Article

A labeling analysis of *tough*-movement operations[*]

Naoto TOMIZAWA

1. Introduction

It is sometimes observed that unlike the subject of genuine raising constructions, the subject DP of the *tough*-movement construction allows only partial reconstruction in the sense that the complement of D can reconstruct but its edge cannot (cf. Kim 1998, Sportiche 2002, 2006, Hicks 2009). One plausible explanation of this fact (which I will adopt in this paper) is an introduction of the D and its edge at a stage of the derivation that is later than the stage when the D's nominal complement is introduced. The implementations of such a "late merger" operation in Sportiche (2006) and Tomizawa (2020), however, violate the Extension Condition (Chomsky 1993) and the No Tampering Condition (Chomsky 2008).

This paper proposes a revision of such a late merger analysis of the edge material of D that does respect the Extension Condition and the No Tampering Condition. The crucial component of the analysis to be presented in this paper is the labeling option in terms of direct selectional features. Specifically, (1d) is adopted, along with the traditional labeling options (1a-c) for the Labeling Algorithm (Chomsky 2013).

(1)　Labeling Algorithm

　　Given a syntactic object (SO) {α, β},

　　a. if α is a head and β is not a head, then α is selected as the label of SO,

　　b. if both α and β are identical in a certain prominent feature, the prominent feature is taken to be the label of SO,

　　c. if α is a copy and β is not a copy, then α is the label of SO,

　　d. if the head of α directly selects β, then α is selected as the label of SO.

The "direct selection" relation in (1d) is typically found in a head-complement configuration. Thus, if such a complement phrase (= β) re-merges with a projection (= αP) of its selecting head (= α), then (1d) ensures that the resulting syntactic object {β, αP} can be labeled as α.[1] This is illustrated in (2) below.

1　The assumption that this re-merging operation is permitted is not compatible with Abels' (2003) Anti-locality Constraint,

For expository purposes, the notation "$x/y \rightarrow y$" is employed to represent that given the syntactic object consisting of x and y, the Labeling Algorithm selects y as the label of $\{x, y\}$.

(2)

$$\beta/\alpha P \rightarrow \alpha$$

β αP

… α … β …
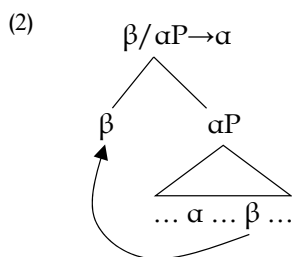
It will be shown that this additional labeling option in (1d), combined with some auxiliary assumptions on relabeling within a phase-based labeling system, generates the *tough*-movement construction.

The paper is organized as follows. Section 2 starts with the derivational analysis of restrictive relative clauses and motivates the labeling option (1d) above. Section 3 turns to the analysis of the *tough*-movement construction and shows that the option (1d) provides us with the derivation of the construction that (i) respects the Extension Condition and No Tampering Condition and (ii) explains the partial reconstruction properties that the construction has. Section 4 reviews how this analysis deals with a variety of reconstruction phenomena and gives some further speculations. Section 5 is a brief conclusion.

2. Nominalization of restrictive relative clauses in the labeling theory

In this section, we will review Donati and Cecchetto's (2011) analysis of restrictive relative clause formation within the labeling system framework and motivate an additional labeling option that hinges on a head's direct selectional property.

2.1. Problems with Donati and Cecchetto's (2011) nominalization procedure

A restrictive relative clause merges with a nominal projection to yield a noun phrase. An interesting analysis of this syntactic procedure within the labeling system framework is presented by Donati and Cecchetto (2011) (see also Cecchetto and Donati 2006). They claim that this nominalization procedure is made possible when the term that a restrictive relative clause merges with is N. Being a lexical item, N is by definition a probe (with an edge feature) and, hence, can provide a label.

To take an example, consider the underlying structure (3a) below, where D_e is a null D that selects a nominal complement. This nominal complement internally merges with CP, yielding (3b). (For expository convenience, a "lower" copy of the element that has undergone internal merge operation is marked by strike-through.) Since man_N is a lexical item, it can provide a label for the whole structure as shown in (3c).

The whole structure, then, merges with D, projecting DP as in (3d).

(3)　　a. [$_{CP}$ that [$_{TP}$ we will never forget [$_{DP}$ D$_e$ man$_N$]]]

　　　　b. man$_N$ [$_{CP}$ that we will never forget [D$_e$ ~~man~~]]

　　　　c. [$_{NP}$ man$_N$ [$_{CP}$ that we will never forget [D$_e$ ~~man~~]]]

　　　　d. [$_{DP}$ the$_D$ [$_{NP}$ man$_N$ that we will never forget [D$_e$ ~~man~~]]]

　　This analysis of the nominalizing phenomenon in restrictive relative clause formation is insightful in several respects but it faces both theoretical and empirical problems that are difficult to overcome.

　　One crucial feature of their labeling system is that it can never allow nominalization of a relative clause construction when NP (rather than N) internally merges with a relative clause. For example, the structure (4) below can never be labeled, since the internally merged NP is not a lexical item.

(4)　　[$_{NP}$ book on her desk] [$_{CP}$ that every professor liked [$_{DP}$ D$_e$ ~~book on her desk~~]]

However, some device is needed to nominalize the relative clause because the sentence (5) is grammatical.

(5)　　[The book on her desk that every professor liked ＿ best] concerned model theory.

<div align="right">(Sauerland 1998)</div>

To deal with this sort of restrictive relative clause formation where the relative clause modifies a phrasal constituent such as *book on her desk*, Donati and Cecchetto (2011) appeal to late merger operations. They claim that the underlying structure for the relative clause in (5) should be (6a) below, where *on her desk* is not present yet. The noun *book* undergoes internal merge with CP, as in (6b), and projects as in (6c). It is at this stage of the derivation that *on her desk* is introduced by a late merger operation, as in (6d).

(6)　　a. [$_{CP}$ that every professor liked [$_{DP}$ D$_e$ book$_N$] best]

　　　　b. book$_N$ [$_{CP}$ that every professor liked [D$_e$ ~~book~~] best]

　　　　c. [$_{NP}$ book$_N$ [$_{CP}$ that every professor liked [D$_e$ ~~book~~] best]]

　　　　d. [$_{NP}$ book$_N$ [on her desk] [$_{CP}$ that every professor liked [D$_e$ ~~book~~] best]]

　　It might be obvious from this illustration that late merger is an indispensable part of Donati and Cecchetto's (2011) theory. But late merger is a device that lacks theoretical foundations and, hence, carries "a burden of proof" (Chomsky 2015: 6) if it is to be adopted. In addition, the well-formedness of the example (5) poses an empirical problem, as well. In (5), the pronoun *her* can be bound to *every professor*. This fact rejects the late introduction of *on her desk* in terms of the late merger operation outlined in (6); rather, it supports the derivation laid out in (4), where the copy of *her* that appears within the complement of *liked* is successfully c-commanded by its quantificational antecedent *every professor*.

　　Similarly, the ill-formedness of the idiomatic interpretation of *make headway* in the example (7) below provides additional evidence against a late merger of *on Mary's project*, since the late merger analysis predicts wrongly that *Mary* can be an antecedent of *she*.

(7)　　*[The headway on Mary$_i$'s project [she$_i$ had made ＿]] pleased the boss.　　(Sauerland 1998)

Rather, the ill-formedness of (7) strongly supports an analysis that introduces *headway on Mary's project* within the complement position of *made*, since it correctly predicts that such coreference of *Mary* and *she* violates the Binding Condition (C).[2]

What can be drawn from these considerations is that the merger of a relative clause with a nominal phrasal constituent such as *book on her desk* and *headway on Mary's project* should yield a labeled constituent. In the next subsection, a new labeling option in terms of direct selectional features is introduced.

2.2. A labeling option in terms of direct selectional features

Before going into details, let us adopt the hypothesis that what undergoes internal merge in relative clause formation is not DP but *n*P. That the element undergoing internal merge is a nominal fragment that excludes D is a widely adopted part of the analysis of restrictive relative clause formation (see Kayne 1994, for example) and Donati and Cecchetto (2011) argue that the D that selects the nominal fragment is stranded *in situ* in relativization. This stranding of D is presupposed in my earlier work (2020), where drawing on but revising Sportiche's (2006) analysis of the *tough*-movement construction, predicative-NP movement is argued to be involved in both restrictive relative clause formation and *tough*-movement. The hypothesis that this nominal fragment is *n*P rather than NP does not seem to affect the essential parts of the arguments presented in these works.

Another assumption I will adopt here is that this internal merger of *n*P with CP does not involve any operator feature that is similar to *wh*-features in interrogative *wh*-movement phenomena. *n*P can merge with CP simply because (internal) merge applies freely (Chomsky 2015).

In addition, let us adopt the hypothesis that labeling of a given constituent is carried out on a phase basis: labeling is not instantaneous but carried out at a phase level. This means that the existence of a non-labeled constituent is never an inherent blocker of further application of a syntactic operation to such a

---

2   The arguments presented here on the basis of the examples in (5) and (7) have shown that strict-cyclic introduction of such dependent elements as *on her desk* and *on Mary's project* is forced in the environment where reconstruction of some material related to such a dependent element is needed for an independent reason (such as bound pronoun interpretation in (5) and idiomatic interpretation in (7)). In this respect, an anonymous reviewer raised an interesting question of whether strict-cyclic introduction of dependent elements is also forced in non-reconstruction environments as well. If dependent elements are always introduced strict-cyclically (in other words, if they are never introduced by late merger), this will constitute a stronger argument against Donati and Cecchetto's (2011) analysis, which is built on the availability of late merger.

It is, however, quite difficult to construct an argument along these lines for the following reason. First of all, the merger of a restrictive relative clause and its "antecedent" nominal expression is carried out either by internal merge, as discussed here, or by external merge: the former is conventionally referred to as a raising/promotion analysis, and the latter as a matching analysis. Thus, the grammatical status of the sentence (i) under the coreference interpretation of *John* and *he* does not reject the raising/promotion analysis, because the sentence is successfully generated under the matching analysis. Nor does it support the raising/promotion analysis, simply because the analysis does not generate this sentence in a strict-cyclic fashion.

(i)   Mary looked at every picture of John$_i$ that he$_i$ sent.   (Hackl and Nissenbaum 2012)

What is needed here is an environment where a matching analysis is unavailable for an independent reason. To the best of my knowledge, however, such an environment is typically provided by reconstruction requirements.

constituent.

Bearing these assumptions in mind, consider the structure generated by the internal merger of *book on her desk* and *that every professor liked best*, as shown in (8) below. (Notice that "nP/CP" is not a label: it represents a syntactic constituent that has to be labeled.)

(8)
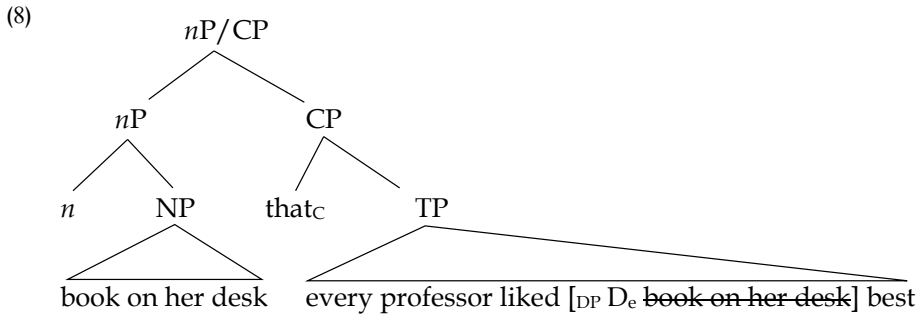
Here, {nP, CP} is not labeled under Donati & Cecchetto's (2011) framework; nor is it in the original formulation of the Labeling Algorithm by Chomsky (2013) in (9a-c).

(9)　　Labeling Algorithm　　　　　　　　　　　　　　　　　　　　　　　(Chomsky 2013)

Given a syntactic object (SO) {α, β},

a. if α is a head and β is not a head, then α is selected as the label of SO,

b. if both α and β are identical in a certain prominent feature, the prominent feature is taken to be the label of SO,

c. if α is a copy and β is not a copy, then α is the label of SO,

In (8), neither nP nor CP is a lexical element; nor do they share a prominent feature. [3]

As discussed in Chomsky (2013, 2015) and others, a labeling problem can sometimes be resolved if one of the terms involved undergoes "movement." This option is formulated in (9c). Let us then consider what happens when a term of a term undergoes "movement." In (8), since the head n of the nP constituent of {nP, CP} is not a phase-head, nothing precludes application of "movement" to [NP book on her desk] to internally merge it with the non-labeled {nP, CP}, as illustrated in (10).

3　Both nP and CP serve as predicates (see for example Heim and Kratzer 1998), which Tomizawa (2020) employs in the determination of the label of {nP, CP}. However, the predicate nature of these elements is semantic and relevant in the semantic component but not in narrow syntax.

(10)

```
                    NP/nP/CP
                   /        \
                 NP          nP/CP
                /  \         /    \
      book on her desk  nP          CP
                       /  \        /   \
                      n    NP   thatᴄ    TP
                          /  \          /    \
                book on her desk   every professor liked [DP Dₑ book on her desk] best
```
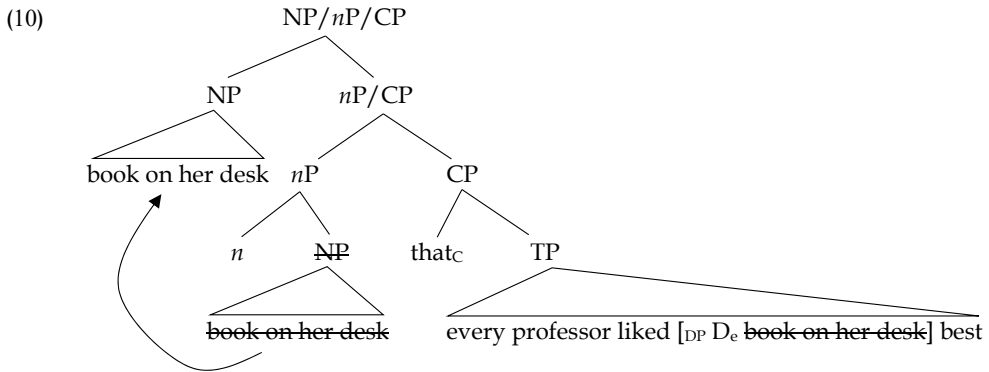
This internal merger of [NP book on her desk] has a series of consequences. First of all, the complement NP of *n* becomes a copy (as indicated by strike-through), so that the label of {*n*, NP} becomes *n*. Thanks to this relabeling of *n*P as *n*, the constituent dominating it, which used to be the non-labeled {*n*P, CP}, is successfully assigned the label *n*P. Now that the formerly non-labeled constituent {*n*P, CP} has the label *n*P, the topmost constituent in (10) is recast as an element consisting of NP and *n*P. The result of these changes is shown in (11).

(11)

```
                    NP/nP/CP→NP/nP
                   /            \
                 NP          nP/CP→nP
                /  \         /      \
      book on her desk  nP→n         CP
                       /  \         /   \
                      n    NP   thatᴄ    TP
                          /  \          /    \
                book on her desk   every professor liked [DP Dₑ book on her desk] best
```
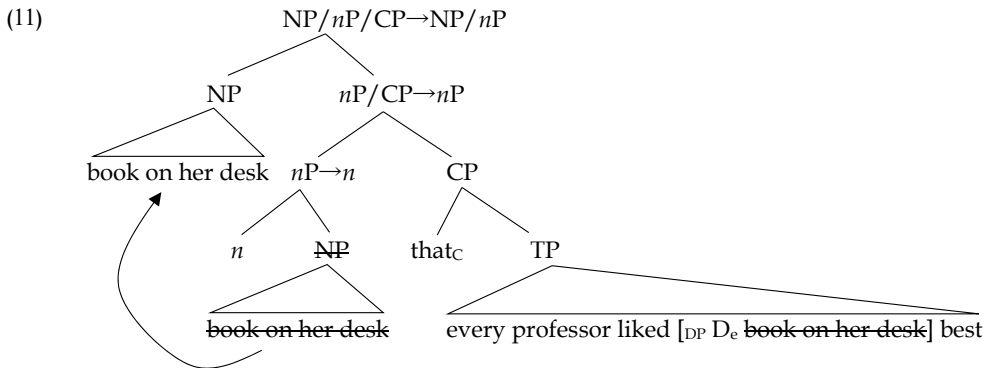
The original labeling problem of {*n*P, CP} has now been resolved but we have a new labeling problem at the topmost {NP, *n*P} in (11). Looking at {NP, *n*P}, we will notice immediately that NP and *n*P are not so distinct in the sense that NP is actually the direct complement of the *n* head of *n*P. Given this consideration, it would be more natural to expect that the label of the topmost {NP, *n*P} will be *n* rather than some other element if it ever has a label.

This labeling option for the topmost {NP, *n*P} can be made possible by the adoption of the additional labeling device in (9d) below.

(9)   Given a syntactic object (SO) {α, β},

      d. if the head of α directly selects β, then α is selected as the label of SO.

Going back to the topmost {NP, *n*P} in (11), since NP is (originally) directly selected by the *n* head of *n*P, {NP,

nP} is successfully labeled as nP. At a later stage of the derivation, this nP can be merged with D, giving rise to the DP structure in (12).

(12)

DP
- the_D
- NP/nP/CP→NP/nP→nP
  - NP
    - book on her desk
  - nP/CP→nP
    - nP→n
      - n
      - ~~NP~~
        - ~~book on her desk~~
    - CP
      - that_C
      - TP
        - every professor liked [_DP D_e ~~book on her desk~~] best
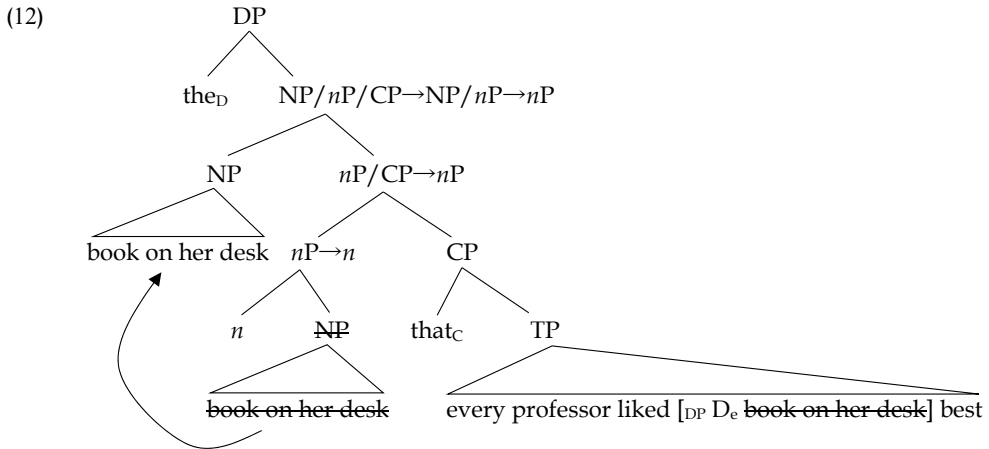
To summarize, the nominalization of the relative clause construction is possible in the labeling system in this paper when NP is re-merged with the nP whose head originally directly selects it.

Let me note in passing that when the labeling problem of the topmost {nP, CP} in (8), reproduced below, needs to be resolved, application of internal merge to TP (rather than to NP) is an unsuccessful option.

(8)

nP/CP
- nP
  - n
  - NP
    - book on her desk
- CP
  - that_C
  - TP
    - every professor liked [_DP D_e ~~book on her desk~~] best
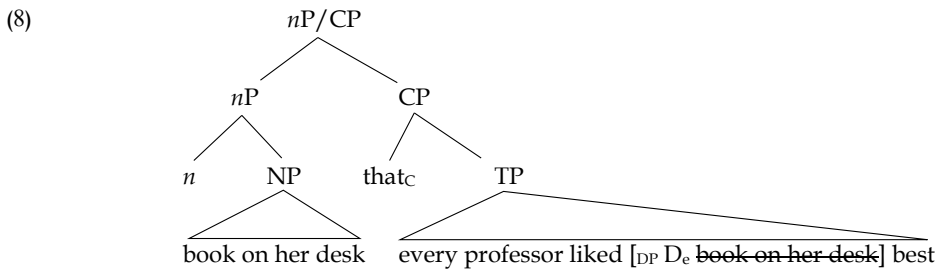
This is due to the phase-head status of *that*_C. By the time the labeling problem of {nP, CP} emerges, CP has been constructed and the TP complement of the phase-head C has been transferred, so that this TP is no longer accessible.

3. A revised analysis of the *tough*-movement construction

Section 3.1 briefly reviews earlier works on the *tough*-movement construction in Sportiche (2006) and Tomizawa (2020) and presents two problems. Section 3.2 is a solution in terms of the labeling option introduced in section 2.2.

3.1. The *n*P-movement analysis

The *tough*-movement construction shares some of the derivational steps that are employed in restrictive relative clause formation outlined above. Thus, the derivation of the example sentence in (13) has intermediate steps in (14a, b).

(13)   These pictures of himself will be difficult to tell Bill about.   (Pesetsky 1987)

(14)   a. [$_{CP}$ C PRO to tell Bill about [$_{DP}$ D$_e$ [$_{nP}$ pictures of himself]]]

   b. [$_{nP}$ pictures of himself] [$_{CP}$ C PRO to tell Bill about [D$_e$ ~~pictures of himself~~]]

In Tomizawa's (2020) analysis of *tough*-movement operations, the {*n*P, CP} constituent in (14b) is not labelable in the light of the labeling options in (9a, b). (Note that Tomizawa's 2020 analysis actually adopts NP instead of *n*P as the complement constituent of D$_e$ in (14) but this review adopts *n*P in accordance with the categorical hypothesis adopted throughout this paper.) The labeling problem that the {*n*P, CP} in (14b) poses is argued to be resolved by "extraction" of *n*P, in the light of the labeling option (9c). Then, the derivation continues roughly as follows: the "extracted" *n*P merges with the matrix TP, as in (14c) below, and it further undergoes late merger with D, as in (14d).

(14)   c. [$_{TP}$ [$_{nP}$ pictures of himself] will be difficult [$_{CP}$ [~~pictures of himself~~] [PRO to tell Bill about [D$_e$ ~~pictures of himself~~]]]]

   d. [$_{TP}$ [$_{DP}$ these$_D$ [$_{nP}$ pictures of himself]] will be difficult [$_{CP}$ [~~pictures of himself~~] [PRO to tell Bill about [D$_e$ ~~pictures of himself~~]]]]

This late merger analysis of D is originally proposed by Sportiche (2006) and adopted in Tomizawa's work. It correctly predicts that the edge of D does not reconstruct but its interior material can, because only the interior has reconstruction sites. One example of the relevant contrast that follows from this difference is given in (15a, b). (For similar contrasts see Kim 1998 , Sportiche 2002, 2006, Hicks 2009.)

(15)   a. Pictures of his$_i$ friends will be hard to convince [any artist]$_i$ to sell.   (Longenbaugh (2017))

   b. *Her$_i$ work is hard to convince [every woman in the group]$_i$ to share.   (Rezac 2006)

   The matrix subjects in (15a, b) have the following structures.

(16)   a. [$_{DP}$ D [$_{nP}$ pictures of his$_i$ friends]]

   b. [$_{DP}$ her$_i$ D [$_{nP}$ work]]

In (16b), the pronominal specifier (*her*) is introduced after the *n*P material has merged with the matrix clause. Therefore, it does not have a copy of its own within the complement position of *share*, giving rise to a familiar weak crossover effect. In (16a), on the other hand, *pictures of his friends* has a copy within the complement position of *sell*, which guarantees that *his* can be bound to its quantificational antecedent *any artist*.

Although illuminating in the treatment of the edge/interior contrast in reconstruction, this analysis has a couple of problems. Two such problems, I would like to pay special attention to here: (i) the late merger

of D and its specifier and (ii) the nature of "movement" from the position "adjoined to CP" to the matrix subject position. As mentioned in section 2.1 in the review of Donati and Cecchetto's (2011) analysis of restrictive relative clause formation, late merger lacks theoretical foundations. Even Sportiche (2016, 2019) embarks on a project to dispense with late merger operations. The nature of "movement" from the position "adjoined to CP" to the matrix subject position is also questionable. In the traditional dichotomy of A/A'-movement, it is categorized as an instance of movement from A'-position to A-position, which is improper and rejected.

3.2. An alternative resolution of the labeling problem

　　Returning to the derivational stage in (14b), where nP merges with CP, let us reconsider how {nP, CP} is labeled. For expository purposes, the relevant tree diagram is produced below.

(17)

```
                    nP/CP
                   /      \
                 nP        CP
                /  \      /  \
               n   NP    C    TP
                  /  \         \
        pictures of himself   PRO to tell Bill about [DP De pictures of himself]
```
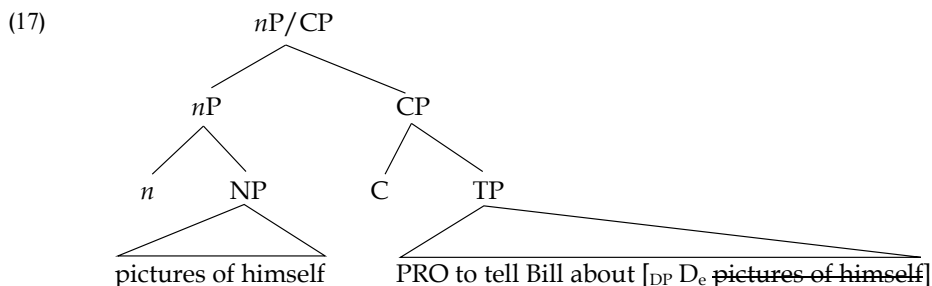
Notice that it is in principle possible to continue subsequent derivational processes without identifying the label of {nP, CP}. Let us suppose that this non-labeled {nP, CP} is externally merged with a new D (*these*). The choice of D is not made at random; rather, it is motivated by the direct selection property of D: D directly selects n. Just because {nP, CP} in (17) does not have a label in the light of the Labeling Algorithm does not mean the {nP, CP} constituent's label(s) is invisible. The Labeling Algorithm does find two candidates for the label (namely, n and C) but cannot select one over the other. What is occurring here is indeterminacy, not invisibility. The categorical features of the terms of the non-labeled constituent {nP, CP} are visible. The external merger of D yields the structure in (18) below, where the new topmost constituent, consisting of *these*$_D$ and {nP, CP}, does not have a label yet.

(18)

```
                    D/nP/CP
                   /        \
              theseD          nP/CP
                             /      \
                          nP          CP
                         /  \        /   \
                        n    NP     C     TP
                             |            |
                    pictures of himself   PRO to tell Bill about [DP De pictures of himself]
```
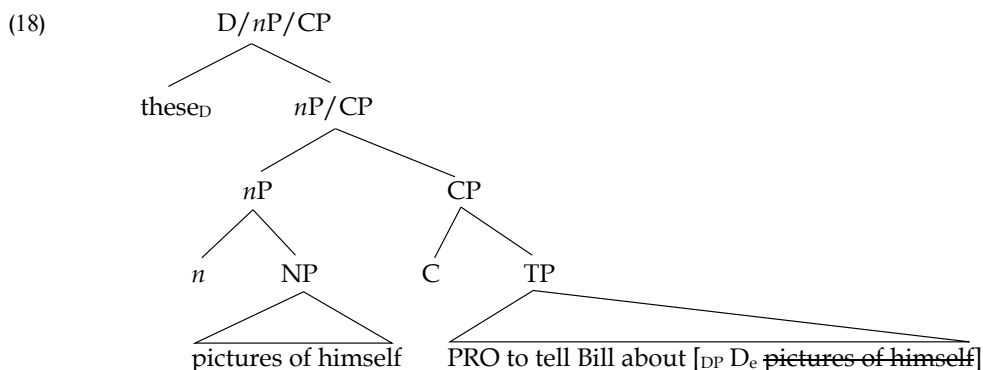
Whether D is a phase-head or not is a controversial question in the literature. Here, I will take the position that D is not a phase-head and look at some consequences.

Since *these*$_D$ in (18) is not a phase-head, it is possible to continue further derivational processes before identifying the labels of {*n*P, CP} and {these$_D$, {*n*P, CP}}. Since merge is free, let us suppose that the topmost constituent in (18) is externally merged with DIFFICULT$_R$, the root lexical entry of *difficult*. Here, the choice of DIFFICULT$_R$ is not arbitrary. *Tough*-movement predicates select two arguments that are categorically realized as (i) an infinitival CP and (ii) a *for*-PP containing an experiencer of some sort. The experiencer *for*-PP is not always spelled out, which suggests that what *tough* predicates directly select is the infinitival CP.

Let me characterize the lexical properties of *tough*-movement predicates here:

(19)   A *tough*-movement predicate:

    i.   takes an infinitival CP and an experiencer *for*-PP,

    ii.   directly selects the infinitival CP,

    iii. is an obligatory-control predicate, with experiencer controlling the PRO subject of the infinitival CP.

For the property (19iii) see Epstein (1984), Pesetsky (1987), Rezac (2006), among others.[4]

The external merger of DIFFICULT$_R$ and the topmost constituent in (18) barely satisfies this direct selectional property; "barely," because DIFFICULT$_R$ does not merge with a syntactically genuine CP but does merge with a constituent whose categorical property of CP is syntactically visible. For clarity, let us assume the following projection rule for direct selectional features.[5]

---

4   The obligatory-control property in (19iii) provides straightforward answers to why the *tough*-movement construction does not have a tensed clause variant as in (i) and why the subject of the infinitival complement cannot "move" into the matrix subject position as in (ii).

   (i)   *John is easy [CP that anyone likes __]   (Browning 1987)

   (ii) *John is difficult [CP __ to solve these problems]   (Browning 1987)

5   Thanks to an anonymous reviewer for encouraging me to clarify the mechanism behind this syntactic visibility.

(20)　Given that α directly selects β, α must merge with a constituent whose possible label is that of β. When DIFFICULT$_R$ merges with the constituent (18), the latter has not its label specified yet and has three possible labels: D, n (of nP) and C (of CP). Since C (of CP) is visible in this sense, the direct selectional relation between DIFFICULT$_R$ and the CP complement is met in the relevant structure.

　　The following structure is yielded.

(21)

```
                    R/D/nP/CP
                   /         \
         DIFFICULT_R         D/nP/CP
                            /       \
                        these_D     nP/CP
                                   /     \
                                 nP       CP
                                /  \     /  \
                               n   NP   C    TP
                                  /\        /        \
                          pictures of himself   PRO to tell Bill about [_DP D_e ~~pictures of himself~~]
```

Here, DIFFICULT$_R$ is not a phase-head. It is then possible to internally merge CP to the topmost constituent, which generates the following structure.

(22)

```
                        CP/R/D/nP/C̶P̶
                       /            \
                     CP            R/D/nP/C̶P̶
                    /  \          /         \
            C PRO to tell Bill  DIFFICULT_R   D/nP/C̶P̶
            about D_e pictures              /       \
            of himself                 these_D     nP/C̶P̶
                                               /        \
                                             nP          C̶P̶
                                            /  \        /    \
                                           n   NP   C PRO to tell Bill about D_e pictures of himself
                                              /\
                                      pictures of himself
```

This internal merger of CP has a number of labeling consequences. First of all, the lower copy of CP becomes invisible to the Labeling Algorithm, so that the constituent {nP, ~~CP~~} is successfully labeled as nP. The constituent consisting of this nP and *these*$_D$ is now labeled as DP. (Let me note in passing that we are now in an interesting situation. DIFFICULT$_R$ directly selects CP (though "barely," as noted above) but the directly selected complement is now relabeled as DP.) The constituent consisting of this DP and DIFFICULT$_R$ will also be successfully labeled, perhaps with the aid of an adjectivizing functional element. If we follow the idea pursued in Chomsky's (2015) discussion of verbal roots and verbalizing functional elements, the label of {DIFFICULT$_R$, DP} would be <ø, ø>. However, I will leave open the extension of the verbal considerations to the adjectival domain here and assume instead that {DIFFICULT$_R$, DP} selects R as the label. These changes are reflected in (23).

(23)

CP/R/D/nP/~~CP~~→CP/RP

    CP   R/D/nP/~~CP~~→RP

C PRO to tell Bill about D$_e$ ~~pictures of himself~~   DIFFICULT$_R$ D/nP/~~CP~~→DP

            these$_D$ nP/~~CP~~→nP

          nP   ~~CP~~

    n NP   ~~C PRO to tell Bill about D$_e$ pictures of himself~~

         pictures of himself

Let us turn to the label of the topmost constituent in (23). The label might appear to be indeterminate between CP and RP. The new labeling option that is introduced in section 2.2, namely (9d), selects RP as the label of {CP, RP}. This is because CP and the head R of RP are originally in a direct selectional relation (though "barely," as noted above). To sum up, with the internal merger of CP in (22/23), every non-labeled constituent is successfully labeled.

The constituent fully labeled in this way undergoes further derivational operations. An adjectivizing functional element (notated as *a* in the following illustrations) is externally merged and then DIFFICULT$_R$ "moves" to adjoin to it. (Thus, the *tough*-predicate precedes the infinitival CP complement when they are spelled out.) Then, matrix *be* and T are introduced. Crucially, at the next stage of the derivation, the DP complement of DIFFICULT$_R$, namely [$_{DP}$ these *n* pictures of himself [~~C PRO to tell Bill about D$_e$ pictures of himself~~]], internally merges with the matrix clause. This "movement" of DP is legitimate in the light of the Phase Impenetrability Condition since neither DIFFICULT$_R$ nor the adjectivizing functional element (*a*) is

a phase-head. That they are not phase-heads are natural to the extent that neither SEEM$_R$ nor its verbalizing functional category (v) is a phase-head in the raising construction like *These pictures of his friends* v *SEEM$_R$ to be nice*. With the completion of these operations, the following structure is generated.

(24) [$_{DP}$ these *n* pictures of himself [~~C PRO to tell Bill about D$_e$ pictures of himself~~]] T be DIFFICULT$_R$+*a* [[$_{CP}$ C PRO to tell Bill about D$_e$ ~~pictures of himself~~] ~~DIFFICULT$_R$~~ [$_{DP}$ ~~these *n* pictures of himself~~ [~~C PRO to tell Bill about D$_e$ pictures of himself~~]]

The new analysis of the *tough*-movement operation presented in this subsection resorts to neither a counter-cyclic late merger of D nor an obscure "movement" operation from the position "adjoined to CP" to the matrix position. What "moves" into the matrix subject position is a DP that contains the infinitival CP constituent. Thus, the original position from which the DP starts "movement" is not a position "adjoined to CP"; rather, it is the complement position of the *tough*-predicate. The head D of the DP (and its edge element) is introduced after its complement *n*P merges with the infinitival CP. In this sense, D is introduced at a later stage of the derivation. However, this D is merged with {*n*P, CP}, rather than with the *n*P material within {*n*P, CP}. Thus, both the Extension Condition and the No Tampering Condition are respected.

As a closing remark of this section, let us overview the system pursued in this paper. Given a structure (25), where {*n*P, CP} does not have a label, this labeling problem can be tackled from four approaches.

(25)

```
              nP/CP
            /       \
          nP         CP
         /  \       /  \
        n   NP     C   TP
```
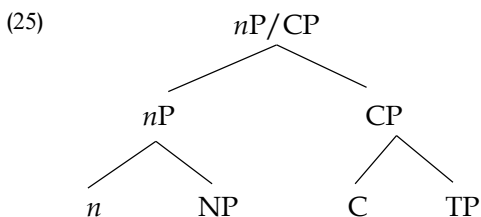
One is to give *n*P a syntactic status of copy, namely, to "move" *n*P. The labeling option (9c), then, selects CP as the label of {*n*P, CP}. A variant of this approach is abundant at the intermediate step of long-distance "A'-movement" (see Chomsky 2013, 2015). In (25), however, no well-formed linguistic expression would be produced since the "A'-moved" *n*P would not be properly interpreted. Another approach to the labeling problem in (25) is to "move" NP. Subsection 2.2 proposes that this movement is employed in the derivation of the noun phrase that contains a restrictive relative clause. A third approach to the labeling problem is to "move" CP. Section 3.2 proposes that this movement is involved in the successful *tough*-movement operation. A fourth approach to the labeling problem is to "move" TP. This logical possibility is excluded from phase considerations. C is a phase-head and when CP is constructed its TP material is transferred. Therefore, at a later stage of the derivation when *n*P and CP are merged, it is already impossible to access to TP.

4. Further speculations on reconstruction

The analysis of the *tough*-movement construction presented in this paper takes a new step forward to construct a computational system devoid of late merger operations. In this section I would like to take up two points that need further consideration within the present analysis: one is concerned with particular cases of anti-reconstruction phenomena and the other with the general architecture of the system to deal with reconstruction.

First of all, our analysis of the *tough*-movement construction is designed to account for reconstruction contrasts like (15a, b), reproduced below.

(15)　a.　Pictures of his$_i$ friends will be hard to convince [any artist]$_i$ to sell.

　　　b.　*Her$_i$ work is hard to convince [every woman in the group]$_i$ to share.

In these examples, each matrix DP subject has a D head; in addition, the subject in (15b) has *her* in the edge domain, as well. These instances of D and *her* are introduced at intermediate stages of the derivation of these sentences after the *n*P complement parts (*pictures of his friends* and *work*) are merged with the respective CP clauses. The relevant structures are shown below.

(26)　a.　[D [[$_{NP}$ pictures of his friends] [[$_{nP}$ *n* [$_{NP}$ ~~pictures of his friends~~]] [$_{CP}$ PRO to convince [any artist]
　　　　to sell [D$_e$ [$_{nP}$ *n* [$_{NP}$ ~~pictures of his friends~~]]]]]]]]

　　　b.　[her D [[$_{NP}$ work] [[$_{nP}$ *n* [$_{NP}$ ~~work~~]] [$_{CP}$ PRO to convince every woman in the group to share [D$_e$ [$_{nP}$
　　　　n [$_{NP}$ ~~work~~]]]]]]]

In (26a), *his* has a copy within the complement of *sell* and this copy is c-commanded by its quantificational antecedent *any artist*. In (26b), on the other hand, *her* does not have such a copy within the c-command domain of its purported antecedent *every woman*, giving rise to a familiar weak crossover effect. Thus, the difference in (26a, b) is attributed to the presence of a reconstruction site in the former and the lack thereof in the latter.

This kind of reconstruction contrast does not arise in the raising construction. This is because no late introduction of D is involved. Thus, both (27a, b) are well-formed under the bound pronoun interpretation of *his*.

(27)　a. Someone from his$_i$ class seems to [every professor]$_i$ to be a genius.

　　　b. His$_i$ father seems to [every boy]$_i$ to be a genius.　　　　　　　　　　　(Fox 1999)
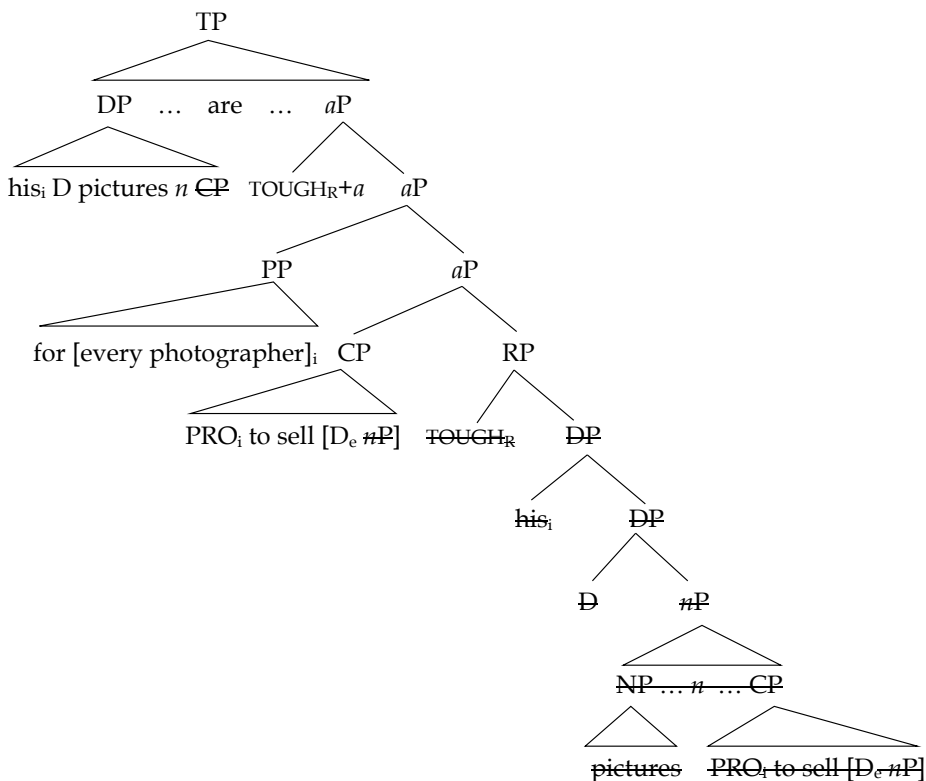
However, the analysis of the contrast between (15a, b) above does not provide a satisfactory account to the contrast in (28a, b), originally observed by Sportiche (2002).

(28)　a.　Pictures of his$_i$ friends are hard for [every photographer]$_i$ to sell.

　　　b.　*His$_i$ pictures are tough for [every photographer]$_i$ to sell.

The reason lies in the position of the quantificational antecedent *every photographer*. This element is an experiencer argument of the relevant *tough*-predicates (HARD$_R$ in (28a) and TOUGH$_R$ in (28b)). Since these

tough-predicates merge with their CP complements first, the merger of *every photographer* and a series of subsequent operations ultimately yield the following structure for the ill-formed sentence (28b).

(29)

```
                              TP
              ┌───────────────┴───────────────┐
             DP    …    are    …    aP
        ┌─────┴─────┐              ┌──┴──┐
  his_i D pictures n C̶P̶   TOUGH_R+a    aP
                                  ┌───────┴───────┐
                                 PP              aP
                          ┌──────┴──────┐    ┌───┴───┐
              for [every photographer]_i  CP      RP
                                    ┌─────┴──┐  ┌──┴──┐
                         PRO_i to sell [D_e n̶P̶]  T̶O̶U̶G̶H̶_R̶  D̶P̶
                                                    ┌──────┴──────┐
                                                  h̶i̶s̶_i̶          D̶P̶
                                                          ┌───────┴───────┐
                                                         D̶               n̶P̶
                                                                  ┌────────┴────────┐
                                                               NP̶ …n̶ …C̶P̶
                                                           ┌─────┴─────┐
                                                        p̶i̶c̶t̶u̶r̶e̶s̶   P̶R̶O̶_i̶ t̶o̶ s̶e̶l̶l̶ [D̶_e̶ n̶P̶]
```

Here, *his* is introduced during the construction of the DP in the sister position of TOUGH_R. When *every photographer* is merged, it appears that it successfully c-commands *his*.[6] Then, it is predicted that the bound pronoun interpretation is available, contrary to fact.

Thus, the degraded status of (28b), compared with (28a), calls for an account that is different from the one given to (15b) above. I would like to suggest here that the degraded status of this sentence comes from the interference of *his* in the establishment of the obligatory-control relation between the experiencer argument (*every photographer*) and the PRO subject of the infinitival CP argument. Specifically, let us adopt the following condition.

(30)　When obligatorily controlled PRO serves as a bound pronoun, it needs to be locally c-commanded by its quantificational controller.

6　The grammatical status of the following sentences suggests that the DPs within the experiencer *for*-PPs can c-command outside the PPs, since given the plausible assumption that the subject DPs in these examples are originally generated at the complement positions of *difficult* and *hard*, the anaphors within the DPs are c-commanded by the experiencers.
　(i)　a. Pictures of himself are difficult for John.
　　　b. Each other's problems, however, were hard for them.　　　　　　　　　　　　　　　　　(Pesetsky 1987)

Going back to the structure (29) above, the obligatorily controlled PRO in the most deeply embedded CP needs to be locally c-commanded by *every photographer* since the latter is its quantificational controller. However, their local c-command relation is disturbed by the presence of *his* and it leads to the degradation.

Given the analyses for the contrasts in (15a, b) and (28a, b), further contrast as in (31a, b) and (32a, b) from Sportiche (2006) is also accounted for, along the lines similar to Sportiche's (2006) original idea but crucially without resorting to late merger operations.

(31)   a. Pictures of his$_i$ friends are hard for [every photographer]$_i$ to sell.

    b. *Most pictures of his$_i$ friends are hard for [every photographer]$_i$ to sell.

(32)   a. Pictures of his$_i$ friends are easy to persuade [every photographer]$_i$ to see.

    b. *Most pictures of his$_i$ friends are easy to persuade [every photographer]$_i$ to see.

"Weak" quantifiers (i.e., cardinals) reside within the *n*P domain, while "strong" (i.e., genuine) quantifiers occur above D (see Milsark 1974 for the weak/strong distinction). Strong quantifiers do not reconstruct (see Boeckx 2001 for reconstruction in the raising construction). Since quantifiers require their restriction to stay in their vicinity, the restriction of strong quantifiers does not reconstruct, either. Therefore, *his* in (31b) and (32b) has to remain within the matrix subject DP and the sentences result in weak crossover violations.

We will now turn our attention to a brief consideration of the general architecture of the system to deal with reconstruction. Reconstruction is optional. Hence, given two copies, either copy can be interpreted. The other copy (namely the non-interpreted copy) is simply disregarded in the relevant interpretive component. This characterization of reconstruction is essential in the analysis presented in this paper. Since no late merger is permitted and every element is introduced cyclically, anti-reconstruction phenomena require (i) some extraneous factors that force interpretation of "upper" copies and (ii) some devices to disregard "lower" copies. "Neglect" in Sportiche (2019, 2016) is one implementation of this disregarding device. The nature of strong quantifiers in (31b) and (32b) above, on the other hand, represents a case of extraneous factors that force interpretation of upper copies. Examples that suggest another kind of extraneous factor are the following, where reconstruction is never permitted.

(33)   a. *He$_i$ seems to John$_i$'s friends to be __nice.   (Belletti & Rizzi 1988)

    b. ?*John$_i$ seems to [the idiot]$_i$'s parents to be __ a genius.

The matrix subjects *he* and *John* are DPs that have the following internal structures, respectively.

(34)   a. [$_{DP}$ he+*n*+D [$_{nP}$ ~~he+*n*~~ [$_{NP}$ ~~he~~]]]

    b. [$_{DP}$ John+*n*+D [$_{nP}$ ~~John+*n*~~ [$_{NP}$ ~~John~~]]]

Here, both *he* and *John* are attached to D and these Ds do not reconstruct.

Examples in (33a, b) can be contrasted with (26a, b), reproduced here as (35a, b), where *his* can reconstruct.

(35)   a. Someone from his$_i$ class seems to [every professor]$_i$ to be a genius.

b. His$_i$ father seems to [every boy]$_i$ to be a genius.

In (35a) *his* resides within the complement domain of the head D of the surface subject, whereas *his* in (35b) occupies the edge of the head D. The comparison between (33a, b) and (35a, b) in the light of reconstruction suggests that the head D may not reconstruct. Since the D head is a labeler in all these structures, I would like to speculate that the following condition is another instance of extraneous factors that force interpretation of upper copies.

(36)　A labeler does not reconstruct.

5. Concluding remarks

This paper presents an analysis of the *tough*-movement operation that makes no recourse to counter-cyclic late merger operations. This provides a new step forward in the efforts to construct a computational system that is devoid of late merger operations.

One crucial component of the analysis presented is the labeling option (1d) (= 9d), repeated below.

(1)　Given a syntactic object (SO) {α, β},

　　d. if the head of α directly selects β, then α is selected as the label of SO.

This new labeling option ensures nominalization of a relative clause in relative clause formation and it is also employed in the *tough*-movement operation. Just as the D head of the noun phrase "modified" by a relative clause is introduced at a later stage of the derivation, so is the D head of the subject noun phrase in the *tough*-movement construction. This accounts for the reconstruction asymmetry that is observed in the *tough*-movement construction but is missing in the raising construction. In the derivation of the *tough*-movement construction, the constituent that "moves" into the matrix subject position is not a run-of-the-mill noun phrase but a DP that contains a copy of the CP complement of the relevant *tough*-movement predicate. Since this complex DP comes from the complement position of the *tough*-movement predicate, the so-called *tough*-movement is viewed as a genuine A-movement.

References

Abels, Klaus. 2003. *Successive cyclicity, anti-locality, and adposition stranding*, Doctoral dissertation, University of Connecticut.

Boeckx, Cedric. 2001. Scope reconstruction and A-movement. *Natural Language and Linguistic Theory* 19, 503-548.

Browning, Marguerite. 1987. *Null operator constructions*, Doctoral dissertation, MIT.

Cecchetto Carlo and Caterina Donati. 2006. On labeling: Principle C and head movement. *Syntax* 13, 241-278.

Chomsky, Noam. 1993. A minimalist program for linguistic theory. In Ken Hale and Samuel Jay Keyer eds., *The view from Building 20: Essays in linguistics in honor of Sylvain Bromberger*, 1-52. Cambridge, Massachusetts: MIT Press.

Chomsky, Noam. 2008. On phases. In Robert Freidin, Carlos P. Otero, and Maria Luisa Zubizarreta eds., *Foundational issues in linguistic theory: Essays in honor of Jean-Roger Vergnaud*, 133-166. Cambridge, Massachusetts: MIT Press.

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

Chomsky, Noam. 2015. Problems of projection: Extensions. In Elisa Di Domenico, Cornelia Hamann, and Simona Matteini eds., *Structures*, *strategies and beyond: Studies in honour of Adriana Belletti*, 3-16. Amsterdam: John Benjamins.

Donati, Caterina and Carlo Cecchetto. 2011. Relabeling heads: A unified account for relativization structures. *Linguistic Inquiry* 42, 519-560.

Epstein, Samuel David. 1984. Quantifier-PRO and the LF representation of PRO$_{arb}$. *Linguistic Inquiry* 15, 499-505.

Fox, Danny. 1999. Reconstruction, Binding Theory, and the interpretation of chains. *Linguistic Inquiry* 30, 157-196.

Hackl, Martin and Jon Nissenbaum. 2012. A modal ambiguity in for-infinitival relative clauses. *Natural Language Semantics* 20, 59-81.

Heim, Irene and Angelika Kratzer. 1998. *Semantics in generative grammar*. Malden: Blackwell.

Hicks, Glyn. 2009. *Tough*-constructions and their derivation. *Linguistic Inquiry* 40, 535-566..

Kim, Kwang-sup. 1998. (*Anti-*)*Connectivity*. Doctoral dissertation, University of Maryland at College Park.

Longenbaugh, Nicholas. 2017. Composite A/A'-movement: Evidence from English *tough*-movement. Manuscript.

Milsark, Gary Lee. 1974. *Existential sentences in English*. Doctoral dissertation, MIT.

Pesetsky, David. 1987. Binding problems with experiencer verbs. *Linguistic Inquiry* 18, 126-140.

Rezac, Milan. 2006. On tough-movement. In Cedric Boeckx ed., *Minimalist essays*, 288-325.

Sauerland, Uli. 1998. *The meaning of chains*. Doctoral dissertation, MIT..

Sportiche, Dominique. 2002. Movement types and triggers. *GLOW Newsletter* 48, 116-117.

Sportiche, Dominique. 2006. NP movement: How to merge and move in *tough*-constructions. LingBuzz.

Sportiche, Dominique. 2016. Neglect. LingBuzz.

Sportiche, Dominique. 2019. Somber prospects for late merger. *Linguistic Inquiry* 50, 416-424.

Tomizawa, Naoto. 2020.　Predicate NP movement in *tough*-constructions," *Yamagata University Faculty of Humanities and Social Sciences Annual Research Report* 17, 19-43.

A labeling analysis of *tough*-movement operations

Naoto TOMIZAWA

This paper presents an analysis of the *tough*-movement operation in terms of the Labeling Algorithm. The analysis introduces a new type of labeling option that hinges on the direct selectional features in the head-complement configuration. This new labeling option ensures nominalization of a relative clause in relative clause formation and is also employed in the *tough*-movement operation. In both the relative clause formation and the *tough*-movement operation, the head D is introduced at a later stage of the relevant derivation. This is shown to be the source of the contrast in the reconstruction that is found in the *tough*-movement construction but is missing in the raising construction. In this analysis, the matrix subject of the *tough*-movement construction is not a run-of-the-mill noun phrase but a DP that contains an invisible copy of the infinitival CP complement of the *tough*-predicate. Since this complex DP comes from the complement position of the *tough*-predicate, the so-called *tough*-movement is viewed as a genuine A-movement. The analysis of the *tough*-movement operation in this paper makes no recourse to a counter-cyclic late merger and provides a new step forward in the efforts to construct a computational system that is devoid of late merger operations.