist}$, {$D_{[v\varphi][uCase]}$, {paintings …}}}, {$R_{[u\varphi]}$, TP}}

This is an asymmetric XP-YP structure. Thus, MS cannot simultaneously locate D and R, causing crash at the interface owing to valuation failure between these two heads.

3.4 Extraction out of Non-Finite Clauses

The proposed analysis also explains finite/nonfinite asymmetry with respect to extraction out of clausal subjects. Kluender (2004) observes that extraction out of the nonfinite subject clauses in (30b, c) is better than extraction out of the finite clause in (30a).[9]

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

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

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

(Kluender 2004: 118-119)

First, we consider (30a). (31) illustrates the stage of the derivation where the subject clause in (30a) internally merges in Spec-T (notice that *who* is extracted to Spec-C before the EM of the subject clause in Spec-v, owing to the PIC).

(31) $\{\{t_{who}, \{C_{[v\varphi]}, \{she, \ldots\}\}\}, \{T_{[u\varphi]}, v\text{P}\}\}$

Let us assume that C involves valued φ-features to agree with T. MS cannot simultaneously locate C and T, the loci of φ-features, because (31) is not a symmetric XP-YP structure. This causes the SCL violation. Let us next consider (30b, c). Suppose that a nonfinite C is not a phase head (Kanno 2008).[10] Then, *who* need not be extracted to Spec-C before the subject clause is externally merged with the independent SO. Given this, (30b, c) have the following structures at some point in their derivations:

(32) a. $\{\{C_{[v\varphi]}, \{PRO, \{being, \{t_{who}, \{v, \ldots\}\}\}\}\}, \{T_{[u\varphi]}, v\text{P}\}\}$

b. $\{\{C_{[v\varphi]}, \{her, \{to, \{t_{who}, \{v, \ldots\}\}\}\}\}, \{T_{[u\varphi]}, v\text{P}\}\}$

In (32a, b), *who* occupies Spec-v, the highest phase edge of the subject clause. Since they are symmetric XP-YP structures, MS successfully locate C and T simultaneously and φ-features on T gets valued by C.

4 *Wh*-Island Effects

4.1 Finite Wh-Islands

This subsection explains the *wh*-island effects in terms of the SCL. As illustrated in (2), repeated here as (33), extraction out of an indirect question leads to degradation in acceptability.

(33) ??What$_i$ do you wonder [whether John saw t_i]? (Lasnik and Saito 1993: 11)

(34) shows the stage of derivation after *what* is moved from the embedded Spec-C to the matrix clause (The assumption here is that *who* is not a head but a phrase being of the form $\{WH_{[uQ]}, \ldots\}$, perhaps $\{WH_{[uQ]}, pro\}$. See also Chomsly 2013 and Uriagereka 1988).

(34) a. $\{\{WH_{[uQ]}, \ldots\}, \{t_{what}, \{C_{[vQ]}, TP\}\}\}$

b. $\{t_{what}, \{\{WH_{[uQ]}, \ldots\}, \{C_{[vQ]}, TP\}\}\}$

Crucially, owing to the PIC, *what* leaves its copy in the embedded Spec-C, creating multiple-Spec configurations.[11] Notice that, given free Merge, no principle of narrow syntax precludes the movement of *what* toward either the inner Spec-C as in (34a) or the outer one as in (34b). Accordingly, to explain *wh*-island effects, we must consider what excludes both of these derivations.

First, we consider (34a). MS in labeling does not simultaneously locate WH involving [uQ] and C with [vQ], because {$WH_{[uQ]}$, …} is an H-ZP structure, but {t_{what}, {$C_{[vQ]}$, TP}} is not. Thus, feature valuation cannot occur between *whether* and C, leading to a crash at the interface.[12]

Now, consider (34b); this structure does not violate the SCL because SO_i = {{$WH_{[Q]}$, …}, {$C_{[Q]}$, TP}} is mirror-symmetric. SO_j = {t_{what}, SO_i} is an XP-YP structure, but the MS simultaneously locates WH and C in the third run of SA, providing the <Q, Q> label. Thus, there is no SCL violation in (34). However, this article suggests that (34b) results in an anomalous interpretation at the CI interface. Let us assume with Chomsky (2013) and EKS (2015) that an SO labeled <Q, Q> is interpreted as a *wh*-question at the CI interface. It is then natural to assume that an SO with the label <Q, Q> is interpreted as an operator-scope configuration at CI. Suppose, for example, that we have the sentence *What did you eat?* which is of the form {{$D_{[Q]}$, …}, {$C_{[Q]}$, …}}. The CI interface interprets *what* as a *wh*-operator, and {$C_{[Q]}$, …} as its scope. With this, consider (34b) again; it is an XP-YP structure with the label <Q, Q>. Then, XP = *what* must be interpreted as a *wh*-operator and YP = {{$whether_{[Q]}$, …}, {$C_{[Q]}$, TP}} as the scope of XP. However, this results in an anomalous interpretation at the interface: Since *what* is an intermediate copy, it cannot behave as an operator.[13] Although the CI interface must interpret (34b) as an operator-scope configuration according to its label <Q, Q>, it contains no *wh*-element that qualifies as an interrogative operator. Thus, (34b) is also correctly ruled out at the CI interface.

4.2 Non-Finite Wh-Islands

The proposed analysis also accounts for finite-nonfinite asymmetry in *wh*-islands (Ross 1968,

Chomsky 1986, and Cinque 1990, among others). Chomsky (1986: 37) notes that extraction out of a finite *wh*-interrogative clause in (35a) is less acceptable than extraction out of non-finite one in (35b).[14]

(35) a. To whom$_i$ did you wonder [what$_j$ John gave t_j t_i]?

b. To whom$_i$ did you wonder [what$_j$ to give t_j t_i]? (Chomsky 1986: 36)

Assuming with Kanno (2008) that nonfinite C is not a phase head, *wh*-phrases extracted to the matrix clauses in (35b) do not have to leave their copy in the embedded Spec-C. The embedded clause is structured as in (36), where the copy of *to whom* does not occupy Spec-C but Spec-v.

(36) {{WH$_{[Q]}$, …}, {C$_{[Q]}$, {PRO, {T, {$t_{to\ whom}$, *v*P}}}}}

This structure observes the SCL because both {whether$_{[Q]}$, …} and {C$_{[Q]}$, …} are H-ZP structures. Thus, (36) causes no feature valuation failures.[15]

5 Proper Binding Condition Effects

5.1 A'-movement

This section explains the PBC effects shown in (3), repeated here in (37).[16]

(37) *[Which picture of t_i]$_j$ do you wonder who$_i$ John likes t_j? (Saito 1989: 187)

In (37), *who* is extracted to the embedded Spec-C, and subsequently the phrase containing a lower copy of *who* undergoes movement to the matrix Spec-C (the first movement is called internal movement, and the latter remnant movement). This type of derivations results in a severe degradation in acceptability, which is greater than that in freezing cases like (38).

(38) ??Who$_i$ do you wonder [which picture of t_i]$_j$ John likes t_j? (Saito 1989: 187)

Consider the derivation of (37) illustrated in (39) (note again that *who* is a phrase of the form {WH$_{[uQ]}$, …}, but its internal structure is abstracted away for simplicity of illustration).

(39) a. {{who, {which$_{[uQ]}$, {picture …}}}, {C, TP}}

b. {who, {{t_{who}, {which, {picture…}}}, {C, TP}}}

c. {*v*, {wonder, {who, {{t_{who}, {which, {picture…}}}, {C$_{[vQ]}$, TP}}}}}

d. {{t_{who}, {which, {picture…}}}, {*v*, {wonder, {who, {$t_{\{t who,\ \{which,\ \{picture…\}\}\}}$, {C,

TP}}}}}}

(39a) shows the stage of derivation in which *which picture of who* is extracted to the embedded Spec-C (note that *who* is placed at the edge of *which* owing to the PIC). In (39b), *who* involving [uQ] moves to the outer Spec-C. After the introduction of V and v as in (39c), *which picture of who* is extracted to the edge of *v*, and the PHC of *v* is labeled and transferred as in (39d). However, this structure violates the SCL because the SO in (40) (i.e., the embedded clause) is not symmetric.

(40) {{$WH_{[uQ]}$, …}, {$t_{\{twho, \{which, \{picture…\}\}\}}$, {$C_{[vQ]}$, TP}}}

MS cannot simultaneously locate the heads WH and C involving interrogative Q features, so the feature value of [vQ] on C is not assigned to [uQ] on WH. Thus, it is ruled out at the interface, as the *wh*-island configuration in (34a) is.[17]

Notice also that the matrix clause in (37) also results in an SCL violation. (41) illustrates the stage of the derivation where *which picture of t* is extracted to the matrix Spec-C.

(41) {{t_{who}, {$WH_{[uQ]}$, {picture …}}}, {$C_{[vQ]}$, TP}}

This structure is not symmetric, because *which picture of t* involves a copy of *who* in its specifier. MS cannot locate WH and C simultaneously, and hence fails in feature valuation. Thus, (37) faces SCL violation twice.[18] This explains why PBC effects lead to a more severe degradation in acceptability than freezing effects, as shown in (37) and (38). In the case of PBC in (37), both the root and embedded CPs cause valuation failure. In contrast, the freezing case in (38) faces valuation failure only once in the embedded CP (see the discussion in Section 3). Thus, this cumulative effect of feature valuation failure yields a severe degradation in acceptability in (38).

5.2 A-movement

Next, we consider why there is no PBC violation in A-movement followed by remnant A'-movement (see also Takano 1995; Müller 1996, among others):

(42) [How likely to t_i win]$_j$ is John$_i$ t_j? (Lasnik and Saito 1993: 140)

Let us assume with Epstein and Seely (2006) and Grohmann, Drury, and Castillo (2000) that

there is no successive-cyclic A-movement: It takes place in "one-fell-swoop." Given this, (42) is derived as follows:

(43) a. {T, {how$_{[uQ]}$, {likely, {to, {John, {v, …}}}}}}

b. {John$_i$, {T, {how, {likely, {to, {t_i, {v, …}}}}}}}

c. {C$_{[vQ]}$, {John$_i$, {T, {how$_{[uQ]}$, {likely, {to, {t_i, {v, …}}}}}}}}

d. {{how$_{[uQ]}$, {likely, {to, {t_i, {v, …}}}}}$_j$, {C$_{[vQ]}$, {John, {T, t_j}}}}

(43a) shows the stage of derivation before A-movement of *John*. In (43b), *John* is raised to the matrix Spec-T in "one-fell-swoop," leaving no intermediate copies. Next, the interrogative C is introduced as in (43c), and finally, *how likely to win* is extracted to Spec-C as in (43d). There is no violation of the SCL in (43) because there are no copies that breaks symmetry between XP-YP structures: the landing site of A-movement is successfully labeled <φ, φ> via feature sharing between *John* and T, and that of A'-movement is labeled <Q, Q> via feature sharing between *how* and C. Thus, (42) causes no valuation failure.

6 Conclusion

This article provided a unified account of freezing effects, *wh*-island effects, and PBC effects in terms of the SCL, according to which an XP-YP structure shares features only when the XP-YP is mirror-symmetric. Based on Chomsky's (2013, 2015) LA, I argued that MS cannot simultaneously locate heads X and Y in an asymmetric XP-YP structure and causes feature-valuation failure at the interface. This article demonstrated that freezing, *wh*-island, and PBC structures involve extraction to the phase edge owing to the PIC, thereby introducing structural asymmetry between XP and YP, and fails at feature valuation between heads X and Y. I demonstrated that SCL is a corollary of Ke's (2019, to appear) Search Algorithm and EKS's (2022) labeling-based feature valuation mechanism. Thus, this analysis, if successful, provides empirical support to Ke's argument that the MS is carried out *in parallel* (i.e., it simultaneously visits every set member that has the same embedding depth), and terminates once relevant heads are located. Furthermore, this analysis empirically supports EKS's claim that Agree is eliminable from narrow-syntax, and feature valuation is contingent on the MS for Labeling.

References

Bobaljik, Jonathan David, and Höskuldur Thráinsson. 1998. Two heads aren't always better than one. *Syntax* 1:37-71.

Bobaljik, Jonathan David, and Dianne Joans. 1996. Subject positions and the roles of TP. *Linguistic Inquiry* 27:195-236.

Bošković, Željko. 2002. A-Movement and the EPP. *Syntax* 5: 167-218.

Bošković, Željko. 2018. On movement out of moved elements, labels, and phases. *Linguistic Inquiry* 49:247-282.

Cable, Seth. 2010. *The grammar of Q: Q-particles, wh-movement and pied-piping*. Oxford: Oxford University Press.

Cecchetto, C. 2001. Proper binding condition effects are phase impenetrability condition effects. In *NELS* 31*: Proceedings of the 31st Annual Meeting of the North East Linguistic Society.* ed. by Minjoo Kim and Uri Strauss, 99-115. Amherst, MA: GLSA Publications.

Chomsky, Noam. 1986. *Barriers*. Cambridge, MA: MIT Press.

Chomsky, Noam. 1995. *The minimalist program*. Cambridge, MA: MIT Press.

Chomsky, Noam. 2000. Minimalist inquiries: The framework. In *Step by step: Essays on minimalist syntax in honor of Howard Lasnik*. ed. by Roger Martin, David Michaels, Juan Uriagereka and Samuel Jay Keyser, 98-155. Cambridge, MA: MIT Press.

Chomsky, Noam. 2001. Derivation by phase. In *Ken Hale: A life in language,* ed. by Michael Kenstowicz. 1-52. Cambridge, MA: MIT Press.

Chomsky, Noam. 2004. Beyond explanatory adequacy. In *Structures and beyond*. ed. by Adriana Belletti, 104-131. Oxford: Oxford University Press.

Chomsky, Noam. 2005. Three factors in language design. *Linguistic Inquiry* 36:1-22.

Chomsky, Noam. 2007. Approaching UG from below. In *Interfaces + recursion = language?: Chomsky's minimalism and the view from syntax-semantics*. ed. by Uli Sauerland and Hans-Martin Gärtner, 1-30. Berlin: Mouton de Gruyter.

Chomsky, Noam. 2008. On Phases. In *Foundational issues in linguistic theory: essays in honor of Jean-Roger Vergnaud*. ed. by Robert Freidin, Carlos P. Otero and Maria Luisa Zubizarreta, 291-231. Cambridge, MA: MIT Press.

Chomsky, Noam. 2013. Problems of projection, *Lingua* 130:33-49.

Chomsky, Noam. 2015. Problems of projection: Extensions. In *Structures, strategies and beyond: Studies in honor of Adriana Belletti*. ed. by Elisa Di Domenico, Cornelia Hamann, Simona Matteini, 1-16. Amsterdam: John Benjamins.

Citko, Barbara. 2014. *Phase theory*. New York: Cambridge University Press.

Cinque, Guglielmo. 1990. *Types of A'-dependencies*. Cambridge, MA: MIT Press.

Epstein, Samuel D., Hisatsugu Kitahara, T. Daniel Seely. 2015. What do we wonder is not syntactic?. In *Explorations in maximizing syntactic minimization*. ed. by Epstein, Samuel D., Hisatsugu Kitahara, T. Daniel Seely, 222-239. New York: Routledge.

Epstein, Samuel D., Hisatsugu Kitahara, T. Daniel Seely. 2022. A Simpler Solution to Two Problems Revealed about the Composite- Operation Agree. In *A minimalist theory of simplest Merge*. ed. by Epstein, Samuel D., Hisatsugu Kitahara, T. Daniel Seely, 111-115. New York: Routledge.

Epstein, Samuel D. and T. Daniel Seely. 2006. *Derivations in minimalism*. New York: Cambridge University Press.

Freidin, Robert. 1986. Fundamental issues in the theory of binding. In *Studies in the acquisition of anaphora*. ed. Barbara Lust, 151-188. Dordrecht: Reidel.

Grohmann, Kleanthes K., John Drury and Juan Carlos Castillo. 2000. No more EPP. In *WCCFL 19: Proceedings of the 19th West Coast Conference on Formal Linguistics*, ed. by Roger Billerey and Brook Danielle Lillehaugen, 153-66. Somerville, MA: Cascadilla Press.

Kanno, Satoru. 2008. On the phasehood and non-phasehood of CP. *English Linguistics* 25:21-55.

Kayne, Richard. 1991. Romance clitics, verb movement, and PRO. *Linguistic Inquiry* 22: 647-686.

Ke, Alan Hezao. 2019. *The syntax, semantics and processing of agreement and binding grammatical illusions*. Doctoral dissertation, University of Michigan.

Ke, Alan Hezao. To appear. Can Agree and Labeling be reduced to Minimal Search? *Linguistic Inquiry.*

Kayne, Richard. 1991. Romance clitics, berb movement, and PRO, *Linguistic Inquiry* 22, 647-689.

Kluender, Robert. 2004. Are subject islands subject to a processing account? In *WCCFL 23: The proceedings of 23rd west coast conference on formal linguistics,* ed. by Vineeta Chand, Ann Kelleher, Angelo J. Rodríguez, and Benjamin Schmeiser, 101-125. Somerville, MA: Cascadilla Press.

Koeneman, Olaf and Ad Neelman. 2001. Predication, verb movement, and the distribution of expletives. *Lingua* 111, 189-233.

Koizumi, M. 1995. *Phrase structure in minimalist syntax*. Doctoral dissertation, MIT.

Koster, Jan. and Jan-Wouter Zwart 2001. Transitive expletive constructions and the object shift parameter. In *Linguistics in the Netherlands 2000*, ed. by Helen de Hoop and Ton van der Wouden, 159-170. Amsterdam: John Benjanims.

Lambova, Mariana. 2001. On A-bar movements in Bulgarian and their interaction. *The Linguistic Review* 18, 327-374.

Lasnik, Howard. 2001. Subjects, objects, and the EPP. In *Objects and other subjects, grammatical functions, functional categories, and configurationality*. ed. by William D. Davies and Stanley Dubinsky, 103-121. Dordrecht: Kluwer.

Lasnik, Howard and Mamoru Saito 1993. *Move α: Condition on its application and output*. Cambridge, MA: MIT Press.

Lebeaux, David. 1988. *Language acquisition and the form of grammar*. Doctoral dissertation, University of Massachusetts.

Müller, Gereon. 1996. A constraint on remnant movement, *Natural Language and Linguistic Theory* 14:355-407.

Pesetsky, David. 2000. *Phrasal movement and its kin*. Cambridge, MA: MIT Press.

Polinsky, Maria. 2013. Raising and control. In *The Cambridge handbook of generative syntax*. ed. by Marcel den Dikken, 578-606. New York: Cambridge University Press.

Richards, Novin. 2001. *Movement language, interaction, and architectures*. Oxford: Oxford University Press.

Ross, John Robert. 1967. *Constraints on variables in syntax*. Doctoral dissertation, MIT.

Safir, Ken. 1999. Vehicle change and reconstruction in A'-chains. *Linguistic Inquiry* 30:587-620.

Saito, Mamoru. 1989. Scrambling as semantically vacuous A'-movement. In *Alternative conceptions of phrase structure*. ed. by Mark R. Baltin and Anthony S. Kroch 182-200. Chicago and London: The University of Chicago Press.

Saito, Mamoru. 2016. (A) case for labeling: Labeling in languages without φ-feature agreement. *The Linguistic Review* 33:129-175.

Sakumoto, Yuta. 2021. On the Minimal Link Condition: In comparison to the Phase Impenetrability Condition. *Kyudai Eibungaku* (Kyusyu University English Literature) 62:45-62.

Sportiche, Dominique. 1998. *Partitions and atoms of clause structure: Subjects, agreement, case and clitics*. London: Routledge.

Takano, Yuji. 1995. Predicate fronting and internal subjects. *Linguistic Inquiry* 26:327-340.

Ura, Hiroyuki. 1993. L-relatedness and its parametric variation. In *MIT working papers in linguistics 19: Papers on case and agreement II*. ed. by Collin Phillips, 377-399. Cambridge, MA: MITWPL.

Uriagereka, Juan. 1988. *On Government*. Doctoral Dissertation, University of Connecticut.

Vermeulen, Reiko. 2005. *The syntax of external possession: Its basis in θ-theory.* Doctoral dissertation, University College London.

Notes

[1] Notice also that the lower copy never disappears from the structure, as the No-Tampering Condition (NTC, Chomsky 2004, 2007, 2008, 2013) dictates.

[2] In contrast to Chomsky (2013, 2015), according to which the pair of shred *features* <F, F> provides the label of α, Ke argues that the pair of *heads* <X, Y> serves as the label. However, this distinction is not relevant for our concern.

[3] Notice that MS does not have to count embedding depth of relevant heads to pick out more shallowly embedded one, because SA terminates and returns a head once the relevant head is located by the "top-down" search algorithm.

[4] Bošković (2018) tries to deduce freezing effects from the phase theory (Chomsky 2000, 2001) and the labeling theory (Chomsky 2013), postulating that unlabeled SOs cannot undergo movement. According to him, extraction out of the bracketed phrase in (14) yields an unlabelable XP-YP structure owing to the PIC, and hence it cannot undergo further movement. Although Bošković's deduction is tempting and this article owes his analysis for many insights, there is a conceptual problem in his analysis: it bars IM of a non-phasal category, though it allows EM of a non-phasal one. As Chomsky (2004, 2007, 2008, 2013, 2015) argues, Internal Merge (IM) and External Merge (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. Unless his analysis provides a principled explanation of why one of the two types of the single rule is constrained without stipulation, it potentially precludes unification of EM and IM into Merge.

[5] This article assumes with Chomsky (2013, 2015) that Merge is applied freely (i.e., there is no deriving force of movement). Although application of Merge is optional, and there is no look-ahead of derivation, we cannot have a representation in which the *wh*-phrase is extracted out of the external argument unless it undergoes free IM to the edge of D at the stage (15b),

owing to the PIC.

[6] One might claim that the SCL incorrectly rules out the sentence like *John's pictures are (beautiful)* on the ground that it has an asymmetric structure {{John, {$D_{[\varphi]}$, pictures}}, {$T_{[\varphi]}$, …}}, where the genitive phrase occupies Spec-D. In this structure, LA cannot locate the φ-features on D owing to the SCL. 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*-movment with an argument CP does not bleed Binding Condition C violation 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 the 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 undergoes SIMPL after Topicalization. Based on this observation, this article suggests that *John's pictures are (beautiful)* is of the form {{$D_{[\varphi]}$, pictures}, {$T_{[\varphi]}$, …}} when it undergoes Transfer, observing the SCL. After that, the genitive subject *John's* is introduced to the structure counter-cyclically, or undergoes SIMPL to yield {{John, {$D_{[\varphi]}$, pictures}}, {$T_{[\varphi]}$, …}} If this analysis is correct, genitive subjects pose no problems to the proposed condition.

[7] One might wonder how the sentences involving pied-piping like *To whom did John talk*

t? are derived in accordance with the SCL. If this sentence is of the form {{P, {$WH_{[uQ]}$, …}}, {$C_{[vQ]}$, …}}, the proposed SCL incorrectly rule it out, since MS cannot locate D involving [uQ]. This problem might be 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 {{$Q_{[uQ]}$, {P, whom}}}, {$C_{[vQ]}$, …}}. Then, MS locates Q involving the interrogative feature and C simultaneously, observing the SCL.

[8] The assumption here is that R that does not assign structural Case does not involve unvalued φ-features.

[9] Kluender gives no dialectic marks to (30b, c). He notes not only that (30b, c) is noticeably better than (30b) and (30c) is also more interpretable than (30a), but also that (30c) is less felicitous than (30b). I leave open why (30b) and (30b) differ in acceptability.

[10] Kanno (2008) assumes with Chomsky (2008) that C bears φ-features and tense features at the stage where it is introduced, and subsequently they are inherited by T. On the basis of this, Kanno proposes that C loses its phasehood if C lacks either of these features.

[11] The assumption here is that *whether* is not a C head but a phrase that occupies Spec-C (Kayne 1991). Another possibility is that *whether* is a C head that licenses a null interrogative operator in Spec-C (Sportiche 1998). See also Sakumoto (2021) for discussion.

[12] One may claim that the proposed system incorrectly rules out multiple-Spec configurations. Suppose we have multiple-Spec structures like {{$U_{[F]}$, …}, {{$X_{[F]}$, …}, {$Y_{[F]}$, ZP}}}, where U and X, the heads of UP and XP, involve features to be shared with Y. Then, the SCL rules it out, because it is not a mirror-symmetric XP-YP structure. However, multiple-

Specs do not seem to pose a serious empirical problem to the SCL, because there are plausible alternative analyses that accommodate constructions that have been analyzed in terms of multiple-Specs. For Multiple Nominative Constructions (MNCs) in Japanese (Ura 1993, 1994; Koizumi 1995), Saito (2016) proposes that the Case particle in Japanese involves an anti-labeling feature, which makes available multiple-Spec configurations without feature sharing. If Saito's analysis is correct, MNCs do not pose a problem to the SCL. As for Transitive Expletive Constructions (TECs) in Germanic languages (Chomsky 1995), previous approaches have shown that two-layered functional projections in the IP area provide positions for an expletive and an external argument, accounting for Vikner's Generalization (Bobaljik and Thráinsson 1998; Koeneman and Neelman 2001) or Bures's Generalization (Bobaljik and Joans 1996; Koster and Zwart 2001). As far as the split-IP analyses are empirically preferable to the multiple-Spec analysis, TECs pose no problem to the SCL (see Vermeulen 2005, which argues for split-IP analyses of TECs and against the multiple-Spec analysis). For Multiple *Wh*-Fronting (MWF) in Slavic languages such as Bulgarian (Koizumi 1995; Pesetsky 2000; Richards 2001, among others), Lambova (2001) argues that the first *wh*-phrase of MWF in Bulgarian moves to Spec-C to check the interrogative feature on C, whereas the second and the following *wh*-phrases move to Spec-ΔP, a dedicated position for discourse-related elements, to form a single *wh*-cluster. If this analysis is correct, MWF does not involve a multiple-Spec configuration but two-layered split functional projections; hence it does not pose a problem to the SCL.

[13] More precisely, to interpret a *wh*-phrase as an interrogative operator, it must enter into agreement with C to receive an interrogative feature value. 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 (34b) to be construed as an operator-scope configuration, owing to its label <Q, Q>. Thus, <Q, Q> labeling without agreement yields anomalous interpretation at the CI interface.

[14] Chomsky does not give a dialectic mark to the sentences in (35).

[15] We put aside the problem with pied-pipping of *to whom*, already noted in footnote 7.

[16] Cecchetto (2001) tries to account for PBC effects in terms of phase theory. According to him, (37) is ungrammatical because remnant movement violates the PIC: After internal movement, the domain including the remnant is rendered inaccessible to further operation. Although his phase-based analysis is attractive, it is not without a problem. For his theory to work, it must block the derivation in which both the internal movement and remnant movement target the embedded multiple Specs-C (i.e., the derivation in (39b)). Otherwise, the PBC cases are successfully derived without PIC violations.

[17] Notably, the embedded clause may have the structure {{t_{who}, {which, …}}, {who$_{[uQ]}$, {C$_{[vQ]}$, …}}}, whereby *who* and *which picture of* occupies the inner Spec-C and the outer Spec-C, respectively. In this structure, LA provides the label <Q, Q>, observing the SCL. However, the embedded clause yields an anomalous interpretation at the CI interface, similar to the *wh*-island case in (34b): Although the label <Q, Q> forces the embedded clause to be construed as an operator-scope configuration, {t_{who}, {Q, …}} in the outer Spec-C, an intermediate copy, cannot behave as an operator.

[18] The proposed analysis predicts that the PBC effect is relaxed when the remnant is extracted out of a nonfinite clause, since it skips the embedded Spec-C without violation of the PIC. Although we must investigate more closely whether PBC effects are relaxed in nonfinite cases, judgement by my informant seems to support the proposed analysis: He observes that there is difference in acceptability between the nonfinite case in (ia) and the finite one in (ib), and the former is slightly better than the later.

(i) a. Which picture does John wonder of whom to buy?

b. Which picture does John wonder of whom he should buy?