Labeling for Linearization[*]
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Abstract

The primary goal of the present paper is to argue for the hypothesis that labeling is required for linearization, which is called *Labeling for Linearization* (*LfL*). To achieve this goal, it is first argued that labels are not necessary for semantic interpretation. It is then proposed that labels are necessary for linearization at the PF-interface in that they serve as a device to encode structural asymmetries that are employed to determine precedence relations, which are asymmetric as well. It is also shown that *LfL* can remove several problems of the original labeling framework. Building on the idea that Spell-Out applies to the whole phase but not its subpart, it is illustrated that the *LfL*-based analysis can solve the problem concerning the variable ways of applying Spell-Out, which arises in the standard phase theory. Extending the *LfL*-based framework to Japanese, a novel analysis of particle-stranding ellipsis is also proposed. Incorporating some insights of recent approaches that particle-stranding ellipsis arises through a PF-deletion process, it is shown that the proposed analysis based on *LfL* offers a theoretically more suitable characterization of the PF-deletion process. In this way, the present article contributes to not only sharpening the core theoretical notions regarding structure building and linearization in terms of labeling but also deepening our understanding of the structure of Japanese.

Keywords
labeling, linearization, Transfer/Spell-Out, particle-stranding ellipsis, string deletion

1 Introduction

One of the most basic properties of natural language is that it allows a syntactic object (SO) to be assembled with another SO, forming a larger one, which can serve as the input for the assembling process again. It has been standardly assumed in the framework of generative grammar that when two SOs are assembled together, the resultant SO belong to a certain category. This has been taken as the reason why there is something like "Law of Coordination of Likes (Chomsky 1957; Williams 1978; Sag et al. 1985; Progovac 1998)", which allows conjunction in (1a) but not in (1b) (adapted from Chomsky 1957:35-36).

(1) a. *The scene [of the movie] and [of the play] was in Chicago.*
    b. * *The scene [of the movie] and [that I wrote] was in Chicago.*

A related observation is that it is often the case that an SO inherits the properties of one of its subcomponents. This property, often called *endocentricity/headedness*, can be seen, for instance, in the Japanese examples in (2), where two lexical items *hon* 'book' and *kabaa* 'cover' are assembled together (putting aside the nature of the genitive Case-marker). As is clear from their translations, the whole SO in (2a) refers to a particular kind of covers while the one in (2b) refers to a particular kind of books, indicating that *kabaa* 'cover' is the head in the former but *hon* 'book' is in the latter.

(2) a. *hon-no   kabaa*   b. *kabaa-no   hon*
       book-GEN   cover   cover-GEN   book
       'the cover of a book'   'the book on covers'

The notion of *labels* has been playing a central role to capture the observations above and others. Under the phrase-structure rule/X'-theoretic notation in (3a), the rule itself specifies that the resultant SO (namely XP) is of the type X. The same is true even under Chomsky's (1995) formulation of the *bare phrase structure* theory, where the operation *Merge* assembles two SOs into a lager SO. Since the notion of labeling is built into the definition of Merge as shown in (3b), Z inherits the properties of X or Y and specifies those of the whole SO. Under these conceptions, SOs are always labeled.

(3) a. XP → YP X (order irrelevant)
    b. Merge(X, Y) → {Z, {X, Y}}, where Z = X or Y

On the other hand, it has also been proposed that the notion of labeling can (hence should) be eliminated from syntax (see, for instance, Collins 2002; Seely 2006; Narita 2011, 2014, among many others), which renders SOs necessarily unlabeled.

Chomsky (2013, 2015) sheds a new light on the issue by proposing the simplest form of Merge, given in (4).

(4)   Merge(X, Y) → {X, Y}

Under this definition, Merge takes two SOs just like (3b), but it forms the set consisting of X and Y without assigning any label. Nonetheless, Chomsky (2013, 2015) proposes that there is a fixed set of ways of determining labels of the SOs formed by Merge, called *labeling algorithm*. Anticipating its review in Section 2, it is worth emphasizing that Chomsky's (2013, 2015) labeling framework introduces a novel distinction among SOs: SOs that can be labeled and ones that cannot be (if nothing further happens).

Against this background, this paper takes up the following two questions.

(5)   a.   For what purpose is labeling required?
      b.   Why does it seem to be the case that Transfer sometimes applies to the whole phase and it does to its subpart at other times?

The question in (5a) is rather straightforward with respect to the background discussed above. Although Chomsky (2013, 2015) suggests that labeling is necessary for both of the interfaces, I argue that labeling is required only for one of them, namely the PF-interface. To be more specific, I hypothesize that labeling is required for the purpose of linearization. The specific hypothesis to be put forth in this paper, which I call *Labeling for Linearization* (or *LfL* for short), is given in (6).

(6)   *Labeling for Linearization*
      Labels are required solely for linearization in the sense that only labeled SOs can have the relative linear order of their members determined.

It is shown that *LfL* solves several conceptual problems of Chomsky's (2013, 2015) original labeling framework.

Turning to the question in (5b), I argue that *LfL* offers an interesting solution to this problem arising in the standard phase-based derivation (Chomsky 2000, 2001), which I call *the variability of Transfer domains*. To be more specific, I first clarify that

it must be assumed under the phase-based derivation that the size of the domain to which Transfer applies varies depending on syntactic contexts. Building on Bošković's (2016a) approach to this problem, it is illustrated that *LfL* offers a novel way of dealing with the problem, discussing some implications for the architecture of grammar such as the status of the operations Transfer and Spell-Out.[1]

Then, incorporating Saito's (2014, 2016) idea about labeling in Japanese, I extend the *LfL*-based analysis to so-called *particle stranding ellipsis* (PSE; see Sato 2012; Goto 2012; Nasu 2012; Shibata 2014; Sakamoto and Saito 2018; Sato and Maeda 2018). While Sato's (2012) purely syntactic analysis of PSE appears to be another instance of the variability of Transfer domains, Sato and Maeda (2018), building on Shibata (2014), explore a PF-oriented approach. Against this background, I propose a novel analysis of PSE in light of *LfL* which exploits Sato and Maeda's (2018) PF-based mechanism. At the same time, I examine the nature of the PF-mechanism and clarify its theoretical status. Therefore, we can contribute to deepen our understanding of the language from the theoretical proposal concerning the nature of structure building and linearization.

This paper is organized as follows: After a brief review of Chomsky's (2013, 2015) labeling framework, Section 2 offers the specific details of the main hypothesis *LfL* and the ideas behind it. Then, I illustrate that *LfL* sheds a new light on the issue of the variability of Transfer domains. Section 3 examines PSE in Japanese in terms of *LfL*. Section 4 is a conclusion.

2 Labeling for Linearization
2.1 Labeling and semantic interpretation

Under Chomsky's (2013, 2015) framework, Merge is defined as in (4), where it takes two SOs and returns the set consisting of them. Then, there are three possibilities depending on what Merge takes as its inputs, as summarized in (7).

(7) a.　Merge(X, Y) → {X, Y}　　　　[head-head]
　　 b.　Merge(X, YP) → {X, YP}　　　[head-phrase]

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[1] Although Chomsky (1995, 2000, 2001) postulates Spell-out as an operation that sends information from narrow syntax to the PF-interface, Chomsky (2004) invents the operation Transfer that sends information to the LF- and PF-interfaces, which thus subsumes Spell-Out. Since then, Transfer and Spell-Out have been used somewhat interchangeably. In this paper, however, I dissociate Spell-Out from Transfer and confine the former to its original conception. In Section 3.2, I clarify how narrow syntactic computation is linked to the LF-interface under the analysis to be proposed.

    c.   Merge(XP, YP) → {XP, YP}   [phrase-phrase]

In (7a), Merge takes two heads X and Y. Since an output of Merge can in turn be an input of further application of Merge, yielding discrete infinity, complex SOs can be subject to Merge. The cases in (7b-c) illustrate such cases, where one of the inputs in (7b) is a phrase while both of them are phrases in (7c), resulting in a so-called XP-YP structure. In each case, the resultant SO does not have any label.

    Then, Chomsky (2013, 2015) argues that labeling algorithm determines the label of the SOs created by Merge as follows. First, it is proposed that when minimal search applies to the SO of the type in (7b), it dictates a designated head (X in this case) and renders it as the label of the whole SO. Note that this idea utilizes the inherent asymmetry of the SO of the form {X, YP}. That is, minimal search capitalizes on the fact that one of them is a head but the other is not.

    What happens then if minimal search applies to the SOs of the form {X, Y} (= (7a)) or of the form {XP, YP} (= (7c)), where no such asymmetry with respect to the phrasal status? Chomsky (2013, 2015) admits that minimal search is ambiguous in these cases, so that their labels cannot be determined. Putting aside the case in (7a), Chomsky (2013, 2015) then suggests that there are two ways of saving the otherwise unlabelable SOs of the type in (7c). The first way is illustrated in (8a), where one of the SO of the form {XP, YP} undergoes movement, leaving a copy (indicated as <XP>). Assuming that lower copies are invisible to labeling, minimal search then finds only YP, taking its label as the label of the whole SO. On the other hand, if the two components of the SO {XP, YP} share the same feature [F] via agreement as in (8b), minimal search renders this feature as the label of the whole SO (notated as <F,F>).

(8)   a.   [$_?$ XP YP]   →   XP … [$_?$ <XP> YP]   →   XP … [$_Y$ <XP> YP]
        b.   [$_?$ XP$_{[F]}$ YP$_{[F]}$]   →   [$_{<F,F>}$ XP$_{[F]}$ YP$_{[F]}$]

    Let us consider how labeling works in a sentence like (9a). Omitting *v*P-phases, the step in (9b) illustrates the movement of the wh-phrase *which book* (namely DP$_{[Q]}$) to the edge of the embedded CP and in (9c) the wh-phrase reaches the final landing site (traditional labels such as DP, TP, and CP are used just for the sake of illustration).

(9)   a.   *Which book did John think that Mary bought?*
        b.   [$_α$ DP$_{[Q]}$ [$_{CP}$ C [$_{TP}$ …]]]   →   DP$_{[Q]}$ … [$_{CP}$ <DP$_{[Q]}$> [$_{CP}$ C [$_{TP}$ …]]]
        c.   [$_β$ DP$_{[Q]}$ [$_{CP}$ C$_{[Q]}$ [$_{TP}$ …]]]   →   [$_{<Q,Q>}$ DP$_{[Q]}$ [$_{CP}$ C$_{[Q]}$ [$_{TP}$ …]]]

The SO α in (9b) instantiates an XP-YP structure, and since there is no feature shared by the heads of the DP and the CP, the label of α cannot be determined. In the case of (9b) the DP moves, and as a result CP provides the label for α. On the other hand, both of the DP and the CP in (9c) have the Q-feature, so that minimal search takes it as the label of the whole SO. Provided that unlabeled SOs are illegitimate, Chomsky's (2013, 2015) system thus explains why movement cannot stop at intermediate landing sites and how it stops at the final landing site.

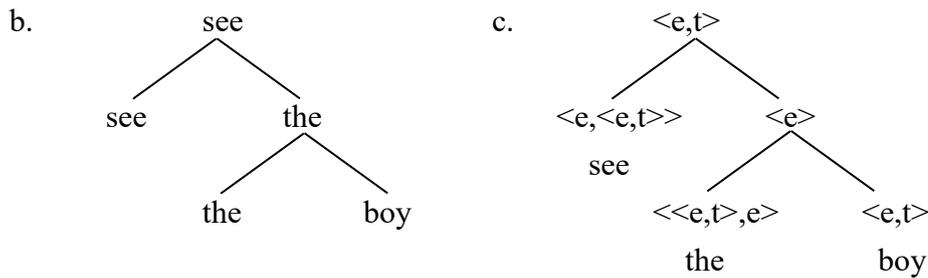As for the necessity of labels, Chomsky (2013) suggests the following:

(10) […] For a syntactic object SO to be interpreted, some information is necessary about it: what kind of object is it? Labeling is the process of providing that information. [...] We assume, then, that there is a fixed labeling algorithm LA that licenses SOs so that they can be interpreted at *the interfaces*, operating at the phase level along with other operations. […]   (Chomsky 2013:43, emphasis mine)

Labeling is necessary for SOs to be interpreted at both of the interfaces. That is, labels are required for both of the semantic and the phonological sides of grammar.[2]

It is, however, not clear whether labels are necessary for semantic interpretation. Suppose that Merge applies to the verb *see* and the nominal *the boy*, forming the SO in (11a). The labeling algorithm dictates the verb *see* as the label as in (11b), since it is a head while *the boy* is a phrase. Under the standard type-driven semantics (Heim and Kratzer 1998), however, the node dominating *see* (V under the traditional notation) is of the type $<e,<e,t>>$ while the node traditionally labeled as V'/VP should be of the type $<e,t>$, as shown in (11c).

(11) a.   {see, {the, boy}}

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[2] Hence, Chomsky's (2013, 2015) approach is in between that of Chomsky (1995) and Collins (2002) and others' label-free ones. That is, SOs can lack labels within syntactic computation as in the latter while they must have labels at the interfaces as in the former.

b.

```
            see
           /    \
        see      the
                /    \
             the      boy
```

c.

```
                <e,t>
               /      \
        <e,<e,t>>      <e>
          see         /    \
                <<e,t>,e>    <e,t>
                   the        boy
```

It is not clear how this mismatch between syntax and semantics can be resolved in a straightforward way if semantic interpretation requires labeling. In fact, if labels are required at the LF-interface, there should be no such mismatch. Note also that the noun *boy* and the whole expression *see the boy* are of the same type in (11c). Nonetheless they have totally different interpretations, the former being nominal and the latter being verbal. Furthermore, neither movement not feature-sharing can affect semantic interpretation in the way how they are supposed to affect labeling.

Another argument for the idea that labels are not relevant for semantics can be gained by considering the cases where feature-sharing aids labeling.[3] As shown in (9c), when a wh-phrase is moved to its final landing site, the labeling algorithm finds the Q-feature which is shared by the wh-phrase and the interrogative C. As a result, the SO is labeled as <Q,Q> as shown in (12).

(12) [$_{<Q,Q>}$ DP$_{[Q]}$ [$_{CP}$ C$_{[Q]}$ …]]

It is not obvious what kind of semantic object the SO labeled as <Q,Q> is, however.

Things become further complicated once we take other instances of feature-sharing into consideration. In (13a), when the subject DP is Merged with TP, feature-sharing takes place. As a result, the whole SO is labeled as <φ,φ>. Let us assume that there is a mapping rule that assigns the semantic value of the traditional TP to the SO labeled as <φ,φ>. This rule then implies that any SO labeled as <φ,φ> is interpreted as a TP semantically. Note that φ-feature agreement is not confined to subjects, however. In (13b), an object DP undergoes Internal Merge with *v*P (or VP under Chomsky's (2015) implementation) to receive accusative Case, and in (13c), a possessive DP is Merged with another DP to receive genitive Case.

(13) a.　　[$_?$ DP$_{Subj[φ]}$ [$_{TP}$ T$_{[φ]}$ …]] → [$_{<φ,φ>}$ DP$_{Subj[φ]}$ [$_{TP}$ T$_{[φ]}$ …]]

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[3] I thank Željko Bošković (p.c.) for helping me develop this argument.

b. $[_? \text{DP}_{\text{Obj}[\phi]} [_{v\text{P}} v_{[\phi]} \ldots]] \rightarrow [_{<\phi,\phi>} \text{DP}_{\text{Obj}[\phi]} [_{v\text{P}} v_{[\phi]} \ldots]]$

c. $[_? \text{DP}_{\text{Poss}[\phi]} [_{\text{DP}} \text{D}_{[\phi]} \ldots]] \rightarrow [_{<\phi,\phi>} \text{DP}_{\text{Poss}[\phi]} [_{\text{DP}} \text{D}_{[\phi]} \ldots]]$

If structural Case is a reflex of φ-feature agreement (Chomsky 2000, 2001), these SOs should also be labeled as <φ,φ>. Hence, the mapping rule interprets the traditional TP, *v*P, and DP as having the same semantic value, which is clearly undesirable result.

An anonymous reviewer suggests that the CP labeled as <Q,Q> is a question anyway, so that it can be semantically selected by verbs like *wonder*, *know*, *ask*, and so on. This approach, however, implies that <φ,φ> also plays a role in semantic selection. If so, it must be the case that the three SOs in (13) pattern with each other in terms of semantic selection, contrary to fact.

The arguments presented in this subsection do not completely refute the idea that labeling is required for semantic interpretation, but its proponents should overcome these problems. Let us then pursue a stronger position and assume that semantic interpretation can be done without labels.

2.2 Proposal

If labels are necessary for an SO to be interpreted, and if semantics does not require them, what is left is phonological interpretation.[4] This is the logic behind the hypothesis *LfL* in (6), repeated as (14).

(14) *Labeling for Linearization*

Labels are required solely for linearization in the sense that only labeled SOs can have the relative linear order of their members determined.

The idea behind this hypothesis is the following: A linear order is an asymmetrical relation, hence linearization requires certain asymmetries between the members of an SO. If a label serves as a means for encoding a structural asymmetry, only an SO with a label can succeed to determine the relative linear order of its members.

Under this conception, why labeling is necessary is to determine the relative linear order of the two members of a given SO. It is then implied that SOs are sent to the LF-interface without labels, while unlabeled SOs may also be sent to the PF-interface as

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[4] Bošković (2016b) explores the possibility that labeling immediately takes place during the narrow syntactic computation when a head is Merged with a phrase. Since it is far beyond the scope of this paper, I leave it for future work to examine whether *LfL* can accommodate the phenomena that Bošković (2016b) aims at capturing.

long as they cause no problem for it. For instance, when one of the members of an SO happens to have no phonological realization, the relative linear order of its members is trivially determined. Hence no unpronounceable structure would result. It follows that in such cases the PF-component can tolerate unlabeled SOs. Therefore, under *LfL*, the so-called labeling problem is conceived as a PF-problem, or more specifically as a linearization failure. As will be shown below, this property plays a crucial role in the analysis to be provided.

Let us now examine how *LfL* treats the SOs listed in (15).

(15) a.   {X, Y}   [head-head]

     b.   {X, YP}   [head-phrase]

     c.   {XP, YP}   [phrase-phrase]

     d.   {<XP>, YP}   [phrase-phrase; XP = a (lower) copy]

     e.   {$XP_{[F]}$, $YP_{[F]}$}   [phrase-phrase; feature-sharing]

(15a) is the case where a head X is Merged with another head Y. In this case, the SO is symmetric so that the label cannot be determined, leading to a labeling problem in both the original labeling framework and *LfL*. Recall that Chomsky (2013, 2015) left unclear how to deal with this case. Under *LfL*, however, the problem is essentially phonological in the sense that the linear order between X and Y cannot be determined. Hence, the problem can be avoided if the SO is made somehow pronounceable. For instance, if one of the two heads lacks its phonological realization, either because of its lexical property or movement, the linear order can be trivially determined.[5]

As for (15b), minimal search detects the asymmetry between a head and a phrase, taking the former as the label. Let us assume that each language specifies a kind of head-parameter in its own linearization rules (see, for instance, Takita 2010). Taking these linearization rules as a process of mapping a set to an ordered pair, I propose that the SOs whose label is provided by one of its members via minimal search (namely, not via feature-sharing; see also footnote 8) are subject to the following linearization rules. (for the sake of illustration, a labeled SO is notated as {$_X$ …}, X being its label).

(16) a.   Head-initial linearization rule (e.g. English):   {$_X$ X, YP}   →   <X, YP>

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[5] The latter strategy, namely labeling via movement, should be available for Chomsky's (2013, 2015) original framework under the assumption that lower copies are invisible for labeling. Note however that *LfL* aims at doing away with this assumption, as will be discussed in the text.

b.   Head-final linearization rule (e.g. Japanese): $\{_X$ X, YP$\}$ →   <YP, X>

In the subsequent sections, I illustrate how these rules work with concrete examples.

The SO in (15c) is structurally symmetric. As pointed above, linearization fails if both of the members of the SO have phonological realizations, but it does not when at least one of them is phonologically null. This is indeed the situation found in (15d), where XP is moved out of the SO. Under the original labeling framework, the problem is avoided by the assumption that copies are invisible to labeling. Under *LfL*, on the other hand, we can capitalize on the fact that the SO is phonologically asymmetric because XP, being a lower copy of movement, is not pronounced. Hence, no PF-problem arises even if the SO remains syntactically symmetric, allowing us to eliminate the assumption regarding the invisibility of copies.

By eliminating the notion of the invisibility of copies, which is in fact fundamentally incompatible with the copy theory of movement (see also Takita et al. 2016 for an independent argument), *LfL* allows us to accommodate reconstruction phenomena in a natural way. The examples in (17) illustrate a typical case of reconstruction. In (17a), *John* fails to bind the anaphor, but it can once the wh-phrase containing the anaphor moves as in (17b).

(17) a.   *Who said that John$_i$ thinks that Bill$_j$ bought pictures of himself$_{*i/j}$?*
     b.   *Which picture of himself$_{i/j}$ does John$_i$ think that Bill$_j$ bought?*

Under the copy theory of movement, (17b) has a representation like (18a). The reconstruction effect is naturally captured by assuming that the copy in the intermediate landing site is available for binding. Note at the same time that the label of the SO α cannot be determined. For one reason, this is because neither the DP nor the CP in (18b) is a head. For another, there should be no feature-sharing between the DP and the non-interrogative C because it is an intermediate landing site. Therefore, the DP must be moved under the original labeling framework, making it invisible for labeling.

(18) a.   [which picture of himself] does John think [$_α$ <which picture of himself>
           Bill bought <which picture of himself>]

b.
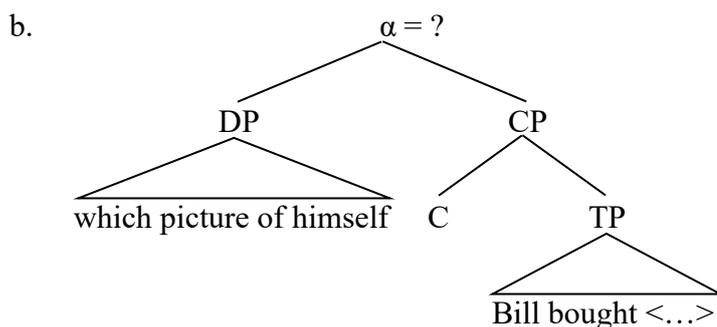
It then becomes unclear how the element that has rendered invisible to the labeling algorithm on the way to the LF-interface can participate in binding at that interface.[6] On the other hand, the fact that the SO α fails to be labeled does not cause any problem under *LfL*. Since semantics does not require the label by assumption, the copy does not have to be made invisible, allowing it to enter the binding relation. Linearization succeeds as well since the copy is not pronounced. In this way, *LfL* captures reconstruction in a straightforward manner, providing another argument for why semantic interpretation does not require labeling.

Finally, let us examine the case of feature-sharing in (15e). This instantiates the case where the SO may be truly symmetric both syntactically and phonologically. Nonetheless, we can find an asymmetry between the shared features. That is, in typical cases where the resulting labels are $\langle \varphi, \varphi \rangle$ or $\langle Q, Q \rangle$, one of them is a valued feature and the other is an unvalued one. If the linearization procedure can make use of this asymmetry, no linearization problem is induced.[7] For the sake of concreteness, I propose that the following linearization rule (at least for English), assuming that the Q-feature on wh-phrases and the φ-features on DPs are valued ones and their respective counterparts are unvalued.

(19) Linearization rule for SOs labeled as $\langle F,F \rangle$: $\{_{\langle F,F \rangle} \text{XP}_{F[val]}, \text{YP}_{F[unval]}\}$ → $\langle \text{XP}, \text{YP} \rangle$

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[6] An anonymous reviewer correctly points out that this problem does not arise under if binding relations can be established derivationally (cf. Belletti and Rizzi 1988), before the copy is rendered invisible. See, for instance, Charnavel and Sportiche (2016) for some arguments for the view that Condition A is as an LF condition.

[7] If the distinction between valued and unvalued features has been lost at the point of linearization, as an anonymous reviewer points out, there must be a way of encoding the distinction. Assuming that it is still available at the point of Spell-Out, where labeling takes place, I claim that labels are required in order to encode the information necessary for linearization, which is otherwise lost at the point of linearization.

I claim that this rule applies to SOs with a label of the type <F,F>, and for the cases at hand, it yields a "Spec-initial" linear order (namely, <wh, CP> and <Subject, TP>).[8]

This idea may lead us to a more restricted theory of feature-sharing. For instance, suppose that the members of a SO happen to be of the same category. The SO α in (20) (cf. (2a)) instantiates such a case, where the members are two nominals (conventionally labeled as DP).

(20) [$_α$ [$_{DP}$ *hon*]*(-*no*) [$_{DP}$ *kabaa*]]
     book-GEN   cover
   'the cover of a book'

It can be claimed that the SO is labeled via feature-sharing of their categorial features (see, for instance, Kobayashi 2017). Nonetheless, the SO α in (20) is legitimate only if one of the members is accompanied with the genitive Case-marker *no*. On the other hand, given that categorial features are always valued, labeling is not possible under the idea discussed here. Hence, the SO remains symmetric, resulting in a linearization problem. Anticipating the review in Section 3.2, Saito (2014, 2016) proposes that SOs with Case-particles in Japanese are invisible to labeling. The obligatory presence of the genitive Case-maker then supports this line of approach.

To summarize the discussion so far, it has shown that the basic aspects of the original labeling framework can be carried over to the *LfL*-based approach. It also paves a new way of accommodating the cases concerning head-head merger and feature-sharing. In the following subsection, I turn to the question in (5b), which concerns the size of Transfer domains, illustrating how the proposed mechanism works in English.

2.3 The *LfL*-based approach to the variability of Transfer domains

This subsection is devoted to discussing the problem concerning the size of Transfer domains (see also Bošković 2016a) in terms of *LfL*. To clarify the issue, let us consider how a sentence like (21a) is derived under the standard phase-based derivation (intermediate *v*P phases are omitted for the sake of illustration).

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[8] In this paper, I leave it open whether (19) is universal or it is necessary to postulate a "Spec-final" linearization rule. It is also worth noting that the linearization rule (19) and those in (16) apply to different set of SOs: The former applies to SOs with <F,F> while the latter apply to SOs whose labels are provided by one of their set-members.

(21) a. *What do you think that John bought?*

b. [$_{CP2}$ what that [$_{TP2}$ John bought <what>]]

c. [$_{CP1}$ what C [$_{TP1}$ you think [$_{CP2}$ <what> that …]]]

The step in (21b) illustrates that the wh-phrase moves to the intermediate CP edge. If Transfer applied to the whole phase CP$_2$ at this step, the wh-phrase could not be moved further. This in turn means that long-distance movement (or phase-crossing movement) is never possible, wrongly predicting that (21a) is ungrammatical. Hence, what is Transferred at this point must be TP$_2$ (indicated by shading), which is the complement of the phase-head. Then the derivation continues to the step in (21c), where the wh-phrase reaches to the final landing site. At this point, however, Transfer must apply to the whole phase CP$_1$, not to the phase-head complement TP$_1$, because the wh-phrase *what* in (21a) clearly receives interpretations at both of the interfaces. Therefore, it must be the case that Transfer targets the whole phase at least at the root, while it applies to a subpart of a phase in other contexts.

In the rest of this subsection, I propose an *LfL*-based analysis of the variability of Transfer domains. Before jumping to the specific implementation, I review Bošković's (2016a) approach to it, which is a point of departure for the analysis to be developed.

One of Bošković's (2016a) main proposals is that Transfer targets the whole phase, not the complement of a phase-head as is assumed under the standard phase theory.[9] Bošković (2016a) offers a number of conceptual and empirical arguments for this proposal. The root/non-root contrast reviewed above is one of the conceptual arguments. The problem is that Transfer must target the whole phase at the root while it must target the phase-head complement in non-root contexts, primarily for the sake of successive-cyclic movement. As for empirical arguments, Bošković (2016a) discusses various cases (such as raddoppiamento fonosintattico in Abruzzese; see D'Alessandro and Scheer (2015) and references cited therein) where the elements on the edge of a phase (namely the phase-head and its specifier) have phonological interactions with the ones contained in the phase-head complement. Without reproducing the concrete data sets that motivate the analysis (as it is not our main concern here), let us consider the schematic representations in (22). In (22), X is the phase-head (notated as X^{ph}).

(22) a. [$_{XP}$ YP X^{ph} [$_{ZP}$ …]]   b. [$_{XP}$ YP X^{ph} [$_{ZP}$ …]]

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[9] Note that Bošković (2016a) uses the term Spell-Out for the operation that sends information to the interfaces. Following the terminological distinction made in footnote 1, I use the term Transfer in reviewing his analysis, to avoid unnecessary confusions.

(22a) illustrates the situation where Transfer applies to the phrase-head complement ZP. Being sent to the PF-interface separately from X^{ph} and YP, which undergo Transfer at a later stage of the derivation, ZP is not expected to have any phonological interaction with X^{ph} and/or YP. On the other hand, (22b) represents the case where Transfer targets the whole phase XP. Hence, it is no wonder that ZP can interact with the edge elements.

Note that Bošković (2016a) crucially assumes that Transfer sends information not only to the PF-interface but also to the LF-interface, rendering the elements within a Transferred domain inaccessible for further syntactic computation. This leads Bošković (2016a) to a new approach to successive-cyclicity. Let us consider how (23a) (repeated from (21a)) is derived under Bošković's (2016a) analysis. (23b) is the step where the wh-phrase is moved to Spec, CP just like in (21b).

(23) a.   *What do you think that John bought?*
     b.   [$_{CP2}$ what that John bought <what>]

If Transfer applies at this point as in (23b), the wh-phrase is trapped inside and never reaches to the matrix CP.

Therefore, Bošković (2016a) argues, unlike Chomsky (2000), that Transfer does not apply upon the completion of a phase. Rather, it is proposed that it applies immediately when the next higher phase-head is introduced to the structure (see also Chomsky 2001). Then, the derivation can continue from (23b) without Transfer to the step in (24a), where the matrix verb is introduced and *what* is moved above it. Since the matrix V is not a phase-head, Transfer is not triggered yet. It is triggered immediately when the next higher phase-head *v* is Merged as in (24b).

(24) a.   [$_{VP}$ what think [$_{CP2}$ <what> that John bought <what>]]
     b.   [$_{vP}$ *v* [$_{VP}$ what think [$_{CP2}$ <what> that John bought <what>]]]

Since the wh-phrase has escaped from the Transfer domain, it can move further up.[10]

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[10] As noted by Bošković (2016a), the system does not require the wh-phrase to move through the edge of CP2. All what we need is that the wh-phrase moves out of a phase before the next higher phase-head is Merged. Bošković (2016a) also argues that this system explains the generalization put forth by Bošković (2015a,b), which states that extraction is blocked when a phase is immediately dominated by another phase. As schematically depicted in (i), Merging X^{ph} with YP immediately triggers its Transfer,

Let us continue the derivation. By the step in (25a), T has been Merged and the wh-phrase has been moved (in addition to the operations concerning the external argument *you*). If the wh-phrase were not moved, it would be trapped by Transfer of *v*P triggered by the matrix C, as illustrated in (25b). Hence the derivation must proceed from (24b) to (25c) via (25a).

(25) a.　[$_{TP}$ what you T [$_{vP}$ <you> *v* [$_{VP}$ <what> think [$_{CP2}$ …]]]]?

　　b.　[$_{CP1}$ C [$_{TP}$ you T [$_{vP}$ <you> *v* [$_{VP}$ what think [$_{CP2}$ …]]]]]?

　　c.　[$_{CP1}$ C [$_{TP}$ what you T [$_{vP}$ <you> *v* [$_{VP}$ <what> think [$_{CP2}$ …]]]]]?

　　d.　[$_{CP1}$ what C [$_{TP}$ <what> you T [$_{vP}$ <you> *v* [$_{VP}$ <what> think [$_{CP2}$ …]]]]]?

Finally, the wh-phrase moves to the final landing site as in (25d).

Note that it is crucial that the timing of Transfer is delayed by assuming that the next higher phase-head triggers it to allow successive-cyclic movement. This assumption, however, revives the original problem concerning the root/non-root contrast. CP$_1$ in (25d) is the root so that there is no next higher phrase-head, but it must be Transferred to derive (23a). Therefore, it must be assumed that there are at least two ways of triggering Transfer: Merging the next higher phase-head or reaching at the root.

Building on but departing from Bošković's (2016a) approach, I claim that Spell-Out, but not Transfer, applies to the whole phase. Under this claim (call it *phasal Spell-Out*, borrowing the terminology in Bošković's 2016a), the narrow syntactic computation can keep accessing the elements in the Spelled-Out domains (see also Fox and Pesetsky 2005). For the LF-side, I assume that the result of the narrow syntactic computation as a whole constitutes the input.[11] Put differently, the proposal is that phasal Spell-Out applies cyclically, sending information to the PF-interface piece by piece, while Transfer applies all at once (if we need a name for the mapping from narrow syntactic computation to the LF-interface). I suggest that this asymmetry between PF and LF not only reflects the general notion of the "primacy of CI" (Chomsky 2007) but also motivates their asymmetry with respect to labeling. That is, semantic computation does not require labeling because it can directly utilize the result of narrow syntactic computation, namely a set of hierarchical relations created by Merge. The PF-interface

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leaving no chance for ZP to move out irrespective of whether it is on the edge or not.

(i)　[$_{XP}$ X^{ph} [$_{YP}$ (ZP) … Y^{ph} … (ZP) …]]

[11] A potential alternative is to assume that Transfer (in the narrow sense) as well as Spell-Out cyclically applies to the whole phase. This alternative, however, runs afoul of the problem of the root/non-root contrast, as in Bošković's (2016a) approach.

however receives pieces of information sent by cyclic phasal Spell-Out, mapping them into linear ordering. Labels are then required to provide clues for specifying the relative linear order.

The above discussion has a non-trivial implication for the status of phonological features in narrow syntax. Let us consider the derivation of (26a).

(26) a. *I wonder* [*what John ate*].
　　b. [$_{vP}$ what John v [$_{VP}$ eat <what>]]
　　c. [$_{CP}$ what C [$_{TP}$ John T [$_{vP}$ <what> John v [$_{VP}$ eat <what>]]]]
　　d. [$_{CP}$ what C [$_{TP}$ John T [$_{vP}$ <what> John v [$_{VP}$ eat <what>]]]]

At the step in (26b), the vP-phase has completed, and let us assume that Spell-Out applies to the whole phase. If Spell-Out strips away the phonological features as is originally defined, *what* and *John* on the edge of vP-phase becomes phonologically null. As a result, their movements depicted in (26c) must be covert, which is a clearly undesirable result. On the other hand, if Spell-Out leaves the phonological features unchanged but send the information necessary for linearization, the subsequent movements in question can be overt. Nonetheless, this raises another problem. When Spell-Out under this conception applies to the matrix CP-phase as in (26d), the phonological features still remain, which arguably violates Full Interpretation at the LF-interface. One way to solve this problem is to assume that phonological features are not present in narrow syntax but inserted post-syntactically (Halle and Marantz 1993).

Having laid out the specifics of Spell-Out and its implications for the architecture of grammar, let us examine how (26a) is derived under *LfL*. By the step in (27a), the external argument *John* is Merged and *what* undergoes movement.[12] Then, at the end

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[12] An important remaining question is what ensures successive-cyclic movement, as is correctly pointed out by an anonymous reviewer. Bošković's (2016a) system does not require successive-cyclic movement to the phase-edge, but it does out of the phase (see also footnote 10). Under the proposed mechanism, the wh-phrase in (27a), for instance, may undergo one-fell-swoop movement to the final landing site since the Spelled-Out domain is assumed to be syntactically accessible. One possible way to block this is to incorporate Fox and Pesetsky's (2005) notion of *Order Preservation* (see also Ko 2005, 2014; Takita 2010) with certain modifications. Another possibility is to assume that certain domains are rendered syntactically opaque for computational reasons, independent of Spell-Out/Transfer. One promising idea is presented by Goto and Ishii (2018), who, building on Chomsky et al.'s (2017) notion of *determinacy*, argue that

of the *v*P-phase, Spell-Out applies to the whole SO as in (27b), assigning a label to each SO where possible (unlabelable SOs are notated as {? …}).

(27) a.　{what, {John, {*v*, {eat, what}}}}
　　 b.　Spell-Out of (27a):
　　　　 {? what, {? John, {*v* *v*, {v eat, what}}}}
　　　　 → {? what {? John, <*v*, <eat, what>>}}

Under *LfL*, only labeled SOs can have the relative linear order of their members specified. In Section 2.2, I have proposed that English is equipped with the head-initial linearization rule in (16a), which maps a set of the form {X X, YP} to the ordered pair <XP, YP>. Given this, the set {v eat, what}, whose label is the head V, is mapped to the ordered pair <eat, what>, where the head *eat* precedes its complement. Similarly, the set {*v* *v*, {v …}} is mapped to the ordered pair where *v* precedes its complement. On the other hand, the unlabeled SOs in (27b), namely the sets {? John, {*v* …}} and {? what, {? …}}, cannot be mapped to ordered pairs. Hence, the relative order of their set-members is left unspecified. Combining these results together, the last line of (27b) is obtained. Note that this does not cause any immediate problem. Assuming that insertion of phonological features including realization of copies takes place at a later point, no unpronounceable result can be detected yet.

　　Let us continue the derivation. At the step in (28a) T is Merged, and then the external argument raises. Similarly, C is Merged and the subsequent movement of the wh-phrase takes place as depicted in (28b).[13]

(28) a.　{John, {T, {? what,{? John,{*v* *v*,{v eat, what}}}}}}
　　 b.　{what, {C, {John, {T, {? what,{? John,{*v* *v*,{v eat, what}}}}}}}}

Since the Spelled-Out domains are assumed to be accessible for further syntactic computation, *what* and *John* can be moved to their respective final landing sites.

　　Assuming that Spell-Out does not compute the domain that has already Spelled-Out again, only the SOs in the shaded part in (29a) are assigned labels and then linearized. To be more specific, the labels <Q,Q> and <φ,φ> are obtained via feature-

certain domains are made inaccessible for syntactic computation to proceed.

[13] Although the SOs contained within the domain that has been Spelled-Out have labels, it is just for the purpose of illustration. Recall that it is assumed that labeling takes place at the point of Spell-Out and it does not affect the narrow syntactic computation.

sharing while the other two are determined by minimal search detecting the heads C and T, respectively. Hence, the SOs labeled as C and T are subject to the linearization rule (16a), while those with <Q,Q> and <φ,φ> are subject to the linearization rule in (19), which maps a set {$_{<F,F>}$ XP$_{F[val]}$, YP$_{F[unval]}$} to <XP, YP>, yielding the "Spec-initial" order. Combined with the previous result of Spell-Out in (27b), the representation consisting of ordered pairs except the unlabeled parts given in the last line of (29a) results. At the step in (29b), insertion of phonological features including realization of copies takes place (unrealized copies are indicated by strikethrough).

(29) a. Spell-Out of (28b):
　　　　{$_{<Q,Q>}$ what, {$_C$ C, {$_{<φ,φ>}$ John, {$_T$ T, {$_?$ what,{$_?$ John,{$_v$ v,{$_V$ eat, what}}}}}}}}
　　　　→ <what, <C, <John, <T, {$_?$ what,{$_?$ John, <v, <eat, what>>}}>>>>

　　 b　Insertion of phonological features/Realization of copies:
　　　　<what, <C, <John, <T, {$_?$ ~~what~~,{$_?$ ~~John~~, <v, <eat, ~~what~~>>}}>>>>

Although (29b) still involves unordered sets, it is pronounceable. This is because for each unordered set in (29b), one of the members, namely *what* and *John* respectively, is not pronounced. The relative linear order can be unambiguously determined. The LF-interface takes (28b) as its input, but no problem arises. Semantic interpretation can be done without labels, and Full Interpretation is satisfied in the absence of phonological features. Note also that Spell-Out always applies in the same manner, no matter whether it is at the intermediate step in (27b) or at the root in (29a).

　　To complete the discussion, let us check what happens if the subject stays in the *v*P-internal position. The step in (30a) illustrates the case which is identical to (28b) except that the subject raising (and concomitant feature-sharing) does not take place. As a result of Spell-Out and subsequent processes, the representation in (30b) is derived.

(30) a. {what, {C, {T, {$_?$ what,{$_?$ John,{$_v$ v,{$_V$ eat, what}}}}}}}
　　 b. Spell-Out and Insertion of phonological features/Realization of copies:
　　　　{$_{<Q,Q>}$ what, {$_C$ C, {$_T$ T, {$_?$ what,{$_?$ John,{$_v$ v,{$_V$ eat, what}}}}}}}
　　　　→ <what, <C, <T, {$_?$ ~~what~~,{$_?$ John, <v, <eat, ~~what~~>>}}>>>

The relative linear order between *John* and its co-member of the unlabeled SO remains unspecified, but this time it is fatal, leading to an unpronounceable result.

　　The same holds for wh-movement. The step in (31a) is identical to (28b) except that the wh-phrase remains in the intermediate position.

(31) a.　{C, {John, {T, {? what,{? John,{v v,{v eat, what}}}}}}}}

　　　b.　Spell-Out and Insertion of phonological features/Realization of copies:

　　　　{C C, {<φ,φ> John, {T T, {? what,{? John,{v v,{v eat, what}}}}}}}}}

　　　→ <C, <John, <T, {? what,{? ~~John~~, <v, <eat, ~~what~~>>}}>>>>

If the wh-phrase in the intermediate landing site is realized as in (31b), a linearization problem results. Hence, wh-phrases cannot stay in intermediate positions. Therefore, the proposed system gains the same result as the original labeling framework does without assuming the invisibility of copies.

　　　Let us consider what happens if the lowest copies of wh-movement are chosen to be realized. (32a) is repeated from the last line of (29a) where Spell-Out applies to (28b). Even when the lowest copy of the wh-phrase is realized as in (32b), there arises no linearization problem.

(32) a.　<what, <C, <John, <T, {? what,{? John, <v, <eat, what>>}}>>>>

　　　b　Insertion of phonological features/Realization of copies:

　　　　<~~what~~, <C, <John, <T, {? ~~what~~,{? ~~John~~, <v, <eat, what>>}}>>>>

This is because the set {eat, what} has its label determined and has been converted to the ordered pair <eat, what> at the previous point of Spell-Out in (27b).

　　　The difference between the legitimate cases in (29b) and (32b) on one hand and the illegitimate one in (31b) on the other is that only in the former the SO containing the wh-phrase chosen to be realized can have its label determined. This difference is exactly what Chomsky (2013: 44-45) relies on to distinguish (33a) from (33b).

(33) a.　*They thought JFK was assassinated in which Texas city?*
　　　b. * *They thought [α in which Texas city [C [JFK was assassinated]]]?*

That is, (33b) is ungrammatical because the label of the SO α fails to be labeled. Under the current analysis, the problem boils down to the fact that the relative linear order between *in which Texas city* and *JFK was assassinated* cannot be specified in (33b).[14]

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[14] An anonymous reviewer wonders whether it is necessary to assume that echo-questions discussed by Chomsky (2013) involve regular wh-movement. As far as I can tell, the point is that under the labeling-based approaches, both Chomsky's and ours, wh-phrases are allowed to appear only in positions where they cause no labeling

One case that distinguishes the proposed analysis from Chomsky's comes from a sentence like (34a), where the wh-subject remains in-situ. As a result of Spell-Out applied to the matrix CP, labeling takes place, yielding (34b).

(34) a. *They thought who assassinated JFK?*

    b. $\{_{<Q,Q>}$ who^1, $\{$C, $\{\ldots$, $\{_?$ who^2, $\{$C, $\{_{<\varphi,\varphi>}$ who^3, $\{$T, $\{_?$ who^4, $\{v, \ldots\}\}\}\}\}\}\}\}\}\}$

If *who*^{1} is realized, a normal wh-question sentence (*Who did they think assassinated JFK?*) is derived. Realizing *who*^{2} (in the intermediate landing site of wh-movement) or *who*^{4} (in the *v*P-internal position) yields a labeling problem under both Chomsky's framework and ours. In order to derive the echo-question version in (34a), it is necessary to realize *who*^{3}. If lower copies are invisible for labeling, it is not clear how to realize *who*^{3}. For the sake of assigning the $<\varphi,\varphi>$ label to the SO, *who*^{3} must be visible, but the assumption renders it invisible. Hence, some additional assumption is required to deal with cases like (34a). On the other hand, *LfL* assumes that copies are visible for labeling. The SO is labeled as $<\varphi,\varphi>$, which in turn serves to determine the relative linear order between *who*^{3} and its co-member (corresponding to the string *assassinated JFK*). Realizing *who*^{3} thus raises no linearization problem. Therefore, *LfL* can accommodate cases like (34a) without requiring any additional assumption.[15]

To sum up, it has been illustrated that *LfL*, combined with the hypothesis that Spell-Out applies to the whole SO upon completion of a phase, solves the problem concerning the variability of Spell-Out domains. In the next section, I illustrate how the proposed mechanism works for Japanese, putting special focus on PSE.

3 An *LfL*-based analysis of PSE and its implications

One of the primary reasons for focusing on PSE is that Sato's (2012) purely

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problem (that ultimately leads to a linearization failure under *LfL*).

[15] An anonymous reviewer points out that the problem discussed in the text does not arise if a subject wh-phrase undergoes two independent movements to Spec, TP and to Spec, CP, respectively (Chomsky 2007, 2008). That is, the A-chain consisting of *who*^{3} and *who*^{4} and the A'-chain consisting of *who*^{2} and *who*^{4} are independent of each other, so that *who*^{3} is not a lower copy any more. If so, however, there must be a way to make *who*^{3} unpronounced in normal wh-movement cases, which is not necessary under *LfL*. In this connection, another reviewer points out that Bošković (2001) observes that lower copy pronunciation never targets a copy in intermediate positions of successive-cyclic movement, which is highly consistent with the proposed analysis.

syntactic analysis seems to constitute another case of the variability of Transfer domains. Section 3.1 confirms this point with a brief review of Sato's (2012) analysis. In Section 3.2, I propose an alternative analysis in light of *LfL*, incorporating Sato and Maeda's (2018) PF-oriented approach. Section 3.3 in turn puts their PF-deletion mechanism under close scrutiny. Pointing out that their characterization of the mechanism has several problems, I argue that *LfL* can offer a way of clarifying its theoretical status.

3.1 PSE: Another instance of the variability of Transfer domains?

Let us consider the examples in (35), which involve a typical instance of PSE. Speaker B's utterance in (35a), which is intended as a reply to Speaker A's utterance, involves the topic marker -*wa* with a phonologically null topic (indicated as [e]). One of the properties Sato (2012) attempts to capture is exemplified by the contrast found in (35a-b), which indicates that PSE must occur at the sentence-initial position.[16]

(35) A: *Miku-wa   kyoo   nani-o   tabeta no?*
      Miku-TOP   today   what-ACC   ate   Q
      'What did Miku eat today?'

  B: a. [e]-*wa,   hoikuen-de   udon-o   tabeta-mitai*
            -TOP   day-care.center-at   noodle-ACC   ate-seem
          '(lit.) [e] (= Miku) seems to have eaten noodles at day-care center.'

      b. * *hoikuen-de   [e]-wa,   udon-o   tabeta-mitai*
            day-care.center-at   -TOP   noodle-ACC   ate-seems
          '(lit.) [e] (= Miku) seems to have eaten noodles at day-care center.'

Sato's (2012) analysis is depicted in (36a). First, it is assumed following Kayne (1994) and Whitman (1997) that the topic marker -*wa* is the head of TopicP, hosting the topic (in this case *Miku*) in its specifier position. Sato (2012) then proposes that the Topic-head is the highest phase and enjoys "the privilege of the root" in the sense of Rizzi (2005), according to which the edge of the highest phase can escape from Spell-Out so that it is allowed to remain unpronounced.[17] That is, Top' is sent to the PF-interface as in (36b), applying Spell-Out only to the Topic-head and its complement.

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[16] Sato (2012) in fact attempts to capture two more properties of PSE. I return to them in Section 3.2.

[17] Sato (2012) assumes that Spell-Out is relevant only for the PF-interface and Transfer applies to the whole phase sending it to the LF-interface. (see also footnote 1).

(36) a.

```
                    TopP
            _____|_____
           DP              Top'
           /\         _____|_____
          /  \       Top          TP
        Miku   -wa        _____|_____
                          hoikuen-de udon-o tabeta-mitai
```

    b.   [TopP Miku [Top' [Top -wa] [TP hoikuen-de udon-o tabeta-mitai]]]

    c.   [TopP Miku [Top' [Top -wa] [TP hoikuen-de udon-o tabeta-mitai]]]

As a result, all the materials except the topic receive phonological realizations, yielding the PSE sentence in (35a). Meanwhile, Sato (2012) explicitly assumes that Spell-Out can also apply to the whole TopP as in (36c), yielding the non-PSE version of (35a).

    If some element other than the topic phrase, for instance *hoikuen-de* 'at day-care center,' is moved across the topic as shown in (37a) and Spell-Out applies to Top' as in (37b), the elements outside the Top' receive no phonological interpretation. In order for the PP to be phonologically realized, Spell-Out must target the whole root phase as in (37c). Consequently, the topic *Miku* is necessarily made pronounced as well.

(37) a.

```
                       TopP
              _____|_____
             PP                TopP
             /\         _____|_____
            /  \       DP              Top'
       hoikuen-de_i    /\         _____|_____
                      /  \       Top          TP
                    Miku   -wa        _____|_____
                                      t_i udon-o tabeta-mitai
```

    b.   [TopP hoikuen-de_i Miku [Top' [Top -wa] [TP t_i udon-o tabeta-mitai]]]

    c.   [TopP hoikuen-de_i Miku [Top' [Top -wa] [TP t_i udon-o tabeta-mitai]]]

Hence, nothing overt can precede the null topic, capturing the contrast in (35a-b).

    What is more important for the current purpose is that Sato's (2012) analysis (as well as Rizzi's 2005 original idea) instantiates the issue concerning the size of Transfer/Spell-Out domains. That is, it appears to be the case that Transfer/Spell-Out sometimes applies to the whole phase and it does its subpart at other times.

3.2 An *LfL*-based analysis of PSE

Given the *LfL*-based mechanism provided in Section 2, Sato's (2012) analysis cannot be maintained. In this subsection, I propose an alternative based on *LfL*. As a first step toward the analysis, let us consider the nature of the particle stranded in PSE.

One of the important gradients of Sato's (2012) analysis is that the topic-marker -*wa* is the head of TopP. A number of researchers, however, have pointed out that PSE is not limited to the cases involving the topic-marker. In fact, a wide variety of particles can be stranded as exemplified in (38)-(40).

(38) A: *John-ga   doo   sita   no?*   B: [e]-*ga   kaisya-o   yameta*
      John-NOM   how   did   Q   -NOM   company-ACC   quit
      'What did John do?'   '[e] (= John) quit the company.'
                                      (modified from Goto 2012:79)

(39) A: *Taroo-mo   kita   no?*   B: [e]-*mo   kimasita*
      Taroo-also   came   Q   -also   came
      'Did Taroo also come?'   '[e] (= Taroo) also came.'
                                        (modified from Shibata 2014)

(40) A: *John-wa   kita   no?*   B: [e]-*to   omoimasu-kedo*
      John-TOP   came   Q   -that   think-though
      'Did John come?'   'I think that [e] (= he came).'
                        (modified from Sato and Maeda 2018:5-6)

In (38B), the nominative Case-marker -*ga* is stranded. In (39B), what is stranded is the focus particle -*mo* 'also,' and (40B) shows that even the complementizer *to* 'that' can be stranded.[18] These observations show that the peculiar property of PSE cannot be

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[18] Sato and Maeda (2018) observe that the interrogative complementizer *kadooka* 'whether' and *mitai* 'seem,' which they suggest is a certain kind of semi-auxiliary expressions, can be stranded, providing examples like (i) and (ii).

(i) A: *John-wa   kita   no?*   B: [e]-*kadooka-wa   tyotto   wakarimasen*
      John-TOP   came   Q   -whether-TOP   a.bit   not.know
      'Did John come?'   'I am little unsure whether [e] (= he came).'

(ii) A: *Chomsky-ga   sangatu-ni   rainiti-suru-rasii-yo*
      Chomsky-NOM   March-in   visit.Japan-to-seem-PRT
      'It seems that Chomsky is visiting Japan in March.'

     B: [e]-*mitai desu-ne*

attributed to the TopP's privileged status as the root.

I assume that the particles stranded in PSE are what Saito (2014, 2016) calls the anti-labeling devices. Following Kuroda (1988), among many others, Saito (2014, 2016) first assumes that Japanese lacks φ-feature agreement. He then points out that if the object DP is Merged with TP, to derive a scrambling sentence like (41a), a labeling problem should occur for the resulting set {DP$_{Obj}$, TP} as in (41b), since they have no φ-features to share. To solve this problem, particles such as Case-markers (notated as Prt) are proposed to make the SO that they attach to invisible to the labeling algorithm. That is, when labeling takes place, only TP but not DP-Prt in (41c) can be detected. Then the label of the TP serves as that of the whole SO (notated as "? → TP").

(41) a.   *Sushi-o$_i$*   *Taroo-ga*   t$_i$ *tabeta*
      sushi-ACC   Taroo-NOM   ate
      'Sushi$_i$, Taroo ate t$_i$'

    b.

    c.

In this way, scrambling is made available in Japanese by the particles acting as anti-labeling devices.

Capitalizing on Saito's (2014, 2016) idea, I propose that PSE is derived in the way schematically depicted in (42). In (42a), the XP accompanied with a particle is moved to the CP-domain. If Spell-Out applies at this point, labeling succeeds due to the anti-labeling function of the particle, yielding a non-PSE sentence. If the XP undergoes scrambling stranding the particle behind as shown in (42b), it induces a labeling

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       -seem   COP-PRT
       'It seems [e] (= that Chomsky is visiting Japan in March).'
It is not clear whether (i) and (ii) are true instance of PSE, because the gap in these examples can be replaced with the sentential pro-form *soo* 'so.' Note at the same time that the pro-form cannot replace the gap in (40B) without the copula *da*, as in (iii).
(iii) *Soo-*(*da*)-to*   *omoimasu-kedo* (as a reply to (40A))
     so-COP-that   think-though
     'I think that it is.'
Hence, I do not include examples like (i) and (ii) for the discussion of PSE.

problem. Nonetheless, I claim that the PSE version is derived by applying Spell-Out to the whole structure in (42b).

(42) a.

```
                CP
           /          \
      XP-Prt_i          CP
                    /        \
                  TP           C
                /    \
          … <XP-Prt_i> …
```

b.

```
                ?
           /          \
        XP_j            CP
                    /         \
          <XP_j>-Prt_i          CP
                            /        \
                          TP           C
                        /    \
                  … <XP-Prt_i> …
```
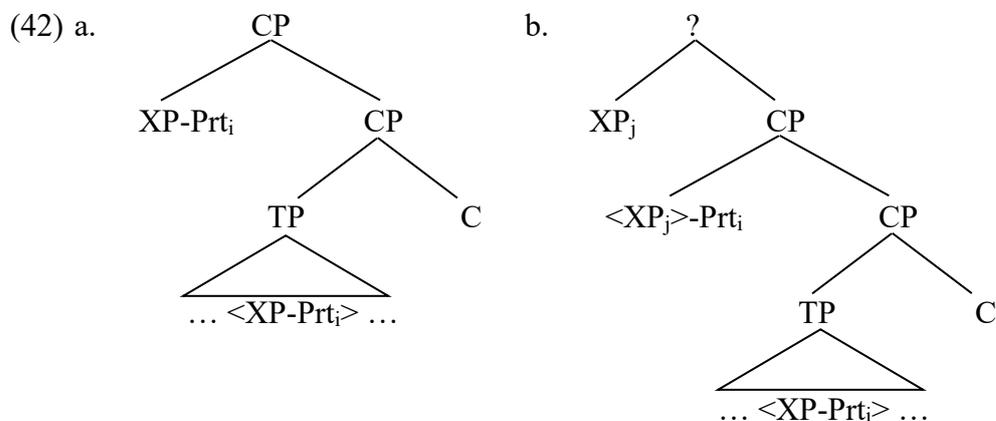
Recall that Sato (2012) assumes Spell-Out can apply either the whole phase (yielding non-PSE sentences) or its subpart (yielding PSE sentences) (see (36b-c)). The proposed analysis does not have to assume the variable ways of applying Spell-Out. The optionality between the PSE and non-PSE versions is attributed to the optionality of particle-stranding scrambling. This is conceptually preferable because scrambling is an instance of application of Merge, which comes for free.[19]

Let us now work out what happens when Spell-Out applies to (42b). The tree diagram in (42b) is in fact the set-theoretic object given in (43a). By hypothesis, Spell-Out applies to the whole SO in (43a), assigning labels where possible as in (43b).

(43) a. $\{XP_j, \{XP_j\text{-Prt}, \{C, TP\}\}\}$

    b. Spell-Out of (43a):

      $\{_? XP_j, \{_C XP_j\text{-Prt}, \{_C C, TP\}\}\}$

      $\rightarrow \{_? XP_j, <XP_j\text{-Prt}, <TP, C>>\}$

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[19] As an anonymous reviewer correctly points out, particle-stranding scrambling does not appear to be observed elsewhere in the grammar of Japanese. The reviewer (as well as another anonymous reviewer) also wonders why this extra step of particle-stranding scrambling is necessary, given that there is no labeling problem in (42a). It is however worth emphasizing that it is not assumed that scrambling (or movement in general) takes place for the sake of labeling. Rather, I assume that it applies freely, yielding both labelable and unlabelable SOs. The unlabelable SOs may or may not lead to a linearization failure, and only the derivations without any linearization failure survive (at least at PF). See Section 3.3 for a more explicit discussion on these questions.

The labeled SO $\{_C$ C, TP$\}$ is converted to the ordered pair <TP, C>, given the head-final linearization rule in (16b). As for the SO $\{_C$ XP$_j$-Prt, $\{_C$ C, TP$\}\}$, the label of the SO $\{$C, TP$\}$ provides the label of the whole SO due to the presence of the particle, given Saito's (2014, 2016) notion of anti-labeling device. Hence, the label is C, namely the head. Thus, the head-final linearization rule (16b) also applies, as in the case of $\{_X$ X, YP$\}$, giving rise to the ordered pair <XP$_j$-Prt, <TP, C>>.[20] Note that the root remains unlabeled, and it does induce a linearization problem if XP is realized. Unlike the original labeling framework, however, no problem arises if XP can somehow be rendered unpronounced.

A solution that nicely fits into the approach pursued in this paper comes from Sato and Maeda's (2018) (henceforth S&M) mechanism for PSE. Developing Mukai's (2003) idea called *String Deletion*, which is proposed for the analysis of gapping in Japanese, S&M propose their own definition, given in (44) (U_E stands for an elliptical utterance and U_A stands for an antecedent non-elliptical utterance).[21]

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[20] This means that the reason why scrambling in Japanese, which does not induce feature-sharing by hypothesis, is a leftward movement is different from the reason why a movement that induces feature-sharing (namely subject-raising and wh-movement in English) is a leftward movement. That is, the former is regulated by the head-final linearization rule (16b) while the latter is subject to the linearization rule in (19). In other words, the directionality of scrambling coincides with the direction of the head-parameter while that of feature-sharing movement does not have to be consistent with the head-parameter. Generalizing this leads to the prediction that if a language has optional movement made available by anti-labeling devices, its direction is regulated by the head-parameter. This is reminiscent of Saito and Fukui's (1998) approach to optional movements, who propose the system where head-final languages have leftward ones while head-initial languages have rightward ones. As exploring the prediction cross-linguistically is far beyond of the scope of this paper, I leave it for future work.

[21] Mukai's (2003) original definition of String Deletion goes as follows:

(i) String Deletion is a PF operation that applies to a phonetic string, regardless of its constituency, under string-based identity. The only structural condition on String Deletion is that the target string is continuous and contains a verb.

(Mukai 2003:210-211)

See also An (2016) for another but similar string-sensitive deletion process, which he calls *Extra Deletion*.

(44) *String Deletion (SD) in the Phonological Component*

String Deletion may apply to a contiguous phonetic string in U_E at PF, regardless of its syntactic constituency, if U_A has the identical phonetic string.

(Sato and Maeda 2018:11)

According to S&M, *Taroo* in (45B) is deleted under the phonetic identity with *Taroo* in (45A), yielding the PSE sentence.

(45) A: *Taroo-wa?*   B: ~~*Taroo*~~-*o*   *Hanako-ga*   *sikatta*

Taroo-TOP   Taroo-ACC   Hanako-NOM   scolded

'How about Taroo?'   'Hanako scolded [e] (= Taroo).'

Under the analysis based on *LfL*, (45B) is analyzed as having the structure in (46a), where *Taroo-o* undergoes scrambling, and then *Taroo* undergoes further scrambling, stranding the accusative Case-particle *-o*. When Spell-Out applies to (46a), labels are assigned where possible, and as a result the relative linear order can be determined except the root as shown in (46b).

(46) a.   {Taroo, {Taroo-o, {C, TP}}} (where TP = Hanako-ga Taroo-o sikatta)

b.   Spell-Out of (46a):

{? Taroo, {C Taroo-o, {C C, TP}}}

→ {? Taroo, <Taroo-o, <TP, C>>}

= {? Taroo, <Taroo-o, <Hanako-ga Taroo-o sikatta, C>>}

Collapsing the internal structure of the TP, the final line of (46b) is obtained.

Recall that it is assumed that phonological features are not present in narrow syntax but inserted as one of the post-Spell-Out processes including copy realization. Since there are two copies of *Taroo-o*, the lower one is determined not to be realized as in (47a). Similarly, the presence of the higher copy of *Taroo* blocks the lower one from being realized as in (47b). Then, the highest copy of *Taroo* is subject to SD, which is now understood as instructing the PF-component not to insert phonological features to the item that has the identical phonological realizations in the antecedent, as in (47c).

(47) a.   {? Taroo, <Taroo-o, <Hanako-ga ~~Taroo~~-o sikatta, C>>}

b.   {? Taroo, <~~Taroo~~-o, <Hanako-ga ~~Taroo~~-o sikatta, C>>}

    c.   SD applied to the higher *Taroo*:

        {₂ ~~Taroo~~, <~~Taroo~~-o, <Hanako-ga ~~Taroo-o~~ sikatta, C>>}

Notice that the linearization problem has disappeared. Due to the lack of the label, the relative linear order between *Taroo* and the rest of the sentence (corresponding to *-o Hanako-ga sikatta*) cannot be specified. Because SD has made *Taroo* unpronounced, the relative linear order can be left unspecified, leading to no PF-problem.

    Let us compare Sato's (2012) original analysis with the one developed so far. One of the properties that Sato (2012) attempts to capture is the fact that nothing can precede the null topic, as exemplified by (48), repeated from (35).

(48) A: *Miku-wa   kyoo   nani-o   tabeta no?*
        Miku-TOP today what-ACC   ate   Q
        'What did Miku eat today?'

    B: a.   [e]-*wa, hoikuen-de   udon-o   tabeta-mitai*
              -TOP   day-care.center-at noodle-ACC   ate-seem
              '(lit.) [e] (= Miku) seems to have eaten noodles at day-care center.'

        b. * *hoikuen-de   [e]-wa, udon-o   tabeta-mitai*
           day-care.center-at   -TOP   noodle-ACC   ate-seems
           '(lit.) [e] (= Miku) seems to have eaten noodles at day-care center.'

    There are two more properties that Sato (2012) attempts to capture. The first one is that PSE is restricted to root clauses, as illustrated by (49B). The second one is exemplified by (50B), which indicates multiple PSE is not possible.

(49) A: *Kimi-wa [Miku-ga   nani-o   tabeta to] omotteiru   no?*
        you-TOP   Miku-NOM what-ACC ate   C   think   Q
        'What do you think [Miku has eaten]?'

    B: * *Boku-wa [[e]-ga   udon-o   tabeta to] omotteiru*
        I-TOP   -NOM   noodle-ACC   ate   C   think
        'I think [that [e] (= Miku) has eaten noodles].'

(50) A: *Miku-wa   udon-o   doko-de   tabeta no?*
        Miku-TOP noodle-ACC   where-at   ate   Q
        'Where does Miku eat noodles?'

B: * [e]-*wa*   [e]-*o*   *hoikuen-de*   *tabeta-mitai*

    -TOP   -ACC   day-care.center-at   ate-seem

   '[e] (= Miku) has eaten [e] (= noodles) at day-care center.'

Under Sato's (2012) analysis, these three properties (sentence-initiality (48), the root-restriction (49), and the prohibition of multiple PSE (50)) are all accounted for by the notion of the privilege of the root. That is, there is only one position that can escape Spell-Out, namely Spec, TopP, which is the root phase. On the other hand, under the analysis in terms of *LfL* and phasal Spell-Out, there is no such designated position.

Nonetheless, there are conceptual and empirical reasons to believe that the proposed analysis is superior to Sato's (2012) analysis. Conceptually, the proposed analysis can maintain that Spell-Out applies in the same manner regardless of whether it applies to the root or to non-root phases. Furthermore, the optionality between PSE and non-PSE versions, which Sato (2012) attributes to the variable ways of applying Spell-Out to the projections of the same head (Top' vs. TopP), arises from the optionality of scrambling, which is independently available in the grammar of Japanese.

On the empirical side, Shibata (2014) points out that the observations in (48)-(50) in fact fall under a broader generalization concerning the syntax-phonology interface. First, building on Pierrehumbert and Beckman (1988) and Nagahara (1994), Shibata (2014) assumes the following two alignment conditions.

(51) *Focus-Left-Edge*

    Left edge of focus = left intermediate phrase edge

(52) *Focus-to-End*

    No intervening [$_i$ between any focus constituent and the end of the sentence.

A normal phonological phrasing of a sentence like (53a) is given in (53b) (where *u* stands for Utterance, *i* stands for Intermediate Phrase, and acute accent marks indicate pitch accent). When the topic-marker *-wa* is focused, however, the sentence has the phonological phrasing in (53c).

(53) a.   *Naoko-wa nitiyoobi   Nagoya-de Mari-ni   atta*

        Naoko-TOP Sunday   Nagoya-in Mari-DAT   met

        'On Sunday, Naoko met Mari in Nagoya.'

   b.   [$_u$ [$_i$ Náoko wá] [$_i$ nitiyóobi] [$_i$ Nágoya dé] [$_i$ Mári ni átta]]

   c.   [$_u$ [$_i$ Náoko] [$_i$ WÁ nitiyóobi Nágoya dé Mári ni átta]]

In (53c), an intermediate phrase boundary [$_i$ is inserted to the left of the focused particle to observe (51). Then, (52) requires the intermediate phrase to be stretched to the end of the sentence.

Capitalizing on the fact that the stranded particles in PSE must trigger focus phrasing, Shibata (2014) then proposes the licensing condition for PSE in (54).

(54) PSE is licensed in: [$_u$ [$_i$ X ……]], where X is a stranded particle and is focused.

The condition in (54), which requires that the left edge of an Intermediate Phrase boundary be aligned with the left edge of the Utterance, effectively forces the stranded particles to appear in the strictly utterance-initial position. Notice then that in all the ungrammatical examples in (48)-(50), some overt element precedes the stranded particles, no matter how we analyze their syntactic structures.

Shibata (2014) also provides a piece of evidence that his analysis is empirically superior to Sato's (2012).[22] In (55B), [e] is the subject of the embedded clause.

(55) A: *John-wa   sigoto-o yameru   no?*
         John-TOP   job-ACC   quit   Q
         'Will John quit his job?'
    B: [e]-*ga   sigoto-o yameru   kadooka-wa   siranai-kedo,*
          -NOM   job-ACC   quit   whether-TOP   not.know-though
         sooiu uwasa-wa   aru
         such   rumor-TOP   exist
         'Though I don't know whether [e] (= John) will quit his job, there is such a
         rumor.'   (adopted from Shibata 2014)

The grammaticality of (55) thus indicates that PSE is not limited to root clauses, contrary to what Sato (2012) attempts to capture. On the other hand, the null topic is

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[22] Another piece of evidence that Shibata (2014) observes is that even an item like an interjection cannot precede PSE, even when it accompanies a pause, as in (i).
(i)   A: 'Will John come?'   B:* *Eetto*(,)   [e]-*wa   kimasen*
                                        well   -top   not.come
                                        'Well, [e] (= John) won't come.'
According to (54), this is because the stranded particle is not in the utterance-initial position. See also S&M for more examples and qualifications.

located at the utterance-initial position, observing the condition in (54).

Not surprisingly, (49B) becomes grammatical if the embedded clause undergoes scrambling so as to locate [e] at the utterance-initial position, as in (56).

(56) [[e]-*ga* *udon-o* *tabeta to*]ᵢ *boku-wa* tᵢ *omotteiru* (as a reply to (49A))
  -NOM noodle-ACC ate C I-TOP   think
 'I think [that [e] (= Miku) has eaten noodles].'

This observation confirms Shibata's (2014) approach based on the condition in (54).

The proposed analysis equipped with SD and the condition in (54) accommodates the embedded PSE cases as follows. Taking (56) as a concrete example, the step in (57a) illustrates the point where the embedded CP phase has completed. After the application of Spell-Out, realization of copies takes place so as to the highest copy of *Miku* is chosen to be realized as in (57b). If nothing further happens, a linearization problem occurs. As a result of SD depicted in (57c), however, the problem disappears.

(57) a. {Miku, {Miku-ga, CP}} (where CP = *udon-o tabeta to*)
  b. Spell-Out of (57a) and realization of copies:
   {₂ Miku, {C Miku-ga, CP}}
   → {₂ Miku, <~~Miku~~-ga, udon-o tabeta to>}
  c. SD applied to *Miku*:
   {₂ ~~Miku~~, <~~Miku~~-ga, udon-o tabeta to>}

The derivation then proceeds to the matrix clause. If the embedded clause does not undergo scrambling, (49B) is derived, while (56) is obtained when it undergoes scrambling. Only in the latter case can the condition in (54) be observed, distinguishing the grammatical (56) from ungrammatical (49B). The point is that because the proposed analysis does not make a distinction between root and non-root contexts, it allows embedded PSE, as long as the output satisfies the licensing condition in (54).

3.3 On the theoretical status of String Deletion

Before concluding this section, let us compare S&M's analysis of PSE and ours. In (58), repeated from (45), S&M argue that SD simply applies to *Taroo* in Speaker B's utterance under string-based identity. On the other hand, I have argued that the derivation involves the steps depicted in (59).

(58) A: *Taroo-wa?*   B: ~~*Taroo-o*~~   *Hanako-ga*   *sikatta*

        Taroo-TOP   Taroo-ACC   Hanako-NOM   scolded

        'How about Taroo?'   'Hanako scolded [e] (= Taroo).'

(59) a.   After the post-Spell-Out processes (cf. (47b)):

        {₂ Taroo, <~~Taroo~~-o, <Hanako-ga ~~Taroo-o~~ sikatta, C>>}

    b.   SD applied to the higher *Taroo*:

        {₂ ~~Taroo~~, <~~Taroo~~-o, <Hanako-ga ~~Taroo-o~~ sikatta, C>>} (= (47c))

Under the proposed analysis, *Taroo* first undergoes particle-stranding scrambling, which triggers a labeling problem, namely a linearization failure, as in (59a). SD then applies as in (59b), resolving the linearization problem.

At a first glance, the proposed analysis raises the following two questions, as two anonymous reviewers independently point out (see also footnote 19).

(60) a.   Is particle-stranding scrambling available in other contexts than PSE?

    b.   Why is it necessary, given that S&M's analysis is simpler?

This subsection is devoted to answering these questions, arguing that the proposed analysis rather provides a way of understanding the nature of SD. To be more specific, I suggest that SD is a purely PF-process that salvages an unlabelable (thus unlinearizable) SO. Put differently, I claim that it is a kind of "last resort" strategy operating at the PF-interface.[23] This in fact supports S&M's characterization of SD as a purely PF-process, but at the same time overcomes certain problematic aspects of their conception.

As for the theoretical status of SD, S&M's claims can be summarized as in (61).

(61) a.   SD, as a purely PF-process, applies regardless of its syntactic constituency.

    b.   SD is also involved in other ellipsis phenomena.

As for (61a), S&M claim that SD is a purely PF-oriented process, which obeys its own domain-specific guideline on its application, hence it can ignore syntactic constituency. By claiming (61b), S&M point out that there are certain similarities between PSE and the so-called *argument ellipsis* (AE) phenomena (see Oku 1998; Saito 2007; Takahashi 2008, among many others). Following the works including Takahashi (2013) and Maeda (2017), where AE is argued to be an instance of PF-deletion, S&M argue that

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[23] This idea is inspired by Mamoru Saito's (p.c.) comments.

SD involved in PSE is not an isolated, mysterious process. Let us examine these claims one by one.

Arguing for the claim in (61a), S&M argue that SD applies to a non-constituent, based on the examples in (62) and (63). They involve a tripartite coordination, namely a coordination structure with three DPs (modified from Sato and Maeda 2018:14-15).

(62) A: *Ano   omoi   piano-o   Taroo-to   Hanako-de   motiageta   no?*
        that   heavy piano-ACC Taroo-and   Hanako-with lifted   Q
        'Did Taroo and Hanako lift that heavy piano?'

    B: a.   [e]-*to   Ziroo-no   sannin-de   (issyoni)   motiageta-nda-yo*
             -and   Ziroo-GEN   three-with   together   lifted-COP-PRT
            '[e] (= Taroo and Hanako) and Ziroo lifted it together.'

      b.   ~~Taroo-to Hanako~~-to Ziroo-no sannin-de   (issyoni)   motiageta

(63) [Context: A and B wonder where they might want to go for a date this Saturday.]

    A: *Konsyuu-no   doyoobi deeto doko ikoo   ka? Omotesando-ka*
       this.week-GEN   Saturday date   where to.go Q   Omotesando-or
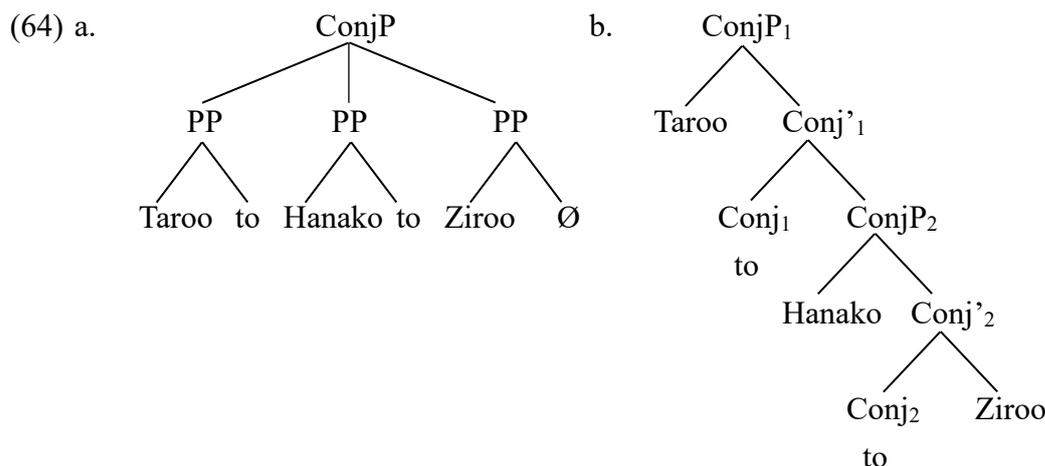   *Sinzyuku?*
      Shinjuku
      'Where shall we go for a date this Saturday? Omotesando or Shinjuku?'

    B: a.   [e]-*ka Asakusa-wa?*
            -or   Asakusa-TOP
            '[e] (= Omotesando or Shinjuku) or Asakusa?'

      b.   ~~Omotesando-ka Sinzyuku~~-ka   Asakusa-wa?

According to S&M, (62a) and (63a) are derived by applying SD to *Taroo-to Hanako* as in (62b) and to *Omotesando-ka Sinzyuku* as in (63b), respectively.

As for the structure of tripartite coordinations, S&M suggest two possibilities depicted in (64) (adopted from Sato and Maeda 2018:15). Notice that SD is forced to apply to a non-constituent in order make *Taroo-to Hanako* unpronounced in either case.

(64) a.

```
                    ConjP                      b.        ConjP₁
          ┌───────────┼───────────┐                    ╱      ╲
         PP          PP          PP               Taroo      Conj'₁
        ╱  ╲        ╱   ╲        ╱  ╲                        ╱    ╲
   Taroo  to  Hanako  to   Ziroo   Ø                   Conj₁    ConjP₂
                                                         to      ╱    ╲
                                                           Hanako    Conj'₂
                                                                    ╱    ╲
                                                               Conj₂   Ziroo
                                                                 to
```

Without exploring the exact structure of tripartite coordinations, I point out that there is an alternative possibility that dispenses with non-constituent SD. As shown in (65), overt pronouns can appear in the position of [e] of (62a) and (63a)).

(65) a. *Karera-to Ziroo-no sannin-de (issyoni) motiageta* (as a reply to (62A))
      they-and Ziroo-GEN three-with together lifted
      'They and Ziroo lifted it together'

    b. *Sore-ka Asakusa-wa?* (as a reply to (63A))
      it-or Asakusa-TOP
      'Those places or Asakusa?'

By replacing these pronouns with *pro*, the sentences in question can be obtained without recourse to non-constituent SD.

As for the claim in (61b), S&M offer several observations that indicate that PSE patterns with AE (see also Sakamoto and Saito 2018). Among those observations, however, the one concerning sloppy interpretations in fact points to the opposite direction under close scrutiny.

It is well known that AE allows sloppy interpretations, as shown in (66). S&M observe that PSE also allows them, observing that (67B) has the interpretation where [e] refers to Hanako's mother.

(66) a. *Taroo-wa zibun-no hahaoya-o sonkeisiteiru*
      Taroo-TOP self-GEN mother-ACC respect
      'Taroo respects self's mother.'

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b. *Hanako-wa*   [e]   *sonkeisiteinai*

Hanako-TOP   not.respect

'Hanako doesn't respect [e] (= Hanako's mother).'

c. *Hanako-wa*   ~~*zibun-no hahaoya-o*~~   *sonkeisiteinai*

(67) A: *Zibun-no   hahaoya-o*$_i$ *Taroo-wa*   t$_i$ *sonkeisiteiru*

self-GEN   mother-ACC   Taroo-TOP   respect

'Self's mother$_i$, Taroo respects t$_i$.'

B: a. [e]-*wa*   *Hanako-wa   sonkeisiteinai*

-TOP   Hanako-TOP   not.respect

'[e] (= Hanako's mother), Hanako does not respect.'

b. ~~*zibun-no hahaoya*~~-*wa*   *Hanako-wa*   *sonkeisiteinai*

S&M's (2018) point is that if the sloppy interpretation in (66b) results from a PF-deletion process responsible for AE, as shown in (66c), the availability of the sloppy interpretation in (67a) should indicate that SD, which is responsible for PSE as in (67b), is also an instance of a PF-deletion process. In this way, S&M attempt to assimilate SD to other PF-deletion processes.

As shown in (68) and (69), however, there is a crucial asymmetry between AE and PSE with respect to the availability of sloppy interpretations. (68a) and (69A) are minimally different from (66a) and (67A) in that the masculine anaphor *karezisin* 'himself' appears instead of *zibun* 'self.'

(68) a. *Taroo-wa   karezisin-no   hahaoya-o   sonkeisiteiru*

Taroo-TOP   himself-GEN   mother-ACC   respect

'Taroo respects himself's mother.'

b. *Hanako-wa*   [e]   *sonkeisiteinai*

Hanako-TOP   not.respect

'Hanako doesn't respect [e] (= Hanako's mother).'

(69) A: *Karezisin-no   hahaoya-o*$_i$ *Taroo-wa*   t$_i$ *sonkeisiteiru*

himself-GEN   mother-ACC   Taroo-TOP   respect

'Himself's mother$_i$, Taroo respects t$_i$.'

B: * [e]-*wa*   *Hanako-wa   sonkeisiteinai*

-TOP   Hanako-TOP   not.respect

'[e] (= Hanako's mother), Hanako does not respect.'

Crucially, AE in (68b) still allows the sloppy interpretation but PSE in (69B) does not.

The unavailability of the sloppy interpretation for (69B) is straightforwardly predicted by the assumption that SD is responsible for the derivation of PSE. Recall that SD by definition applies under PF-identity between the target and its antecedent. Hence, the underlying form of [e] in (69B) must be *karezisin-no hahaoya* 'himself's mother.' As shown in (70), however, the masculine anaphor *karezisin* 'himself' cannot take the feminine name *Hanako* as its antecedent, unlike *zibun* 'self.'

(70) **Karezisin-no/Kanozyozisin-no hahaoya-o*$_i$ *Hanako-wa*   t$_i$ *sonkeisiteinai*
     himself-GEN herself- GEN   mother-ACC   Hanako-TOP   not.respect
     'Himself's/Herself's mother, Hanako does not respect.'

Since the feminine anaphor *kanozyozisin* 'herself' has a different PF-realization, there is no way to derive (69B) via SD.

(68b) also becomes ungrammatical if the gap is realized as *karezisin-no hahaoya-o* 'himself's mother,' which contains the masculine anaphor *karezisin* 'himself', as shown in (71).

(71) *Hanako-wa*   **karezisin-no/kanozyozisin-no*   *hahaoya-o*   *sonkeisiteinai*
     Hanako-TOP   himself-GEN herself-GEN   mother-ACC   not.respect
     'Hanako doesn't respect himself's/herself's mother.'

The fact that (68b) is grammatical with the intended sloppy interpretation thus indicates that AE can ignore the difference between *karezisin* 'himself' and *kanozyozisin* 'herself,' unlike PSE.

The contrast between (68b) and (69B) indicates that a phonetic/phonological mismatch between the target and its antecedent is irrelevant for AE but it is fatal for PSE. In fact, there is independent evidence that AE does not require PF-identity between the target and its antecedent. Saito (2007) observes that a dative argument can be elided taking an accusative one, as shown in (72).

(72) a. *Taroo-wa* [*zibun-no hahaoya*]-*o* *tazuneta*
        Taroo-TOP   self-GEN   mother-ACC   visited
        'Taroo visited his mother.'
   b. *Hanako-wa* ~~[*zibun-no hahaoya*]-*ni*~~ *denwa-o* *sita*
        Hanako-TOP   self-GEN   mother-DAT   phone-ACC did
        'Hanako made a phone call to her mother.'

These observations thus suggest that AE is insensitive to PF-identity, unlike PSE.

What does the discussion so far imply for the theoretical status of SD summarized in (61)? Notice first that the fact PSE is sensitive to PF-identity strongly supports S&M's original claim that SD is a purely PF-process. At the same time, the difference between PSE and AE suggests that they involve different processes. No matter whether AE involves LF-copying (see Oku 1998; Saito 2007; Takita 2010; Bošković 2016c; Sakamoto 2017, among others) or PF-deletion (Takahashi 2013; Maeda 2017, among others), it must be assumed that the deletion process is rather insensitive to phonological/phonetic differences, unlike SD.[24] As for non-constituent SD, the pieces of evidence that S&M do not suffice to motivate it. Although there remains a possibility that non-constituent SD is available, all the PSE examples discussed in the literature virtually involve constituent deletion. A curious situation thus arises: SD, a purely PF-deletion process, seems to target constituents only and have no other comparable ellipsis processes.

I then claim that SD finds its theoretical position in the analysis that regards SD as a last resort PF-process that resolves a linearization problem, which is caused by an unlabeled SO. First, the idea that SD is a kind of last resort allows us to dissociate it from other ellipsis processes: AE and other well-studied instances of ellipsis (such as VP-ellipsis and sluicing) are generally optional, hence not regarded as "last resort". On the other hand, SD must be triggered in order to yield a legitimate output under the proposed analysis (see (59)). Second, SD, though a PF-process, targets constituents because a labeling problem is caused by syntax. That is, if the role of SD is to make an unlabeled SO of the form $\{_? XP, YP\}$ pronounceable as a last resort, it necessarily targets a constituent XP or YP. Hence, even if SD is a purely PF-process, it inevitably applies to a constituent.

The above discussion provides a partial answer to the questions in (60), repeated as (73), especially for (73b).

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[24] This is trivially true under the LF-copying approaches. Even for the PF-deletion approaches, it is not assumed that PF-deletion is sensitive only to PF-related information. One simple illustration comes from the well-known example of VP-ellipsis in (i).

(i)   *John likes flying planes, and Bill does too.*   (Fox 1995:306)

Although the antecedent VP has two interpretations due to the expression *flying planes*, the intepretation of the elided part must be parallel to the one in the antecedent. Hence, the deletion process is sensitive to something more abstract than phonological strings.

(73) a.   Is particle-stranding scrambling available in other contexts than PSE?

   b.   Why is it necessary, given that S&M's analysis is simpler?

That is, although the *LfL*-based analysis with particle-stranding scrambling looks more complicated than S&M's, it offers a more solid theoretical rationale for the otherwise mysterious process of SD.[25]

As for the question in (73a), the answer goes as follows: Any application of particle-stranding scrambling induces a labeling problem under Saito's (2014, 2016) treatment of the particles, leading to a linearization failure under *LfL*. SD is then inevitably triggered to resolve the problem. This series of operations leaves us a stranded particle, which Shibata's (2014) condition in (54) forces to appear in the utterance-initial position. Hence, particle-stranding scrambling always results in PSE.

The above discussion does not exclude the possibility that SD as a last resort for salvaging a labeling/linearization failure plays a role in phenomena other than PSE. In fact, the empirical motivations for Mukai's (2003) and An's (2016) PF-deletion processes that are exclusively sensitive to string-identity have to do with the cases where deletion targets the right-edge (namely gapping and fragment answers), unlike PSE, which exclusively targets the left-edge. It is thus worth exploring to what extent *LfL* can accommodate those right-edge phenomena. In particular, although Mukai (2003) formulates SD as an instance of non-constituent deletion (see footnote 21), our conception of SD necessarily targets constituents. Thus, careful examinations are called for (see S&M for a relevant discussion). Another interesting research topic is that whether SD is a language-specific last resort option, or it has other instantiations in different languages other than Japanese. In this respect, the topic-drop phenomena in German, which Sato (2012) originally ties with PSE, can be an interesting area to explore. For reasons of space, however, I leave these important issues for future research. Nonetheless, it is worth emphasizing that the idea that SD as a last resort PF-process that saves an unlinearizable SO (due to its unlabelable nature) finds its natural place in the principal hypothesis of this paper, namely *LfL*.

4 Conclusion

   The primary goal of this paper is to argue for the idea *Labeling for Linearization*

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[25] As pointed out in footnote 19, particle-stranding scrambling itself must be available given that Merge applies freely. I thus believe that the complexity of the derivation is only an apparent problem.

(*LfL*), which hypothesizes that labeling is required for the purpose of linearization. To achieve this goal, it is first illustrated that labels are not only unnecessary for semantic interpretation but also complicate the mapping between syntactic objects and semantic values. Then, it is proposed that labels are necessary for linearization in that they serve as a device to encode structural asymmetries that are employed to determine precedence relations at the PF-interface, which are asymmetric as well. It is also shown that *LfL* can remove several problems of Chomsky's (2013, 2015) original framework.

One of the most straightforward merits of *LfL* is that it gains the effect of Chomsky's (2013, 2015) assumption that copies are invisible for labeling without making such an assumption. Capitalizing on this merit, it has argued that *LfL* offers a novel way to approach to the issue concerning the size of Transfer/Spell-Out domain. Building on Bošković's (2016a) idea that the whole phase but not its subpart constitutes such a domain, but at the same time departing from it with clarifying certain architectural implications, I have illustrated that Spell-Out always applies to the whole SO upon completion of a phase regardless of at the root or not. Working out several concrete cases, it is shown that the proposed analysis offers a more natural account for the core cases of successive-cyclic movement as well as lower copy pronunciation.

Extending the analysis to Japanese, then, I have proposed a novel analysis of particle-stranding ellipsis (PSE), incorporating Saito's (2014, 2016) idea about the role of Case-particles in languages without φ-features. Combined with the PF-oriented approaches put forth by Shibata (2014) and Sato and Maeda (2018), it is argued that the proposed analysis can overcome several problems of Sato's (2012) original analysis. Finally, I have put Sato and Maeda's (2018) PF-deletion mechanism of Sting Deletion (SD) under close scrutiny, clarifying its theoretical status.

There are several remaining issues, however. For instance, concrete empirical evidence is necessary to see how *LfL* resolves labeling problems in head-head merger cases. As for the specific linearization rules in (16) and (19), several details still remain stipulative and hence must be further elaborated, although they suffice to derive correct word orders in English and Japanese. Yet another issue has to do with the Japanese-internal as well as cross-linguistic status of SD. Nonetheless, I believe that the current work contributes to not only sharpening the core theoretical notions regarding structure building and linearization in terms of labeling but also deepening our understanding of the structure of Japanese.

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