

A Labeling-Based Approach to Massive Pied-Piping in English*

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Abstract

Massive pied-piping is observed under limited circumstances in English (e.g. *A picture of whom is on sale?*). Adopting Abe's (2015) assumption that English massive pied-piping constructions involve the interaction of *wh*-movement and topicalization in their derivation, this paper aims to account for this construction within Suzuki's (2023) labeling framework, which assumes that labeling can be ambiguously applied to XP-YP configurations (Mizuguchi (2019)) and that copies of a syntactic object can be assigned (different) labels in a phase by phase fashion. This paper argues that the possibility of massive pied-piping in English depends on whether the copies of the massively pied-piped phrase can receive different labels or not. Furthermore, this paper also addresses the issue of criterial freezing (Rizzi (2006)), which, in terms of labeling, is understood to require that a syntactic object participates in labeling at no more than one criterial position in a derivation.

Keywords: massive pied-piping, labeling, transfer, copy, *wh*-movement, topicalization, criterial freezing

1. Introduction

In *wh*-interrogatives in English, if a *wh*-phrase is embedded under an object noun phrase, the *wh*-phrase cannot pied-pipe the entire object phrase, as follows:

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- (1) a.(?)A picture of which president does Jim own?¹ (Cable (2010: 138))
 b.?*A picture of whom did you see? (Abe (2015: 52))

Following Heck (2008) and Cable (2010), this paper calls such a pied-piping “massive pied-piping.” Interestingly, the massive pied-piping construction becomes acceptable when a *wh*-phrase pied-pipes the subject phrase, as shown in (2).

- (2) a. A picture of which president hangs in Jim’s office?
 (Cable (2010: 138))
 b. A picture of whom is on sale? (Abe (2015: 52))

However, massive pied-piping is restricted to simplex *wh*-interrogative sentences, the ones consisting of a single *wh*-interrogative clause. Thus, if it applies to a *wh*-containing subject phrase of an embedded clause in a long-distance manner, the resulting sentence sounds unacceptable, as illustrated in (3).

- (3)?* A picture of whom do you think is on sale? (Abe (2015: 52))

Furthermore, embedded *wh*-interrogatives do not allow for massive pied-piping regardless of whether the subject or the object is pied-piped, as follows:

- (4) a. *I wonder a picture of whom is on sale.
 b. *I wonder a picture of whom you saw.
 c. *I wonder a picture of whom you think is on sale. (Abe (2015: 52))

The above examples have shown that massive pied-piping is restricted to the *wh*-containing subject of the simplex *wh*-interrogative sentence. However, the following pair of examples involving a sluiced embedded *wh*-interrogative exhibits an

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intriguing contrast: (5a) is well-formed, where the *wh*-containing object phrase of the embedded clause further undergoes massive pied-piping to the sentence-initial position, while (5b) is ill-formed, where the *wh*-containing object phrase stays at the initial position of the embedded clause.

- (5) a. He has a picture of somebody, but a picture of whom I don't know.
(Ross (1969: 281))
- b. *He has a picture of somebody, but I don't know a picture of whom.
(Ross (1969: 262))

This type of construction is referred to as the “topicalized sluicing construction” by Abe (2015) and the “swamp construction” by Abels (2019). These terms reflect the authors’ analyses of (5a) (see section 2).

This paper aims to address the following questions under labeling theory, which has received considerable attention since Chomsky (2013, 2015): (i) why the possible target of massive pied-piping is restricted to subjects of the simplex *wh*-interrogative sentences (e.g. (1)-(4)) and (ii) why massive pied-piping is applicable in embedded *wh*-interrogatives when the *wh*-containing object is further pied-piped to the sentence-initial position and the embedded clause is elided (e.g. (5)). We propose a labeling-based analysis which makes crucial use of Mizuguchi’s (2019) ambiguous labeling strategy and Suzuki’s (2023) assumption that copies of a syntactic object (SO) within a single transfer domain are assigned the same label in an across-the-board manner, which then implies that if its copies are separated by a transfer domain, they can be labeled differently; otherwise, they cannot. Pursuing this possibility leads to a unified answer to the questions above.

This paper is organized as follows. Section 2 provides an overview of previous research: Abe (2015) and Abels (2019). After presenting Suzuki’s (2023) labeling mechanism as the main theoretical framework of this study and some assumptions

on massive pied-piping, section 3 accounts for the distribution of massive pied-piping in English. Section 4 addresses the issue of criterial freezing (Rizzi (2006)), which my analysis would face. Section 5 concludes this paper.

2. Previous Approaches

2.1. Abe (2015)

To provide a unified account of the examples of massive pied-piping in (1)-(5), Abe (2015) hypothesizes that massive pied-piping involves not only *wh*-movement but also topicalization and what is topicalized to a sentence-initial position is a *wh*-containing phrase. The involvement of topicalization is confirmed by the presence of island effects exhibited by the type of massive pied-piping in (5), which Abe (2015) calls topicalized sluicing construction. Relevant examples are given in (6).

- (6) a.?*John met a person who took a picture of somebody, but a picture of whom I don't know. (Abe (2015: 48))
 (Intended island-violating reading: '... but I don't know who John met a person who took a picture of.') (Abe (2015: 48, 49))
- b. John met a person who took a picture of somebody, but I don't know who. (Abe (2015: 48))
- c.?*John got mad because Mary took a picture of somebody, but a picture of whom I don't know. (Abe (2015: 48))
 (Intended island-violating reading: '... but I don't know who John got mad because Mary took a picture of.') (Abe (2015: 48, 49))
- d. John got mad because Mary took a picture of somebody, but I don't know who. (Abe (2015: 48))

(6b) and (6d) indicate that the standard sluicing construction, which does not involve topicalization, is island-insensitive. On the other hand, (6a) violates the complex NP

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island constraint and (6c), the adjunct island constraint (see Ross (1967)). According to Abe (2015), this is due to topicalization. Moreover, Abe (2015) argues that the ungrammaticality of the examples repeated in (7) can be derived from the fact that topicalization is impossible within embedded interrogative clauses, which is shown in (8).

- (7) a. *I wonder a picture of whom is on sale. (Abe (2015: 52))
 b. *I wonder a picture of whom you saw. (Abe (2015: 52))
 c. *I wonder a picture of whom you think is on sale. (Abe (2015: 52))
 d. *He has a picture of somebody, but I don't know a picture of whom.
 (Ross (1969: 262))
- (8) a. Fred asked where John had put the skates.
 b. *Fred asked where the skates John had put. (McCawley (1988: 492))

Under Abe's (2015) analysis, the *wh*-phrase undergoes covert *wh*-movement to satisfy the Q-feature carried by C and the *wh*-containing phrase independently undergoes overt topicalization to Spec, TopicP in the massive pied-piping construction. Crucially, assuming that both *wh*-phrases and topicalized phrases carry a [Focus] feature, Abe (2015) proposes a mechanism to determine which occurrence of a phrase bears a [PF] feature, as follows:²

- (9) The decision of which occurrence of a non-trivial chain carries its [PF] feature is made upon the completion of producing the chain involved, except for the case where a phrase carrying a feature F is properly contained in another phrase carrying F. In that case, the decision is postponed until both Fs are satisfied. (Abe (2015: 53))

According to Abe (2015), *wh*-movement is followed by topicalization of *wh*-

containing phrases in the massive pied-piping construction and both movements involve a [Focus] feature. Thus, it is yet to be determined which occurrence of the *wh*-phrase bears its [PF] feature immediately after the *wh*-phrase undergoes *wh*-movement and the decision is executed after the *wh*-containing phrase undergoes topicalization, according to (9). Using this mechanism, Abe (2015) gives an account of the (im)possibility of massive pied-piping in English.

First, let us consider (10a), which has the derivation in (10b-d), where angled brackets (e.g. in <[PF]>) indicate that both can be candidates for pronunciation, the carrier of the [PF] feature.

- (10) a. A picture of whom is on sale? (Abe (2015: 52))
 b. [_{TopicP} [_{CP} C_Q [_{TP} [a picture of whom] is on sale]]]
 c. [_{TopicP} [_{CP} <whom> C_Q [_{TP} [a picture of whom] is on sale]]]
 <[PF]> <[PF]>
 d. [_{TopicP} [a picture of whom]][_{CP} <whom> C_Q [_{TP} <a picture of
 [PF]
 whom> is on sale]]] (Abe (2015: 54))

In (10c), *whom* undergoes *wh*-movement from the subject position to Spec, CP. Since *a picture of whom*, which contains *whom*, carries a [Focus] feature like *whom*, no decision is made at this point regarding which occurrence of *whom* carries its [PF] feature. Next, in (10d), *a picture of whom* undergoes topicalization from the subject position to Spec, TopicP above CP. At this point, it is possible to determine which occurrences of *whom* and *a picture of whom* are pronounced because their [Focus] features are satisfied. Here, Abe (2015) assumes the following condition on copy pronunciation, which says that the overt movement is prohibited when it has no PF effect:

- (11) Given a chain $C = (\alpha_1, \dots, \alpha_n)$, the head of each link (α_i, α_j) cannot be pronounced unless it has an effect on PF output. (Abe (2015: 52))

If the head and tail of a chain produced by movement are adjacent, the movement is string-vacuous, i.e. has no PF effect. Then, the head must not be pronounced and the tail has a [PF] feature, in conformity with (11). In this connection, Abe (2015) also assumes that in a sequence of lexical strings $\beta\text{-}\alpha\text{-}\gamma$, β and γ are not adjacent to each other even if α is a member of a chain without a [PF] feature. Based on these assumptions, let us first look at how the copy pronunciation mechanism decides which copy of *a picture of whom* receives its [PF] feature in the representation in (10d). The two members of the chain of *a picture of whom* are not adjacent due to *whom* in Spec, CP in (10d), which means that the movement of *a picture of whom* can have a [PF] effect. Therefore, the upper occurrence of *a picture of whom* in Spec, TopicP is pronounced there rather than in the base-generated position. As for *whom*, the member of its chain in Spec, CP should not carry its [PF] feature because there are no interveners between it and the base-generated occurrence. It should be noted that the string *a picture of* does not count as an intervener between the two occurrences of *whom* because the string itself is not a member of the chain of *a picture of whom* but is just part of the member. Thus, the two occurrences of *whom* are adjacent to each other. Nevertheless, as discussed earlier, since the lower occurrence of the whole expression *a picture of whom* does not carry a [PF] feature, the lower occurrence of *whom* contained in it is also not pronounced. As a result, among the occurrences of *whom* and *a picture of whom*, only the upper copy of *a picture of whom* carries a [PF] feature. In this derivation, no crash occurs up to PF, which leads to the grammaticality of (10a).

Next, let us turn to (12a), which is ungrammatical and has the derivation in (12b-d), where T-to-C movement is omitted due to space limitations.

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- (12) a.?*A picture of whom did you see? (Abe (2015: 52))
b. [_{TopicP} [_{CP} C_Q [_{TP} you saw [a picture of whom]]]]
c. [_{TopicP} [_{CP} <whom> C_Q [_{TP} you saw [a picture of whom]]]]
 <[PF]> <[PF]>
d. [_{TopicP} [a picture of whom] [_{CP} <whom> C_Q [_{TP} you saw <a picture
 [PF] [PF]
of whom>]]] (Abe (2015: 56))

In (12c), *whom* undergoes *wh*-movement from the object position to Spec, CP. In (12d), *a picture of whom* undergoes topicalization from the object position to Spec, TopicP above CP. The decision of which occurrences of *whom* and *a picture of whom* bear their [PF] features is executed at this point, in accordance with (9). Regarding *a picture of whom*, the upper occurrence in Spec, TopicP carries its [PF] feature due to the interveners *whom you saw*. As for *whom*, the string *you saw* also serves as an intervener between its two occurrences; the upper *whom* is therefore designated as carrying a [PF] feature. Here, it should be noted that in (12d), the two occurrences of *whom* are required to be pronounced, resulting in linearization failure caused by a contradiction concerning the pronunciation of *whom*.³ Thus, the derivation crashes, i.e., (12a) becomes ungrammatical.

Finally, let us consider the derivation of the topicalized sluicing construction in (13a) within Abe's (2015) framework.

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- (13) a. He has a picture of somebody, but a picture of whom I don't know.
(Ross (1969: 281))
- b. [_{TopicP} [_{TP} I don't know [_{CP} C_Q [_{TP}_{Delete} he has [a picture of
whom]]]]]]
- c. [_{TopicP} [_{TP} I don't know [_{CP} <whom> C_Q [_{TP}_{Delete} he has [a picture
<[PF]> <[PF]>
of whom]]]]]]
- d. [_{TopicP} [a picture of whom] [_{TP} I don't know [_{CP} <whom> C_Q
[PF]
[_{TP}_{Delete} he has <a picture of whom>]]]]] (Abe (2015: 58))

In (13c), *whom* undergoes *wh*-movement from the object position to Spec, CP within the embedded clause, which is followed by topicalization of *a picture of whom* from the object position in the embedded clause to Spec, TopicP in the matrix clause, as illustrated in (13d). At this point, the decision of which occurrences of *whom* and *a picture of whom* carry their [PF] features can be made. Regarding *a picture of whom*, the upper occurrence, rather than the lower one, is pronounced because the occurrences are not adjacent to each other. As for *whom*, the members of its chain do not seem to be adjacent because of the intervening string *he has* between them. However, in this derivation, the embedded TP is assigned the label of [Delete] and will later be deleted at the PF interface. Consequently, this deletion eventually makes the two occurrences of *whom* adjacent, so that the movement of *whom* becomes covert in this sense, i.e., a contradiction in linear order concerning the pronunciation of *whom* does not arise, unlike in (12). Since it is contained in the non-pronounced copy of *a picture of whom* as in the case of (10), the lower copy of *whom* is not pronounced. The topicalized sluicing construction in (13a) is derived in this way. In the case where the embedded TP is not deleted, *whom* in Spec, CP in (13d) carries a [PF] feature, leading to the contradictory ordering statement that *whom* precedes and

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follows the string *I don't know*. As shown in (14), even if the copy of *whom* in Spec, CP is not pronounced, the resulting sentence is still ungrammatical.

- (14) *He has a picture of somebody, but a picture of whom I don't know he has. (Abe (2015: 59))

Although Abe's (2015) analysis is compelling in that it gives a unified account of the constructions involving massive pied-piping in English, Abels (2019) points out some problems with Abe (2015). First, let us take a look at (15) and (16).

- (15) a. ?Joe has a picture of Nixon, but a picture of Kennedy I don't know who has.
 b. ??Joe buys the New York Times, but read it I don't know who has. (Abels (2019: 1220))

- (16) a. *Joe has a picture of Nixon, but a picture of Kennedy I don't know who.
 b. *Joe buys the New York Times, but read it I don't know who. (Abels (2019: 1220))

In (15), *a picture of Kennedy* and *read it* are topicalized out of the interrogative embedded clauses. The examples of (16) illustrate that when sluicing is additionally involved, the grammaticality degrades compared to when it is not. Since Abe (2015) assumes that topicalization and sluicing are both involved in the massive pied-piping constructions in English, the ungrammaticality of (16) is problematic for his analysis.

Moreover, (17) also casts doubt on Abe's (2015) framework, wherein topicalization and *wh*-movement co-occur within a single clause. As pointed out by Abels (2019), topicalization cannot occur within interrogative clauses, as shown in (17) (see also Reinhart (1976)).

- (17) a. *These petunias, did John plant?
 b. *These petunias, when did John plant? (Abels (2019: 1220))

Finally, Abels (2019) raises Abe's (2015) theoretical problems. According to Abels (2019), the mechanism determining which occurrence of a phrase carries a [PF] feature is ad hoc. Furthermore, under the mechanism, (12a) is excluded due to the occurrences of *whom* in Spec, CP and within the topicalized phrase in Spec, TopicP both carrying [PF] features. However, Abe (2015: Chapter 2) assumes that the features that constitute a syntactic object, including a [PF] feature, are not copied in full form upon movement but are instead scattered over its occurrences (the topicalized sluicing construction is addressed in Chapter 4 of his book). Therefore, based on this assumption, if the copy of *whom* in the topicalized phrase in Spec, TopicP carries a [PF] feature, the copy of *whom* in Spec, CP should not carry a [PF] feature. Thus, the analysis of massive pied-piping in English proposed by Abe (2015) is at odds with the assumption on the feature composition of copies just mentioned.⁴

With these problems of Abe's (2015) analysis discussed so far in mind, let us turn to Abels (2019), who presents an alternative analysis of the topicalized sluicing construction.

2.2. Abels (2019)

As already mentioned in section 1, Abels (2019) refers to the topicalized sluicing construction in Abe (2015) as the "swamp construction" in the sense that neither topicalization nor sluicing (e.g. TP-deletion) is involved in its derivation.

- (18) He has a picture of somebody, but a picture of whom I don't know.
 (Ross (1969: 281))

Using a wealth of data in German, Abels (2019) demonstrates that the swamp

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construction shares more properties with contrastive left-dislocation than with topicalization. A standard example of contrastive left-dislocation in German is shown in (19).

- (19) Den Hans, den habe ich gesehen.
 the.M.SG.ACC Hans dPR.M.SG.ACC have I seen
 ‘Hans I have seen (him).’ (Abels (2019: 1212))

In (19), the phrase *den Hans* is dislocated at the sentence-initial position and is followed by what is called a d-pronoun (e.g. *den* in (19)), which agrees in case and ϕ -feature with the dislocated phrase. Moreover, a V3 order obtains by the verb *habe* ‘have’ following the d-pronoun.

Under Abels’ (2019) analysis, the swamp construction exemplified in (18) is derived from recursive contrastive left-dislocations and CP-deletion, as follows (the derivation is simplified here for ease of exposition.):

- (20) [CLD-P1 [CLD-P2 [a picture of whom]_i [_{CP2} [~~wh. dPR t_i]~~ he has t_k]]]_j
 [CP1 [dPR t_j]; I don’t know t_i]]
 (cf. Abels (2019: 1213))

In (20), *a picture of whom* is left-dislocated within the clausal complement of *know*, and the clausal complement of *know* itself is also left-dislocated to the sentence-initial position. That is, contrary to Abe (2015), Abels (2019) assumes that not a nominal element (e.g. *a picture of whom*) but a clausal element containing it (e.g. *a picture of whom he has*) moves to the sentence-initial position in the derivation of the swamp construction. Since *a picture of whom* and the clausal complement of *know* undergo left-dislocation, the d-pronouns corresponding to the dislocated phrases are left behind in the embedded Spec, CP and the matrix Spec, CP,

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respectively. According to Abels (2019), the d-pronoun in the matrix Spec, CP is null in English. On the other hand, the d-pronoun in the embedded Spec, CP in (20) must serve as not only a d-pronoun but also a *wh*-phrase because a *wh*-feature of the interrogative C is assumed to be checked by the d-pronoun within CP₂ instead of *whom*, which is too deeply embedded to check C's *wh*-feature. Abels (2019) assumes that such a pronoun however does not morphologically exist in English and German and the embedded CP containing such an offending morpheme must therefore be deleted in the swamp construction. In fact, the following sentence is ungrammatical due to the failure to realize the pronoun in question.

- (21) *He has a picture of somebody, but a picture of whom he has I don't know. (Ross (1969: 281))

As seen so far, Abels (2019) focuses on the swamp construction and attempts to explain its properties by reducing it to contrastive left-dislocation. However, Abels (2019) does not discuss massive pied-piping in simplex *wh*-interrogative sentences, which is accounted for by Abe (2015) along with the swamp construction, i.e. the topicalized sluicing construction in Abe's (2015) term. The relevant examples are repeated below as (22) and (23).

- (22) a.(?)A picture of which president does Jim own? (Cable (2010: 138))
 b.?*A picture of whom did you see? (Abe (2015: 52))
- (23) a. A picture of which president hangs in Jim's office?
 (Cable (2010: 138))
 b. A picture of whom is on sale? (Abe (2015: 52))

(22) and (23) indicate that in simplex *wh*-interrogative clauses, massive pied-piping of objects is illegitimate but that of subjects is legitimate. Under Abels' (2019)

contrastive left-dislocation approach, the ungrammaticality of (22) may be attributed to the presence of *wh.dPR*, which lacks its morphological counterpart. However, this analysis also incorrectly excludes (23), as demonstrated in (24):

(24) *[_{CLD-P} [a picture of whom]_j [_{CP} [*wh.dPR* *t_j*]_i *t_i* is on sale]]

This problem appears to have a solution if it is assumed that the subjects containing a *wh*-phrase remain in Spec, TP in (23) and do not undergo contrastive left-dislocation, as follows:

(25) [_{CP} C [_{TP} a picture of whom is on sale]]

Since the insertion of the morphologically unrealizable pronoun *wh.dPR* is not involved in this derivation, the examples in (23) are correctly predicted to be acceptable. However, given Abels' (2019) assumption that it is *wh.dPR* that satisfies a *wh*-feature on C rather than the contained *wh*-phrase, it is unclear how the deeply embedded *wh*-phrase can satisfy a *wh*-feature on C in the absence of *wh.dPR*. Moreover, as repeated below as (26), massive pied-piping is not allowed within embedded clauses even when it targets subjects.

(26) *I wonder a picture of whom is on sale. (Abe (2015: 52))

If Abels (2019) were to explain the ungrammaticality of (26), a possible explanation would have to have recourse to the property of contrastive left-dislocation: *wh.dPR* cannot be morphologically realized. Consequently, Abels' (2019) approach might require the assumption that in the case of (23), *a picture of whom* can stay in Spec, TP whereas in the case of (26), it cannot stay in Spec, TP and must somehow be left-dislocated. This poses a challenge for Abels (2019).

3. Proposal

3.1. Labeling Theory

This paper accounts for the distribution of massive pied-piping in English within the framework of labeling theory, which has been remarkably developed since Chomsky (2013, 2015). Labels must be assigned to SOs formed by Merge for interpretation at the interfaces. This paper adopts a labeling mechanism proposed by Suzuki (2023), who integrates Chomsky's (2013, 2015) Labeling Algorithm (LA) and Mizuguchi's (2019) ambiguous labeling. Under the system, labels are assigned to SOs in the following manner:

- | | | | |
|---------|---------------------------------------------|-------------------------|---------------------|
| (27) a. | $\{\alpha \text{ H, XP}\}$ | $\alpha = \text{H}$ | |
| b. | $\{\alpha \text{ XP, YP}\}$ | $\alpha = \text{XP/YP}$ | |
| c. | $\text{XP} \dots \{\alpha \text{ XP, YP}\}$ | $\alpha = \text{YP}$ | (Suzuki (2023: 91)) |

In (27a), α consists of the head H and the phrase XP and is assigned the label of H. In (27b), where α consists of the two phrases XP and YP, α is labeled as either XP or YP. Following Mizuguchi (2019), this labeling strategy is referred to as ambiguous labeling. In (27c), XP, which is one of the two phrases forming α , undergoes Internal Merge (IM). In this case, the lower copy of XP becomes invisible to the labeling process of α , so that YP becomes the label of α . Note that Chomsky (2013, 2015) and Mizuguchi (2019) have conflicting views on copy invisibility and labeling of XP-YP configurations. As shown in (27), Suzuki (2023) follows Chomsky (2013, 2015) in assuming that copies are invisible to labeling but agrees with Mizuguchi (2019) in that XP-YP configurations can be labeled, thus avoiding any labeling failure.

Suzuki (2013) assumes that labeling is applied to phasal complements (McInnerney (2022)) when SOs are transferred to the interfaces. Then, the assigned labels are evaluated at the Conceptual-Intentional (CI) interfaces (Mizuguchi

(2019)): for example, if they violate selectional requirements, they are ruled out. Phases are assumed to be vP and CP, so their complements VP and TP are labeled and transferred after they are completed. As discussed in sections 3.2 and 3.3, we also adopt a split CP structure (Rizzi (1997)). When CP is split, following Maeda (2010), we assume that the highest CP is a phase, but the transfer domain is TP rather than the complement of the highest CP.

Moreover, Suzuki (2023) proposes that copies of an SO are assigned the same label within a single transfer domain in an across-the-board manner, which she attributes to economy considerations and from which she derives copy invisibility (see Suzuki (2023) for details). This implies that if copies of an SO belong to different transfer domains, they can be labeled differently; otherwise, they cannot.⁵ This paper argues that this labeling mechanism enables us to offer a unified explanation of massive pied-piping in English.

3.2. Assumptions on Massive Pied-Piping in English

This subsection introduces several assumptions we make to construct a labeling-based analysis of massive pied-piping in English. First, following Abe (2015), we assume that the derivation of massive pied-piping involves *wh*-movement and topicalization. However, our assumption is different from that of Abe (2015), who assumes that *wh*-phrases alone first undergo *wh*-movement and then, *wh*-containing phrases undergo topicalization across the moved *wh*-phrases. Unlike Abe (2015), we assume that *wh*-containing phrases (e.g. *a picture of whom*) undergo both *wh*-movement and topicalization in massive pied-piping constructions. That is, the *wh*-containing phrases undergo movement to criterial positions twice. Note that this assumption does not seem viable at first sight but actually plausible and worth considering for the following reasons. First of all, Abels (2019) raises the impossibility of topicalization crossing *wh*-phrases (see (16) and (17)). However, there are counterexamples (see also Bošković (2008)):

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- (28) a. To Bill, what will you give for Christmas?
 b. And to Cynthia, what do you think you will send?
 c. For Fred, what are you going to buy?
 d. And on this shelf, what do you think we should put?
 e. And a book like this, to whom would you give?

(Delahunty (1983: 384, 385))

One might also wonder whether the assumed movement from one criterial position to another criterial position violates criterial freezing (Rizzi (2006)). We will return to this issue in section 4, where the issue of the apparent violation of criterial freezing is resolved. Thus, let us keep our assumption here.

Next, this paper assumes that *wh*-containing phrases form an XP-YP configuration in massive pied-piping constructions, as follows:⁶

$$(29) \quad \{\alpha \text{ XP}_{[\text{Top}]}, \text{YP}_{[\text{Q}]}\} \quad \alpha = \text{XP}_{[\text{Top}]} / \text{YP}_{[\text{Q}]}$$

(29) illustrates that one of the phrases forming α , XP, carries a [Top] feature while the other, YP, carries a [Q] feature. For example, in the case of *a picture of whom*, it is assumed that $\{\text{XP}_{[\text{Top}]} \text{ a picture}\}$ and $\{\text{YP}_{[\text{Q}]} \text{ of whom}\}$ form a set of $\{\text{XP}_{[\text{Top}]}, \text{YP}_{[\text{Q}]}\}$. Since ambiguous labeling is possible under the labeling mechanism adopted in this paper, α is labeled as either $\text{XP}_{[\text{Top}]}$ or $\text{YP}_{[\text{Q}]}$. On the other hand, to satisfy the criteria involving [Top] and [Q], one of the phrases must become the label of α to enter into a criterial relation with a corresponding one of the Cs composing the split CP (Rizzi (1996)). For example, if α is assigned the label of $\text{XP}_{[\text{Top}]}$ and occupies Spec, $\text{CP}_{[\text{Top}]}$, Topic Criterion can be met (e.g. (30a)), and if α is labeled as $\text{YP}_{[\text{Q}]}$ in Spec, $\text{CP}_{[\text{Q}]}$, Q-Criterion can be fulfilled (e.g. (30b)).

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- (30) a. $\{\{XP_{[Top]} XP_{[Top]}, YP_{[Q]}\}, \{CP C_{[Top]}, \dots\}$
 b. $\{\{YP_{[Q]} XP_{[Top]}, YP_{[Q]}\}, \{CP C_{[Q]}, \dots\}$

Then, the two criterial configurations are permitted to be constructed in a single derivation when such an XP-YP configuration as in (29) is formed in the derivation.

3.3. Analysis

In this subsection, we illustrate how the distribution of massive pied-piping in English is accounted for under Suzuki's (2023) labeling mechanism.

First, let us consider (31), which shows that a *wh*-containing object cannot be a target of massive pied-piping in simplex *wh*-interrogative clauses.

- (31) a.(?)A picture of which president does Jim own? (Cable (2010: 138))
 b.?*A picture of whom did you see? (Abe (2015: 52))

This paper analyzes (31) as having the following derivation, wherein transferred domains are boxed and lower copies are shaded.

- (32) a. $\{\alpha \{DP_{[Top]} \text{ a picture}\}, \{PP_{[Q]} \text{ of whom}\}\}$
 b. $\{\{\alpha_1 DP_{[Top]}, PP_{[Q]}\}, \{\text{you}, \{v, \dots\}\}\}$
 c. $\{\{\alpha_2 DP_{[Top]}, PP_{[Q]}\}, \{C_{[Q]}, \{\text{you}, \{T, \{\{\alpha_1 DP_{[Top]}, PP_{[Q]}\}, \{\text{you}, \{v, \dots\}\}\}\}\}\}\}$
 d. $\{\{\alpha_3 DP_{[Top]}, PP_{[Q]}\}, \{C_{[Top]}, \{\{\alpha_2 DP_{[Top]}, PP_{[Q]}\}, \{C_{[Q]}, \{\text{you}, \{T, \{\{\alpha_1 DP_{[Top]}, PP_{[Q]}\}, \{\text{you}, \{v, \dots\}\}\}\}\}\}\}\}$
 e. $\{\{\alpha_3 DP_{[Top]}, PP_{[Q]}\}, \{C_{[Top]}, \{\{\alpha_2 DP_{[Top]}, PP_{[Q]}\}, \{C_{[Q]}, \dots\}\}\}$

In (32a), DP *a picture* and PP *of whom* form a set of α , which is then merged as a complement of the verb, with the resulting set labeled with the verb upon transfer.

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In (32b), α undergoes IM to the νP edge (the copy of α occupying Spec, νP is notated with α_1 for ease of explanation). Next, in (32c), α undergoes IM to the first criterial position, Spec, $\text{CP}_{[\text{Q}]}$ (the copy of α occupying the first criterial position is notated with α_2). Subsequently, in (32d), α undergoes further IM to the second criterial position, Spec, $\text{CP}_{[\text{Top}]}$ (the copy of α occupying the second criterial position is notated with α_3). Since the CP phase is completed at this stage, TP is transferred, which means that the SOs contained in TP are labeled. Let us consider the labeling of α_1 . Because ambiguous labeling can apply to α_1 and the labeling outcome at the νP edge is not subject to any CI requirements, either DP or PP can become the label of α_1 (or it might be the case that the intermediate copy α_1 is eliminated from the LF representation). Finally, in (32e), the remaining structure is transferred and the SOs contained in the domain are labeled. Based on the assumption that copies of an SO are assigned the same label within a single transfer domain under our labeling system, it follows that both α_2 and α_3 are labeled as DP or are labeled as PP. Then, one of the relevant criteria, Topic Criterion or Q-Criterion cannot be satisfied because one of the phrases carrying a [Top] or [Q] feature cannot form a criterial relation with a relevant C, causing the derivation to a crash.⁷

Next, let us consider the case of massive pied-piping with subjects, which is allowed in simplex *wh*-interrogatives.

- (33) a. A picture of which president hangs in Jim's office? (Cable (2010: 138))
 b. A picture of whom is on sale? (Abe (2015: 52))

As further confirmation, we can add the following examples where massive pied-piping of *wh*-containing subjects is always possible, regardless of the type of verb:

- (34) a. A picture of whom hung over the table? *unaccusative*

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- b. A picture of whom fell out of his backpack?
- c. A picture of whom was taken by the famous photographer? *passive*
- d. A picture of whom was sent to Mary by John?
- e. A picture of whom brought tears to her eyes? *transitive*
- f. A picture of whom jogged his memory?

(33) is analyzed as in (35).

- (35) a. $\{\{DP_{[Top]} \text{ a picture}\}, \{PP_{[Q]} \text{ of whom}\}\}$
 b. $\{\{\alpha_1 DP_{[Top]}, PP_{[Q]}\}, \{v, \dots\}\}$
 c. $\{\{\alpha_2 DP_{[Top]}, PP_{[Q]}\}, \{T, \{\{\alpha_1 DP_{[Top]}, PP_{[Q]}\}, \{v, \dots\}\}\}\}$
 d. $\{\{\alpha_3 DP_{[Top]}, PP_{[Q]}\}, \{C_{[Q]},$
 $\quad \{\{\alpha_2 DP_{[Top]}, PP_{[Q]}\}, \{T_{[Top]}, \{\{\alpha_1 DP_{[Top]}, PP_{[Q]}\}, \{v, \dots\}\}\}\}\}$
 e. $\{\{\alpha_3 DP_{[Top]}, PP_{[Q]}\}, \{C_{[Q]}, \dots\}$

In (35b), α , which consists of DP and PP, undergoes EM to vP . In (35c), α undergoes IM from the vP edge to the subject position. In (35d), α undergoes further IM from the subject position to Spec, CP. Notice that in this case, C is not split because following Tanigawa (2018), this paper assumes that a [Top] feature can be inherited from C by T. Then, if α_2 is labeled as DP after the CP phase is completed, and its complement is transferred at the stage of (35d), Topic Criterion can be met by forming a local structural relation between $DP_{[Top]}$ and $T_{[Top]}$. Given that copies of an SO receive the same label in an across-the-board manner within a single transfer domain, α_1 is also labeled as DP and thus can satisfy the vP 's selectional requirement. In (35e), Q-Criterion is met by labeling α_3 as PP. As a result, this derivation converges.^{8,9,10}

Recall here that subjects are not always eligible for the target of massive pied-piping, as shown in (36), where the embedded subject *a picture of whom* is preposed

to the sentence-initial position.

(36)?* A picture of whom do you think is on sale? (Abe (2015: 52))

Under our labeling-based analysis of massive pied-piping, (36) can be analyzed in the same way as the case of massive pied-piping of objects: the set of $\{\{DP_{[Top]}$ picture $\}, \{PP_{[Q]}$ of whom $\}\}$ undergoes IM to the first criterial position in Spec, CP in the matrix clause and then, undergoes further IM to the second criterial position in a higher Spec, CP. The two criterial positions are contained within a single transfer domain, which means that the two copies of the set are uniquely labeled as $DP_{[Top]}$ or $PP_{[Q]}$ and thus, one of the relevant criteria cannot be met, resulting in the ungrammaticality of (36).

Furthermore, recall that in embedded clauses, massive pied-piping is always impossible:

- (37) a. *I wonder a picture of whom is on sale.
 b. *I wonder a picture of whom you saw.
 c. *I wonder a picture of whom you think is on sale. (Abe (2015: 52))

As also argued by Abe (2015), this can be reduced to the impossibility of topicalization in embedded interrogative clauses. The relevant examples in (8) are repeated in (38).

- (38) a. Fred asked where John had put the skates.
 b. *Fred asked where the skates John had put. (McCawley (1988: 492))

Finally, let us consider the massive pied-piping construction involving clausal ellipsis, i.e. what has been called the “topicalized sluicing construction” in Abe’s

(2015) term or the “swamp construction” in Abels’ (2019) term. As shown in (39), massive pied-piping of the *wh*-containing object from within the embedded clause to the matrix CP edge is allowed when ellipsis of an embedded clause is involved; but when it stays at the embedded CP edge, the resulting sentence is still unacceptable even if ellipsis is involved.

- (39) a. He has a picture of somebody, but a picture of whom I don’t know
~~he has.~~ (Ross (1969: 281))
- b. *He has a picture of somebody, but I don’t know a picture of whom
~~he has.~~ (Ross (1969: 262))

The ungrammaticality of (39b) is readily accounted for: it is reduced to the impossibility of topicalization in embedded interrogative clauses (e.g. (38)). Then, how does our analysis account for (39a)? We analyze (39a) as having the following derivation:¹¹

- (40) a. {know, {{ α_1 DP_[Top], PP_[Q]}, {C_[Q], ... }}}
- b. {{ α_2 DP_[Top], PP_[Q]}, {I, {v,
{know, {{ α_1 DP_[Top], PP_[Q]}, {C_[Q], ... }}}}}}}
- c. {{ α_3 DP_[Top], PP_[Q]}, {C_[Top],
{I, {T, {{ α_2 DP_[Top], PP_[Q]}, {I, {v, ... }}}}}}}
- d. {{ α_3 DP_[Top], PP_[Q]}, {C_[Top], ...}}

In (40a), α undergoes IM from the complement position to the embedded Spec, CP, which is the first criterial position. In (40b), α undergoes IM to the matrix *vP* edge. Then, the matrix *vP* phase is completed and its complement is transferred. α_1 constitutes an ambiguous labeling configuration, but PP_[Q] must become the label of α_1 rather than DP_[Top] because *know* in this case should select an interrogative clause

(the embedded clause in (39a) is interpreted in almost the same way as (*I don't know who he has a picture of*). Next, in (40c), α undergoes IM to the matrix Spec, CP and TP is transferred after the completion of CP. As for the labeling of α_2 , the Spec, ν P position is not subject to any requirements at the CI interface, so in this respect, either DP or PP can be the label of α_2 . In (40d), α_3 is transferred and labeled. The labeling outcome is ruled in if DP is selected as the label of α_3 because Q-Criterion has already been satisfied in the embedded Spec, CP and Topic Criterion therefore remains to be satisfied in the matrix Spec, CP. Since the two criterial positions belong to separate transfer domains in this case, massive pied-piping becomes possible.

As discussed so far, in our proposed analysis, massive pied-piping constructions in English are required to meet both Topic Criterion and Q-Criterion by moving the same *wh*-containing phrase to two criterial positions. That is, the set of $\{XP_{[Top]}, YP_{[Q]}\}$ must be labeled differently at the two criterial positions so that each phrase enters into a criterial relation with a relevant C head (or instead, T, when it inherits a [Top] feature from C). This doubly-labeled configuration is derived from Suzuki's (2023) labeling mechanism: if the two criterial positions belong to separate transfer domains, it is possible that in one transfer domain, the set of $\{XP_{[Top]}, YP_{[Q]}\}$ receives the $XP_{[Top]}$ label while in another transfer domain, it receives the $YP_{[Q]}$ label. In this way, we can account for in terms of labeling (i) the subject/object asymmetry in the possibility of massive pied-piping in simplex *wh*-interrogative clauses and (ii) the topicalized sluicing (swamp) construction.

Recall, however, that (39a) is not allowed if ellipsis is not involved (see (14)). The issue regarding the obligatoriness of ellipsis will be briefly addressed in section 4.3, where we suggest that sluicing might be required by an independent morpho-syntactic factor.

4. Avoiding a Violation of Criterial Freezing

4.1. Criterial Freezing

This section addresses the issue of criterial freezing that might pose a problem for our analysis. It is defined by Rizzi (2006) as follows:

(41) *Criterial Freezing*

A phrase meeting a criterion is frozen in place. (Rizzi (2006: 112))

(41) indicates that the phrase moved to a criterial position cannot undergo further movement. For example, the ungrammaticality of (42b) is explained as violating (41).

(42) a. Bill wonders [which book C_Q [she read t]]

b. *Which book C_Q does Bill wonder [t' C_Q [she read t]]?

(Rizzi (2006: 112))

In (42b), *which book* undergoes *wh*-movement twice: after undergoing IM to the embedded *wh*-criterial position, *which book* undergoes further IM to the matrix *wh*-criterial position. Since, in accordance with (41), *which book* is frozen when it reaches the embedded Spec, CP, its further movement is banned, giving rise to the ungrammaticality of (42b).

Adopting Chomsky's (2013, 2015) LA, Rizzi (2015a, b, 2017) has recently argued that criterial freezing can be deduced from the following syntactic condition:

(43) *Maximality*

Only maximal objects with a given label can be moved.

(Rizzi (2015a: 327))

Under Chomsky's (2013, 2015) LA and the maximality condition in (43), (42b) is

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analyzed as having the structure in (44).

$$(44) \quad \{Q \{Q \{Q \text{ which}\}, \{n \text{ book, n}\}\}, \{Q \text{ Q}, \{I \text{ Bill read } _ \}\}\}$$

←—————*

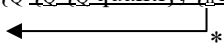
(cf. Rizzi (2015a: 328))

In (44), the set of $\{Q \{Q \text{ which}\}, \{n \text{ book, n}\}\}$ is assigned the Q label and undergoes IM from the complement position of *read* and lands at the specifier position of the phrase headed by Q corresponding to the embedded C head. Though XP-YP configurations cannot be labeled as either XP or YP under Chomsky's (2013, 2015) LA, taking the strategy of feature sharing enables the embedded clause to be labeled with the shared feature Q. Note that in this structure, the maximal object with the Q label is the entire embedded clause. That is, the set of $\{Q \text{ which book}\}$ becomes a non-maximal Q-labeled object derivationally and hence not movable. Thus, further movement of $\{Q \text{ which book}\}$ is banned due to (43), leading to a criterial freezing effect.

Furthermore, the ungrammaticality of (45b), where *quanti ARTICOLI* 'how many ARTICLES' undergoes focus movement after *wh*-movement, is also explained as violating the maximality condition.

- (45) a. Non so [quanti ARTICOLI] Q abbiamo pubblicato _, non quanti libri
 'I don't know how many ARTICLES they have published, not how many books'
- b. *[Quanti ARTICOLI] Foc non so _ Q abbiamo pubblicato _, non
 quanti libri
 'How many ARTICLES I don't know they have published, not how many books' (Rizzi (2017: 6))

Rizzi (2017) analyzes (45b) as having the following structure:

- (46) $\{Q \{Q \{Q \text{ quanti} \}, \{n \text{ ARTICOLI}_{\text{Foc n}}\} \}, \{Q \text{ Q}, \{\text{abbiano pubblicato } _ \}\}\}$

(Rizzi (2017: 17))

In (46), the set of $\{quanti \text{ ARTICOLI}\}$ undergoes IM to the phrase headed by Q and the resulting structure is labeled as Q. As a result, further movement of $\{quanti \text{ ARTICOLI}\}$, namely focalization, is derivationally blocked by maximality.¹²

Now, we need to reconsider our analysis of massive pied-piping in terms of criterial freezing/the maximality condition. The relevant examples are repeated in (47).

- (47) a. A picture of which president hangs in Jim's office?
(Cable (2010: 138))
- b. He has a picture of somebody, but a picture of whom I don't know.
(Ross (1969: 281))

Recall that this paper has proposed that the fronted *wh*-containing phrase *a picture of whom* undergoes topicalization and *wh*-movement. The derivations illustrated in (35) and (40) are repeated below:

- (48) *the derivation of (47a)*
- a. $\{\{DP_{[\text{Top}]}$ a picture $\}, \{PP_{[Q]}$ of whom $\}\}$
 - b. $\{\{\alpha_1 DP_{[\text{Top}]}$, $PP_{[Q]}\}, \{v, \dots \}\}$
 - c. $\{\{\alpha_2 DP_{[\text{Top}]}$, $PP_{[Q]}\}, \{T, \{\{\alpha_1 DP_{[\text{Top}]}$, $PP_{[Q]}\}, \{v, \dots \}\}\}\}$
 - d. $\{\{\alpha_3 DP_{[\text{Top}]}$, $PP_{[Q]}\}, \{C_{[Q]}$,
 $\{\{\alpha_2 DP_{[\text{Top}]}$, $PP_{[Q]}\}, \{T_{[\text{Top}]}$, $\{\{\alpha_1 DP_{[\text{Top}]}$, $PP_{[Q]}\}, \{v, \dots \}\}\}\}\}$
 - e. $\{\{\alpha_3 DP_{[\text{Top}]}$, $PP_{[Q]}\}, \{C_{[Q]}$, $\dots\}$

(49) *the derivation of (47b)*

- a. {know, {{_{a1} DP_[Top], PP_[Q]}, {C_[Q], ... }}}
- b. {{_{a2} DP_[Top], PP_[Q]}, {I, {v,
{know, {{_{a1} DP_[Top], PP_[Q]}, {C_[Q], ... }}}}}}}
- c. {{_{a3} DP_[Top], PP_[Q]}, {C_[Top],
{I, {T, {{_{a2} DP_[Top], PP_[Q]}, {I, {v, ... }}}}}}}}
- d. {{_{a3} DP_[Top], PP_[Q]}, {C_[Top], ...}}

If our proposal is on the right track, it follows that the examples in (47) somehow void a criterial freezing effect because we assume that it involves movement between two criterial positions. In the next subsection, discarding the maximality condition and adopting Maeda's (2019) feature-relativized criterial freezing, we argue that massive pied-piping in English avoids a violation of criterial freezing. Furthermore, in section 4.3, we attempt to account for the ungrammaticality of the type of example in (45b) without utilizing the maximality condition. This also leads to an explanation of the contrast in (39), repeated in (50), which shows that the ellipsis of the embedded clause is obligatory in the topicalized sluicing/swamp construction.

- (50) a. *He has a picture of somebody, but a picture of whom I don't know
 he has. (Abe (2015: 59))
- b. He has a picture of somebody, but a picture of whom I don't know
~~he has~~. (Ross (1969: 281))

4.2. Feature-Relativized Criterial Freezing

Modifying Rizzi's (2006) criterial freezing, Maeda (2019) proposes feature-relativized criterial freezing as an alternative definition of criterial freezing, which is stated in (51).

(51) *Feature-Relativized Criterial Freezing*

Criterial freezing is sensitive to exhaustive satisfaction of criterial features. (Maeda (2019: 4))

In light of this definition, (52a) is ruled out while (52b) is ruled in.

- (52) a. * $XP_\alpha \dots \{XP_\alpha, C_\alpha\}$
 b. $XP_{\alpha, \beta} \dots \{XP_{\alpha, \beta}, C_\alpha\}$ (cf. Maeda (2019: 11))

(52a) shows that XP carrying a single criterial feature α cannot undergo IM from a criterial position headed by C_α because of the lack of motivation for further movement. On the other hand, (52b) indicates that XP carrying multiple criterial features can undergo IM from one criterial position to another criterial position: after satisfying α -Criterion at Spec, CP_α , XP can undergo IM to satisfy β -Criterion.

The case of (52a) illustrated by (42b) is repeated in (53).

- (53) *Which book C_Q does Bill wonder [t' C_Q [she read t]]?
 (Rizzi (2006: 112))

In (53), *which book* is prohibited from undergoing IM to the matrix C_Q because Q-Criterion has already been satisfied at the position headed by C_Q in the embedded clause.

According to Maeda (2019), the following Japanese sentences including *wh-sae* illustrate the case of (52b).

- (54) a. [Kenta-wa [nani-sae tabere ba]yorokobu no]?
 Kenta-TOP what-at.least eat if glad Q
 ‘What is it that Kenta is glad if he at least eats?’

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- b. Yuki-wa [[Kenta-ga nani-sae tabeta ka]wakare ba]
 Yuki-TOP Kenta-NOM what-at.least ate Q know if
 manzoku desu.
 satisfied is
 ‘Yuki is satisfied if she knows what Kenta at least ate.’

(Maeda (2019: 12))

In (54), *wh-sae*, ‘what-at.least’ in English, is analyzed as having multiple criterial features and undergoing IM from a criterial position to another. Kusumoto (2001) assumes that DP-*sae* ‘at least DP’ has a [*sae*] feature, which is licensed when the *sae*-containing phrase covertly moves to Spec, CP headed by *ba* ‘if.’ Thus, *wh-sae* has [Q] and [*sae*] features and satisfies the relevant criteria by covert movement. In (54a), *wh-sae* undergoes covert IM to the embedded CP headed by *ba* to license a [*sae*] feature, and subsequently moves covertly to the matrix C_Q. In (54b), *wh-sae* undergoes covert IM to the embedded C_Q, undergoing further covert IM to the matrix CP headed by *ba*. In both cases, further movement of *wh-sae* from a criterial position is possible because it is motivated by the need to satisfy another criterial feature, different from the one already satisfied. In this way, Maeda (2019) argues that feature-relativized criterial freezing operates on movement, regardless of whether it is overt or covert. However, according to Maeda (2019), Rizzi’s (2015a, b, 2017) maximality condition is still necessary for overt movement because (45b), repeated in (55), cannot be excluded by feature-relativized criterial freezing alone since the moved phrase have two criterial features.

- (55) *[Quanti ARTICOLI] Foc non so _ Q abbiamo pubblicato _, non quanti
 libri
 ‘How many ARTICLES I don’t know they have published, not how
 many books’ (Rizzi (2017: 6))

Thus, under Maeda's (2019) analysis, movement from a criterial position to another criterial position is only possible when all the relevant movements are covert, as in (54).

Contrary to Maeda (2019), however, this paper discards the maximality condition imposed on overt movement and explores the possibility that criterial freezing is entirely attributed to Maeda's (2019) feature-relativized criterial freezing. Consequently, the grammatical examples of massive pied-piping like (47), repeated in (56), do not violate criterial freezing in the sense that because the massively pied-piped expression {XP, YP} in the construction has multiple criterial features, namely [Q] and [Top] features, under our labeling-based analysis.

(56) a. A picture of which president hangs in Jim's office?

(Cable (2010: 138))

b. He has a picture of somebody, but a picture of whom I don't know.

(Ross (1969: 281))

Furthermore, this proposed analysis accounts for the contrast shown in (57) and (58). As shown in (57), *wh*-movement can apply to a clefted expression in *it*-cleft constructions. On the other hand, focus movement cannot target the same expression, as shown in (58).

(57) a. What colour was it that her eyes were?

b. To whom was it that you gave the vodka? (Reeve (2011:169))

(58) a.?*Green it was that her eyes were.

b.??To John it was that I gave the vodka. (Reeve (2011:169))

Given that a clefted phrase has a [Foc] feature and satisfies Focus Criterion at the cleft position immediately following *it* + a copula, the difference regarding the

grammaticality between (57) and (58) can be accounted for by assuming feature-relativized criterial freezing: in (57), the clefted phrases can undergo further IM to the sentence-initial position because of a [Q] feature, while in (58), since the sentence-initial expressions have already had their [Foc] features satisfied at the cleft position, the clefted phrases cannot undergo further focus movement from there, leading to a violation of feature-relativized criterial freezing.¹³

4.3. Apparent Criterial Freezing Effects

So far, we have argued that Rizzi's (2015a, b, 2017) maximality condition should be discarded and Maeda's (2019) feature-relativized criterial freezing suffices to account for freezing effects. However, the unacceptability of (45b), repeated in (59), is not attributable to Maeda's (2019) feature-relativized criterial freezing, and thus seems to constitute evidence for the maximality condition. In this subsection, we demonstrate that (59) can be explained without recourse to the maximality condition.

- (59) *[Quanti ARTICOLI] Foc non so _ Q abbiano pubblicato _, non quanti libri
 'How many ARTICLES I don't know they have published, not how many books' (Rizzi (2017: 6))

There is good evidence that (59) does not violate the maximality condition. Let us examine (60), where (60a) is the English counterpart of (59).¹⁴

- (60) a. *They have published articles and books, but how many ARTICLES I don't know they have published, not how many books.
 b. They have published articles and books, but how many ARTICLES I don't know ~~they have published~~, not how many books.

The contrast in (60) demonstrates that the grammaticality of (60a) improves when clausal ellipsis is applied as in (60b). Therefore, if (60a) were to be an example of a violation of the maximality condition, (60b) would also be ungrammatical. This fact suggests that the ungrammaticality of (60a) comes from a different reason than a violation of the maximality condition and can be ameliorated by ellipsis of the embedded clause. Thus, we cannot rely on the maximality condition to explain the ungrammaticality of (59) and (60a). Based on this discussion, we conclude that positing Maeda's (2019) feature-relativized criterial freezing alone is sufficient for explaining criterial freezing phenomena.

Then, regarding the ungrammaticality of (59) and (60a), we argue that it might be attributed to a morpho-syntactic condition unique to *wh*-interrogative clauses: typically, embedded *wh*-interrogative clauses must be overtly marked by *wh*-phrases in CP_[Q]. However, in the absence of such overt *wh*-phrases, e.g. if the *wh*-phrases undergo IM from the embedded clauses that they take scope over, as in (60a), they must be marked as such by an alternative way. The crucial point here is that sluicing, which only occurs in *wh*-interrogative clauses, is often analyzed to be licensed by *wh*-phrases in Spec, CP_[Q] (see e.g. Lobeck (1995) and Merchant (2001), among others). Given this, we suggest that this type of ellipsis indirectly serves as marking clauses as *wh*-interrogatives, giving rise to the amelioration effect in (60b). While the *wh*-containing object *how many ARTICLES* undergoes IM from the embedded Spec, CP_[Q] in (60b), we assume that its remaining copy there is still a licenser for sluicing, the type of ellipsis that can then “overtly” mark the embedded clause as a *wh*-interrogative. At this moment, we leave a detailed account of this matter for future research. However, it should be noted in passing that a contrast like (60) can also be found in the topicalized sluicing/swamp construction, as follows:

- (61) a. *He has a picture of somebody, but a picture of whom I don't know
 he has. (Abe (2015: 59))

- b. He has a picture of somebody, but a picture of whom I don't know
~~he has~~. (Ross (1969: 281))

In (61), just as in (60), the embedded clauses are interpreted as interrogative, and massive pied-piping of the embedded objects to the matrix CP is possible only when clausal ellipsis is involved.¹⁵ In light of the similarities between (60) and (61), it is reasonable to consider that the necessity of ellipsis in (60) and (61) actually can be attributed to the unique property of the embedded interrogative clause in English, the details of which, however, remain to be worked out.¹⁶

5. Conclusion

This paper has proposed that in massive pied-piping in English, non-*wh*-phrases undergo both topicalization and *wh*-movement. Integrating this assumption with Suzuki's (2023) labeling mechanism, we have argued that in possible cases of massive pied-piping, the copies of the moved phrase can meet both Topic and Q-Criteria because they belong to separate transfer domains and can therefore be assigned different labels; conversely, in impossible cases of massive pied-piping, one of the two criteria cannot be met because the relevant copies are included in a single transfer domain and therefore automatically receive the same label.

Moreover, we have addressed the issue of criterial freezing. In this respect, we have argued that feature-relativized criterial freezing proposed by Maeda (2019) alone is sufficient for explaining criterial freezing phenomena. Therefore, massive pied-piping in English can be legitimately derived without yielding criterial freezing effects.

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Notes

1) (1a), repeated in (ia), is marked with (?) to indicate its marginality, and contrasted with the worse examples (ib, c) marked with *.

- (i) a. (?) A picture of which president does Jim own?
- b. *No picture of which president does Jim own?
- c. *Only picture of which president does Jim own? (Cable (2010: 138))

In contrast, as shown in (2a), repeated in (ii), massive pied-piping of subjects is perfectly possible, which means that (ia) and (ii) clearly differ in grammaticality.

- (ii) A picture of which president hangs in Jim's office? (Cable (2010: 138))

2) Abe (2015) simply assumes [Focus] features as triggering movement of a phrase. That is, carrying a [Focus] feature does not entail that the phrase with a [Focus] feature receives a focus interpretation. Rather, the interpretation of the phrase depends on its position: if it occupies Spec, TopicP, it receives a topic interpretation. Thus, according to Abe (2015), a [Focus] feature can be rephrased as [A'] or [Operator] features.

3) One might wonder whether *whom* within Spec, TopicP does not carry a [PF] feature

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because it is adjacent to *whom* in Spec, CP in (12d). However, the two occurrences do not produce a chain by movement. Thus, both can carry a [PF] feature independently.

4) Abels (2019) further discusses the problems of Abe (2015). For example, although Abe (2015) argues that what is preposed to the sentence-initial position in the topicalized sluicing construction is DP, Abels (2019) presents evidence supporting the claim that it is CP (see Abels (2019) for details). However, following Abe (2015), this paper still assumes that the preposed constituent is DP. We leave this issue for future research.

5) Using the assumption, Suzuki (2023) argues that in degree fronting constructions and discontinuous spellout constructions, a copy of the moved phrase at the final landing site is labeled differently from the original copy at the base-generated site due to the mismatch of the selectional and clausal typing requirements. See section 5.1 in Suzuki (2023) for detailed discussion.

6) One might argue that *wh*-containing phrases in massive pied-piping should have the following structure rather than {XP, YP}.

(i) {a, {picture, {of, {who}}}}

(i) illustrates that the indefinite article *a* is merged to {picture, {of, {whom}}}, which is formed by merging *picture* with *of whom*. However, let us consider the following example, where the phrase *which picture* is separated from the phrase *of who* through movement.

(ii) Which picture have you chosen of who? (Radford (2016: 378))

Given that only constituents are movable, the example in (ii) will be supportive evidence

for the assumption that *wh*-containing phrases in massive pied-piping form an XP-YP configuration. Note in passing that we do not analyze *of who* in (ii) as occupying the complement position of the verb because, if so, it would violate the verb's selectional requirement. Therefore, in this regard, we argue that *of who* occupies a higher position than the complement position of the verb.

7) The following example seems to be problematic for our analysis.

- (i) A: He has a picture of somebody.
 B: Oh, a picture of whom?
 B': *A picture of whom does he have? (Abe (2015: 50))

In (iB), *he has* is omitted and *a picture of whom* remains as a remnant. If *a picture of whom* were to be moved to the sentence-initial position, our analysis would incorrectly predict that (iB) is ungrammatical, like (iB'). Following Bechhofer (1976), we assume that in (iB), movement of *a picture of whom* does not take place and non-constituent deletion is applied, as follows:

- (ii) Oh, ~~he has~~ a picture of whom?

If *a picture of whom* does not undergo IM, (iB) does not become an obstacle to our analysis. Furthermore, the following example provides support for the in-situ analysis of (iB).

- (iii) A: He doesn't have any pictures of John.
 B: Any pictures of whom?

(iii) shows that the negative polarity item *any (pictures of whom)* is properly bound and

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licensed by the negation, which means that its movement does not occur.

However, at this moment, questions remain about why there is no need for movement of the *wh*-phrase and how the in-situ *wh*-phrase is interpreted in (ii). We will leave these matters for future research.

8) One might wonder why a [Top] feature rather than a [Q] feature must be inherited by T from C. Let us demonstrate what happens if a [Q] feature is inherited by T instead of a [Top] feature. (35d) is repeated in (i):

- (i) $\{\{\alpha_3 \text{DP}_{[\text{Top}]}, \text{PP}_{[\text{Q}]}\}, \{\text{C}_{[\text{Q}]},$
 $\boxed{\{\{\alpha_2 \text{DP}_{[\text{Top}]}, \text{PP}_{[\text{Q}]}\}, \{\text{T}_{[\text{Top}]}, \{\{\alpha_1 \text{DP}_{[\text{Top}]}, \text{PP}_{[\text{Q}]}\}, \{v, \dots\}\}\}\}}\}$

If T inherits a [Q] feature, α_2 must be labeled as $\text{PP}_{[\text{Q}]}$ to satisfy Q-Criterion. Then, since α_1 belongs to the same transfer domain as α_2 , it also receives the $\text{PP}_{[\text{Q}]}$ label. However, at the CI interface, v is required to select $\text{DP}_{[\text{Top}]}$ as the subject. Thus, the outcome of labeling, the $\text{PP}_{[\text{Q}]}$ label of α_1 , violates the v 's selectional requirement. Therefore, only the option of [Top] feature inheritance enables the derivation to converge.

9) If a [Top] feature is not inherited by T and remains in C, $\{\text{DP}_{[\text{Top}]}, \text{PP}_{[\text{Q}]}\}$ must undergo movement twice within a single transfer domain, i.e. to Spec, $\text{CP}_{[\text{Q}]}$ and to Spec, $\text{CP}_{[\text{Top}]}$, to satisfy both Topic and Q-Criterion. Such a derivation is excluded in the same way as the case of massive pied-piping of the *wh*-containing objects. See the explanation of (32).

10) We should consider the possibility that the set of $\{\{\text{DP}_{[\text{Top}]}, \text{PP}_{[\text{Q}]}\}, \{\text{DP}, \text{PP}_{[\text{Q}]}\}\}$ is formed in such a way that PP has a [Q] feature while DP does not have a [Top] feature, because it seems to be able to undergo massive pied-piping as well: in such a case, since there is no need to satisfy Topic Criterion, $\{\text{DP}, \text{PP}_{[\text{Q}]}\}$ only satisfies Q-Criterion and is

thus labeled only once as $PP_{[Q]}$ when transferred. Thus, it would wrongly be predicted that massive pied-piping is applicable to such a *wh*-containing object, contrary to fact. On this point, we argue that if a *wh*-containing object DP lacks a [Top] feature, massive pied-piping of the object is excluded by economy considerations: for the purpose of satisfying the Q-Criterion, it is unnecessary for DP to move along with $PP_{[Q]}$ (conversely, the sole movement of $PP_{[Q]}$ is only permitted, as in the sentence *of whom did you see a picture?* (Ike-uchi (1996: 533)). Therefore, massive pied-piping of *wh*-containing objects is still excluded when they do not carry a [Top] feature.

Let us turn to the cases of massive pied-piping of *wh*-containing subjects. Regarding the subjects, unlike the objects, the sole movement of $PP_{[Q]}$ is excluded independently (i.e. subject condition (Chomsky (1973))). Given this, one might wonder whether massive pied-piping of subjects is possible even when they lack a [Top] feature because the entire subject of {DP, $PP_{[Q]}$ } can be the smallest movable constituent instead of $PP_{[Q]}$. However, we assume that the banned movement of $PP_{[Q]}$ is still the most economical and thus only option to satisfy the criterion at hand and its impossibility does not enable {DP, $PP_{[Q]}$ } to move. Therefore, under our analysis, massive pied-piping of {DP, { $PP_{[Q]}$ }} is uniformly banned for economy reasons.

11) One might wonder whether (37a) can be derived from (i), where *a picture of whom* undergoes IM within the embedded clause and the embedded clause itself is preposed to the sentence-initial position.

- (i) He has a picture of somebody, but a picture of whom ~~he has~~ I don't know.

This type of derivation is adopted by Abels (2019), but under our analysis, (i) is excluded as in (32) because *a picture of whom* must undergo both topicalization and *wh*-movement within the embedded clause, which fails to meet one of the relevant criteria, causing the derivation to a crash. Furthermore, even when *a picture of whom* only has a [Q] feature,


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and the embedded clause is preposed by its [Top] feature, (i) is excluded by economy considerations, based on the fact that there is no need for pied-piping of the entire *wh*-containing object *a picture of whom* (see also note 10).

- (ii) He has a picture of somebody, but who (he has a picture of) I don't know.
(Abels (2019: 1206))

12) See also Epstein, Kitahara and Seely (2015) and Chomsky (2015) for an explanation of criterial freezing in terms of the interaction of the two labeling strategies, i.e. copy invisibility by movement and feature sharing.

13) Rizzi (2015b) also recognizes that examples like (57) are possible, where clefted phrases undergo *wh*-movement in *it*-cleft constructions and argues that such cases avoid a violation of maximality by having the following derivation:

- (i) a. Foc_Q it was [_{FocP_{Cleft}} what colour Foc_{Cleft} that her eyes were]
 b. Foc_Q it was [_{FocP_{Cleft}} what colour Foc_{Cleft} _] [that her eyes were]

 c. [_{FocP_{Cleft}} what colour Foc_{Cleft} _] Foc_Q was it [that her eyes were]?
 (cf. Rizzi (2015b: 39))

First, in (ia), *what colour* satisfies Focus Criterion by IM to Spec, Foc_{Cleft}. Then, in (ib), the cleft sentence *that her eyes were* is extraposed out of FocP_{Cleft}. Finally, in (ic), the remnant FocP_{Cleft} containing *what colour* undergoes IM to Spec, Foc_Q rather than *what colour* itself. In this derivation, preposing applies to the Foc_{Cleft} label assigned to the clausal remnant and obeys maximality. However, this approach cannot explain the ungrammaticality of (58), where the clefted phrases undergo focus movement. In contrast, our proposed analysis can account for the difference between (57) and (58) without

stipulating remnant movement with clausal extraposition.

14) One might wonder whether the same amelioration effect as in (60) can be observed in the case of Italian. We leave this issue for future research.

15) In this respect, we should also note that in the case where *wh*-movement applies to a clefted, focused expression of the *it*-cleft construction, the cleft clause is not interpreted as interrogative, and thus there is no need for them to be omitted (see (57)).

16) Maeda (2019) also presents (i) as an example that cannot be explained by feature-relativized criterial freezing.

(i) *Who thinks that which problem, Mary hates? (Bošković (2008: 254))

In (i), the *wh*-phrase *which problem* undergoes topicalization within the embedded clause. Based on the assumption that in-situ *wh*-phrases undergo covert movement, Maeda (2019) analyzes the ungrammaticality of (i) as violating the maximality condition, because (i) cannot be excluded by feature-relativized criterial freezing in that *which problem* seem to have multiple criterial features: [Q] and [Top]. However, since we do not assume the maximality condition, an alternative account should be explored. Although Maeda (2019) assumes covert movement of in-situ *wh*-phrases, we might assume with Stroik (1996) and Simpson (2000) and so on that in-situ *wh*-phrases do not move covertly in English. This means that the ungrammaticality of (i) is due to a different factor other than a violation of criterial freezing. At this moment, we cannot present any further discussion, which will be left for future research.

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