

# Labeling and Disjunctive Feature Sharing\*

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## Abstract

This paper will explore how Chomsky's (2013, 2015) Labeling Algorithm selects a label when it finds more than one shared feature in the {XP, YP} configuration. I propose that if X enters a feature sharing relation with Y and Z at the same time, a disjunctive form of a label is produced, and this particular type of label is illegitimate at the interfaces. Let us call this type of feature sharing disjunctive feature sharing. I suggest that the subject island violation results from disjunctive feature sharing.

**Keywords:** Labeling Algorithm, Minimal Search, T-to-C Movement, Subject-Object Asymmetry, Subject Island

## 1. Labeling by Sharing More than One Feature

Chomsky (2013, 2015) argues that a label is required for interpretation at the interfaces and assigned at the phase level. Under Chomsky's Labeling Algorithm (LA), a syntactic object (SO) of the form {X, YP}, where a head X merges with a phrase YP, is labeled, as X as seen in (1a), because LA selects the closest element as the label via the operation called minimal search (MS). In the case of a SO {XP, YP} in (1b), however, LA cannot determine which is to be a label because XP and YP, more specifically and their heads X and Y, are equally close in the eyes of MS. The situation changes when one of the members, say XP, moves and leaves a copy, as in

(1bi). On the assumption that copies are invisible to LA, YP is selected as a label. The SO  $\{XP, YP\}$  can also be labeled if the two members share some features, as in (1bii). LA then uses as a label the most prominent feature shared between the two.

- (1) a.  $\{X, YP\} = X$   
 b.  $\{XP, YP\} = ??$   
 i.  $XP \dots \{t, YP\} = YP$   
 ii.  $\{XP_{[F]}, YP_{[F]}\} = \langle F, F \rangle$

This paper aims to explore how LA selects a label when more than one shared feature is involved, as in (2).

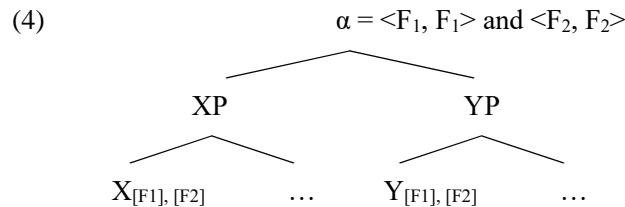
- (2)  $\{XP_{[F1], [F2]}, YP_{[F1], [F2]}\} = \langle F1, F1 \rangle / \langle F2, F2 \rangle$

Given that labels are needed for interpretation at the interfaces, any SO should have a single label unambiguously. If that is the case, how can the SO in (2) be labeled via feature sharing? Does LA provide a label  $\langle F2, F2 \rangle$  in tandem with  $\langle F1, F1 \rangle$  or select one of them? And if more than one shared feature can be a single label, are there any conditions there? In this paper, I propose the following condition on labeling:

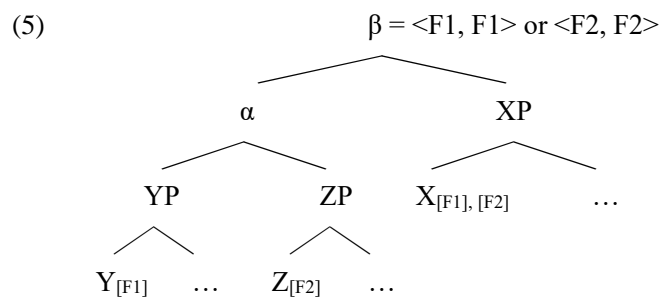
- (3) a. Labeling yields a conjunctive label if more than one feature is shared between X and Y.  
 b. Labeling yields a disjunctive label if X shares different features with Y and Z.

Let us examine how conjunctive and disjunctive labels are provided via feature sharing. First consider the following SO, where two distinct features are shared between X and Y:

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In this case, LA finds the two heads that share [F1] and [F2], and then selects the shared features as the label of  $\alpha$  in accordance with (1bii): the label of  $\alpha$  is the conjunction of  $\langle F_1, F_1 \rangle$  and  $\langle F_2, F_2 \rangle$ .<sup>1</sup> Let us call this strategy conjunctive feature sharing. However, conjunctive feature sharing is not available when X shares the two features distributively with Y and Z, as in (5).



The label of  $\beta$  in (5) would be X under normal circumstances since LA first finds the head X. Let us suppose here that X is weak in the sense of Chomsky (2015): the head X is too weak to serve as a label. Thus, LA continues searching and finds Y with [F1] and Z with [F2] within  $\alpha$  simultaneously. The label of  $\beta$  is then provided via feature sharing between X and Y or between X and Z. Since the head X shares [F1] with Y and [F2] with Z at the same time, the disjunctive label  $\langle F_1, F_1 \rangle$  or  $\langle F_2, F_2 \rangle$  is formed. Let us call this type of feature sharing disjunctive feature sharing. Here I argue that this resulting label is illegible at the interfaces for the following reason:

the disjunctive label of  $\beta$  in (5) is ambiguous between  $\langle F1, F1 \rangle$  and  $\langle F2, F2 \rangle$ , and hence one of the labels is superfluous and plays no role for interpretation at the interfaces. This paper argues that the assignment of this illegitimate disjunctive label in (5) causes so-called subject island violations, while a conjunctive label in (4) is involved in a derivation of legitimate subject questions.

This paper is organized as follows: in section 2, I argue that the formation of subject questions involves conjunctive feature sharing and show how this type of labeling relates to the absence of T-to-C movement. I argue in section 3 that a subject island effect is attributed to the illegitimate disjunctive label formed by disjunctive feature sharing. Section 4 concludes this paper.

## 2. A Conjunctive Label in a (Matrix) Subject Question

Consider the following asymmetry between subjects and objects with respect to T-to-C movement in matrix question formation:

- (6) a. What did Mary buy \_\_\_?  
 b. \*What Mary bought \_\_\_?  
 c. \*Who did \_\_\_ buy the book [\*unless *did* is emphatic]  
 d. Who \_\_\_ bought the book? (Pesetsky and Torrego (2001: 357))

T-to-C movement in the form of the auxiliary *do* is obligatory when an object is questioned as in (6a, b), while it must be absent in the case of subject question as in (6c, d). Under Chomsky's (2015) LA, the difference between the behavior of subjects and objects lies in the head T's inability to provide a label. A possible derivation of (6d) goes as follows:

- (7) a.  $[_\gamma C_{[uQ]} [_\beta \text{who}_{[\varphi], [Q]} T_{[\text{u}\varphi]} [_\alpha t \text{v} \dots]]$   $\beta = \langle \varphi, \varphi \rangle$   
 b.  $[_\gamma \text{who}_{[\varphi], [Q]} C_{[uQ]} [_\beta t T_{[\text{u}\varphi]} [_\alpha t \text{v} \dots]]$   $\beta = ?, \gamma = \langle Q, Q \rangle$

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Chomsky (2015) supposes that the head T itself cannot be a label, and in order for the phrase traditionally analyzed as TP to get properly labeled, there must be an element whose  $\varphi$ -features enter an agreement or feature sharing relation with the corresponding features of T. The wh-subject *who* in (7a) needs to stay at Spec TP until the C phase is completed and  $\beta$  gets transferred so that LA can label  $\beta$  as  $\langle\varphi, \varphi\rangle$  via feature sharing (the transferred domain is highlighted in gray throughout the paper). It then follows that  $\gamma$  is not labeled as  $\langle Q, Q\rangle$  and the sentence fails to receive an appropriate interrogative interpretation. Even though *who* can move to Spec CP to label  $\gamma$  as  $\langle Q, Q\rangle$  as in (7b), the label of  $\beta$  cannot then be determined at the timing of transfer because the copy left by the movement is invisible to labeling. To circumvent this situation, an unvalued Q-feature should be inherited from C to T, as in (8).

$$(8) \quad [{}_{\gamma} C [{}_{\beta} \text{who } [{}_{\varphi}, [Q] T [{}_{\varphi}, [uQ] [{}_{\alpha} t \text{ v } \dots \quad \beta = \langle\varphi, \varphi\rangle \text{ and } \langle Q, Q\rangle$$

The wh-subject *who* in (8) not only ‘strengthens’ the weak T by  $\varphi$ -feature sharing but also can participate in Q-feature sharing owing to the Q-feature inheritance. The label of  $\beta$  is thus determined as the conjunctive label,  $\langle\varphi, \varphi\rangle$  and  $\langle Q, Q\rangle$ . Here I suggest that this labeling strategy spares wh-subject questions from T-to-C movement and assume the following condition on T-to-C movement in matrix question formation.

- (9) T-to-C movement takes place only if [uQ] obligatorily inherited from C to T does not contribute to labeling via Q-feature sharing.

T moves to C after the obligatory Q-feature inheritance only if T cannot take part in Q-feature sharing with another SO in its original position.

Let us consider how this analysis accounts for the absence of T-to-C movement

in *wh*-subject questions.

- (10) a. Who \_\_\_ bought the book?  
 b.  $[_\gamma C [_\beta \text{who}_{[\varphi], [Q]} T_{[\#\varphi], [\#\text{Q}]} [_\alpha t_{\text{wh}} \text{V} \dots \quad \beta = \langle \varphi, \varphi \rangle \text{ and } \langle \text{Q}, \text{Q} \rangle$
- (11) a. \*Who did \_\_\_ buy the book?  
 b.  $*[_\gamma \text{who}_{[\varphi], [Q]} \langle T_{[\#\varphi], [\#\text{Q}]}, C \rangle [_\beta t_{\text{wh}} t_T [_\alpha t_{\text{wh}} \text{V} \dots$

As already seen in (8), the  $\langle \text{Q}, \text{Q} \rangle$  label is provided by Q-feature sharing between T and the *wh*-subject because the Q-feature is inherited from C to T. T thus has no occasion to move further to C, and this redundant operation is ruled out as in (11).

In contrast to *wh*-subject questions, T in *wh*-object questions cannot participate in Q-feature sharing when T is in situ.

- (12) a. \*What Mary bought \_\_\_?  
 b.  $[_\gamma \text{what}_{[Q]} C [_\beta \text{DP}_{[\varphi]} T_{[\#\varphi], [uQ]} [_\alpha t_{\text{wh}} t_{\text{DP}} \text{V} \dots \quad \beta = \langle \varphi, \varphi \rangle, \gamma = ?$
- (13) a. What did Mary buy \_\_\_?  
 b.  $[_\gamma C [_\beta \text{DP}_{[\varphi]} T_{[u\varphi], [uQ]} [_\alpha \text{what}_{[Q]} t_{\text{DP}} \text{V} \dots$   
 c.  $[_\gamma \text{what}_{[Q]} C [_\beta \text{DP}_{[\varphi]} T_{[\#\varphi], [uQ]} [_\alpha t_{\text{what}} t_{\text{DP}} \text{V} \dots \quad \beta = \langle \varphi, \varphi \rangle$   
 d.  $[_\gamma \text{what}_{[Q]} \langle T_{[\#\varphi], [\#\text{Q}]}, C \rangle [_\beta \text{DP}_{[\varphi]} t_T [_\alpha t_{\text{what}} t_{\text{DP}} \text{V} \dots \quad \gamma = \langle \text{Q}, \text{Q} \rangle$

The derivation (12b) results in not only labeling failure because the Q-feature on T in situ cannot participate in labeling of  $\gamma$  but also a derivational crash because the uninterpretable Q-feature is still unvalued and uninterpretable. Therefore, T-to-C movement takes place as in (13). Following Chomsky's (2015) proposal of R-to-v head movement via internal pair-merge followed by phasehood inheritance, I suggest that T-to-C movement occurs soon after  $\beta$  is labeled as  $\langle \varphi, \varphi \rangle$  and triggers the phasehood inheritance from C to T. The complement of the head T, namely  $\alpha$ , then gets transferred as in (13d). Now that T is pair-merged with C in  $\gamma$ , the  $[uQ]$  feature

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on T is available for labeling. Thus,  $\gamma$  is labeled via Q-feature sharing. In this way, T-to-C movement results from the interaction of labeling and Q-feature inheritance.

Next let us consider the cases of embedded wh-questions. It is well-known that the subject-object asymmetry in (6) disappears in the embedded clause as shown in (14).

- (14) a. I wonder who bought the book.  
 b. I wonder what Mary bought.

Here, I simply suppose that in the embedded clause an uninterpretable Q-feature may be inherited from C to T due to the selectional requirement on the matrix V. The derivation then goes as follows:

- (15) a. ... [ $\gamma$  what<sub>[Q]</sub> C<sub>[uQ]</sub> [ $\beta$  DP<sub>[ $\varphi$ ]</sub> T<sub>[u $\varphi$ ]</sub>, [ $\alpha$  t<sub>wh</sub> tDP V ...]       $\beta = \langle \varphi, \varphi \rangle, \gamma = \langle Q, Q \rangle$   
 b. ... [ $\gamma$  C<sub>[uQ]</sub> [ $\beta$  who<sub>[ $\varphi$ ], [Q]</sub> T<sub>[u $\varphi$ ], [uQ]</sub> [ $\alpha$  t<sub>wh</sub> V ...]       $\beta = \langle \varphi, \varphi \rangle$  and  $\langle Q, Q \rangle$

T-to-C movement does not take place in the embedded clause either because the Q-feature is not inherited by T as in (15a) or because the inherited Q-feature on T participates in the labeling process via conjunctive feature sharing as in (15b) in the same manner as in the matrix subject question. In the latter case, the head C is deleted in the manner of Chomsky (2015), and thus  $\beta$  is then directly dominated by the matrix V and will satisfy the selectional requirement of V.

We have now examined how a conjunctive label is formed in (matrix) wh-subject questions and how it relates to the absence of T-to-C movement. In the following section I will explore the cases where a disjunctive label is formed.

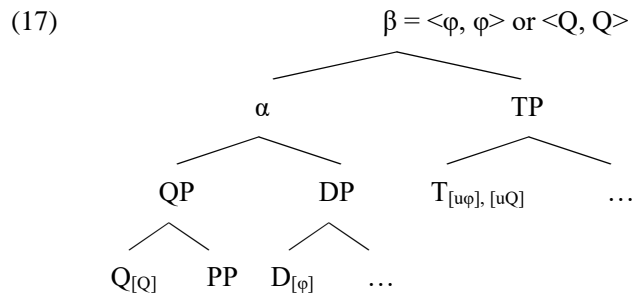
### 3. A Disjunctive Label and a Subject Island

I would suggest that a disjunctive label, which is illegitimate at the interfaces, is involved in the prohibition of extraction from a subject. A *wh*-expression can be extracted from a complement (16a). However, such extraction is not permitted when it applies to a subject, as shown in (16b).

- (16) a. [Of which car]<sub>i</sub> did they find [the driver \_\_\_<sub>i</sub>]?  
 b. \*[Of which car]<sub>i</sub> did [the driver \_\_\_<sub>i</sub>] cause a scandal?

(Chomsky (2008:147))

Here I argue that the impossibility of *wh*-extraction from a subject is attributed to the configuration where X shares more than one feature distributively between Y and Z and a disjunctive label is formed. Consider the following schematized structure.



Let us first assume that DP forms a phase. Hence, if a *wh*-expression is extracted from the subject DP, it must stop at by the edge of the subject DP. Moreover, I adopt Cable's (2010) system of a Q-particle and a pied-piped PP is headed by a question particle Q with a Q-feature. Now let us consider how LA applies to the structure in (17). To label β in (17), LA finds the head T first, but T itself is weak to serve as a label. It then continues search within α and finds Q with [Q] and D with [φ] simultaneously. The SO β is labeled as <φ, φ> or <Q, Q> because the head T shares



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[ $\varphi$ ] with D and [Q] with Q at the same time. This disjunctive label  $\langle \varphi, \varphi \rangle$  or  $\langle Q, Q \rangle$  is illegitimate at the interfaces, which yields a subject island effect.

The current approach will correctly predict that the subject island effect is not observed in the embedded clause in the case of long-distance wh-movement under the assumption that the embedded C head does not carry a Q-feature.

(18) Of which car did it seem (that) the driver had caused a scandal?

(Zyman (2021: 534, 535))

When a Q-feature on the embedded C is not introduced in syntax in the first place, a wh-phrase can be extracted from a subject in the embedded clause. This is because only  $\varphi$ -features are involved in the relevant feature sharing and it does not form a disjunctive label.

Our analysis might also shed light on the observation that the acceptability of wh-extraction from a subject depends on whether its predicate is stage-level or individual-level.

(19) a. Of which masterpiece is [one reproduction  $t_{pp}$ ] already available?

b. ?\*Of which masterpiece is [one reproduction  $t_{pp}$ ] absolutely perfect?

(Bianchi and Chesi (2015: 50))

How is this difference to be accounted for? I argue that disjunctive feature sharing can be changed into conjunctive one by adding an extra shared feature to a disjunctive feature sharing relation. Consider the following schematized SOs.

(20) a.  $\{\{Y_{[F1]}, \dots\}, \{Z_{[F2]}, \dots\}, \{X_{[F1], [F2]}, \dots\}\} = \langle F1, F1 \rangle$  or  $\langle F2, F2 \rangle$

b.  $\{\{\{Y_{[F1]}, \dots\}, \{Z_{[F2], [F3]}, \dots\}\}, \{X_{[F1], [F2], [F3]}, \dots\}\}$

$= \langle F2, F2 \rangle$  and  $\langle F3, F3 \rangle$

The reason why LA provides a disjunctive label,  $\langle F1, F1 \rangle$  or  $\langle F2, F2 \rangle$  in (20a) is that both Y with [F1] and Z with [F2] can be selected as a feature sharer. This situation changes when Z (and X) assumes an extra shared feature [F3] and Z becomes more prominent than Y as in (20b). LA will now select Z instead of Y as forming a feature sharing relation with X, which yields a conjunctive label,  $\langle F2, F2 \rangle$  and  $\langle F3, F3 \rangle$ . As for a candidate for an extra feature in the sentence (19a), I adopt Kiss' (1996) proposal that a subject in an individual-level predicate has  $\langle +\text{specific} \rangle$  feature while that in a stage-level predicate has  $\langle -\text{specific} \rangle$  feature.<sup>2</sup> In this paper I take  $[-\text{specific}]$  and its counterpart  $[u-\text{specific}]$  as a syntactic feature to encode non-specificity on the subject of a stage-level predicate. I suggest that  $[u-\text{specific}]$  is inherited from C to T with other features if a subject with  $[-\text{specific}]$  is introduced in syntax. The derivation of (19a) then goes as follows:

- (21) a.  $[\beta [\delta \text{QP}_{[Q]} \text{D}_{[\varphi], [-\text{specific}]} [\dots t_{\text{QP}}]] \text{T} [\alpha t_{\text{DP}} \vee [\dots]]$   
 b.  $[\gamma \text{C}_{[u\varphi], [u-\text{specific}], [uQ]} [\beta [\delta \text{QP}_{[Q]} \text{D}_{[\varphi], [-\text{specific}]} [\dots t_{\text{QP}}]] \text{T} [\alpha t_{\text{DP}} \vee [\dots]]$   
 c.  $[\gamma \text{C} [\beta [\delta \text{QP}_{[Q]} \text{D}_{[\varphi], [-\text{specific}]} [\dots t_{\text{QP}}]] \text{T}_{[\#\varphi], [u-\text{specific}], [uQ]} [\alpha t_{\text{DP}} \vee [\dots]]$   
 $\beta = \langle \varphi, \varphi \rangle \text{ and } \langle -\text{specific}, -\text{specific} \rangle$   
 d.  $[\gamma \langle \text{T}_{[u\varphi], [u-\text{specific}], [uQ]}, \text{C} \rangle [\beta [\delta \text{QP}_{[Q]} \text{D}_{[\varphi], [-\text{specific}]} [\dots t_{\text{QP}}]] t_{\text{T}} [\alpha t_{\text{DP}} \vee [\dots]]$   
 e.  $[\gamma \text{QP}_{[Q]} \langle \text{T}_{[\#\varphi], [\#\text{-specific}], [\#\text{Q}]}, \text{C} \rangle [\beta [\delta t_{\text{QP}} \text{D}_{[\varphi], [-\text{specific}]} [\dots t_{\text{QP}}]] t_{\text{T}}$   
 $[\alpha t_{\text{DP}} \vee [\dots]] \quad \gamma = \langle \text{Q}, \text{Q} \rangle$

The head C with features including the uninterpretable feature  $[u-\text{specific}]$  is merged with TP as in (21b). After an inheritance of features occurs from C to T at the stage in (21c), the label of  $\beta$  is provided as  $\langle \varphi, \varphi \rangle$  and  $\langle -\text{specific}, -\text{specific} \rangle$  since LA selects the head D with  $[\varphi]$  and  $[-\text{specific}]$  as forming a feature sharing relation with T. This conjunctive label poses no problem for interpretation at the interfaces. After T is internally pair-merged with C, the phasehood of C is inherited from C to T as in

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(21d) and the complement of the phase head T, namely  $\alpha$ , gets transferred. The wh-phrase now can be extracted from the subject to Spec CP, and  $\gamma$  is labeled as  $\langle Q, Q \rangle$ , as shown in (21e).

#### 4. Conclusion

In this paper, I have proposed that more than one feature is shared in labeling and such sharing provides a conjunctive label and a disjunctive one. I have shown that multiple feature sharing between X and Y yields a conjunctive label, but if X enters a different feature sharing relation with Y and Z simultaneously, such sharing produces a disjunctive label, which is illegitimate at the interfaces. I have also argued that subject island effects are attributable to this illegitimate disjunctive label.

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#### Note

- 1) Throughout the paper I use the notation ' $\langle F1, F1 \rangle$  and  $\langle F2, F2 \rangle$ ' as a single label for a conjunctive label because the relevant SO  $\{XP, YP\}$  shares two prominent features [F1] and [F2] and it is easier to distinguish the conjunctive label from the disjunctive label, ' $\langle F1, F1 \rangle$  or  $\langle F2, F2 \rangle$ '.

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2) Kiss (1996) further argues that specific subjects occupy a predicate-phrase-external position in Spec RefP (Referential Phrase), a projection dominating IP and dominated by CP, while non-specific ones occupy a predicate-phrase-internal position in Spec IP. This argument is supported by a number of empirical facts like adverb placement.

- (i) a. Boys luckily know the novels of Karl May.  
       b. <sup>??</sup>Boys luckily were born.  
       c. Luckily boys were born. (Kiss (1996: 219))
- (ii) a. [<sub>RefP</sub> Boys luckily [<sub>IP</sub> know the novels of Karl May]]  
       b. <sup>??</sup>[<sub>IP</sub> Boys luckily were born]  
       c. Luckily [<sub>IP</sub> boys were born] (Kiss (1996: 219))

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