SYNTACTIC AND PROSODIC SCRAMBLING IN JAPANESE*

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Abstract
This paper presents evidence that Japanese has prosodic scrambling of phonological phrases (ɸ) in addition to the well-studied syntactic scrambling of XPs. All cases of scrambling in Japanese involve fronting constituents, be they syntactic XPs or phonological ɸs. If the syntax cannot move XPs, the phonology is forced to move their prosodic equivalents: these ɸs are fronted to the left edge of the intonational phrase (ι) that contains them and join to make a single recursive ɸ, the domain for tonal downstep (Itô & Mester 2012, 2013). Syntactic scrambling 'bleeds' prosodic scrambling, adding support for a uni-directional, feed-forward model of syntax-phonology interactions. Syntactic scrambling fronts XPs and obeys syntactic conditions on movement, and the scrambled XP exhibits interpretive effects in its surface position. Prosodic scrambling fronts ɸs and is blind to syntactic conditions on movement, and the scrambled ɸs are interpreted *in situ*, as expected.

1 Introduction: single and multiple scrambling in Japanese
Canonical cases of scrambling in Japanese involve movement of a single syntactic constituent (usually NP or PP) to clause-initial position (Harada 1977). Since Saito (1985, 1992), scrambling has been analyzed as an instance of syntactic movement that is sensitive to islands and has an effect on semantic interpretation. Canonical cases of (long-distance) scrambling are shown in (1), and are assumed to involve adjunction to TP of the scrambled NP or PP. Scrambled material is in *italics*.

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(1) a. *sono mame-o₁* John-ga [Mary-ga Bill-ni *t₁* watasita to] omotteiru <koto>[1]
that bean-ACC John-NOM Mary-NOM Bill-DAT handed C think fact
'John thinks that Mary handed that bean to Bill.'

b. *Hawai-de₁* John-ga [Kiyomi-ga *t₁* Masami-ni purezento-o katta to]
Hawaii-in John-NOM Kiyomi-NOM Masami-DAT present-ACC bought C
omotteiru <koto>
think fact
'John thinks that Kiyomi bought a present for Masami in Hawaii.'

It has been observed that multiple XPs cannot be scrambled in the same way (Saito 1985, Koizumi 2000).

(2) a. ?* *Bill-ni₁ sono mame-o₂* John-ga [Mary-ga *t₁ t₂* watasita to]
Bill-DAT that bean-ACC John-NOM Mary-NOM handed C
omotteiru <koto>
think fact

b. ?* *Purezento-o₃ Masami-ni₂ Hawai-de₁* John-ga [Kiyomi-ga *t₁ t₂ t₃*
present-ACC Masami-DAT Hawaii-in John-NOM Kiyomi-NOM
katta to] omotteiru <koto>
bought C think fact

Koizumi (2000) and Fukui and Sakai (2006) observe, however, that the 'multiple long-distance scrambling' in (2) improves significantly if the scrambled IO *Bill-ni* and DO *sono mame-o* are phrased together prosodically:

(3) a. (*Bill-ni sono mame-o*)$_\phi$ (John-ga)$_\phi$ (Mary-ga watasita to)$_\phi$ (omotteiru koto)$_\phi$
Bill-DAT that bean-ACC John-NOM Mary-NOM handed C think fact
'John thinks that Mary handed that bean to Bill.'

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[1] Here and in the relevant examples to follow, <koto> 'the fact that' is added to the end of some examples in order to avoid the unnaturalness resulting from the lack of topic in a matrix clause.

b. (*Purezento-o Masami-ni   Hawai-de*)ϕ   (John-ga)ϕ (Kiyomi-ga   katta   to)ϕ

  present-ACC Masami-DAT Hawaii-in   John-NOM Kiyomi-NOM bought C

  (omotteiru koto)ϕ

  think   fact

  'John believes that Kiyomi bought a present for Masami in Hawaii.'

We can see that the scrambled elements are phrased together prosodically by the effects of tonal downstep: the phonological phrase ϕ is the domain of tonal downstep in Japanese (Itô & Mester 2012, 2013), and tonal downstep occurs within the fronted constituents in (3a). This can be seen in the pitch track in Figure 1, taken from an adult female speaker of Tokyo Japanese.
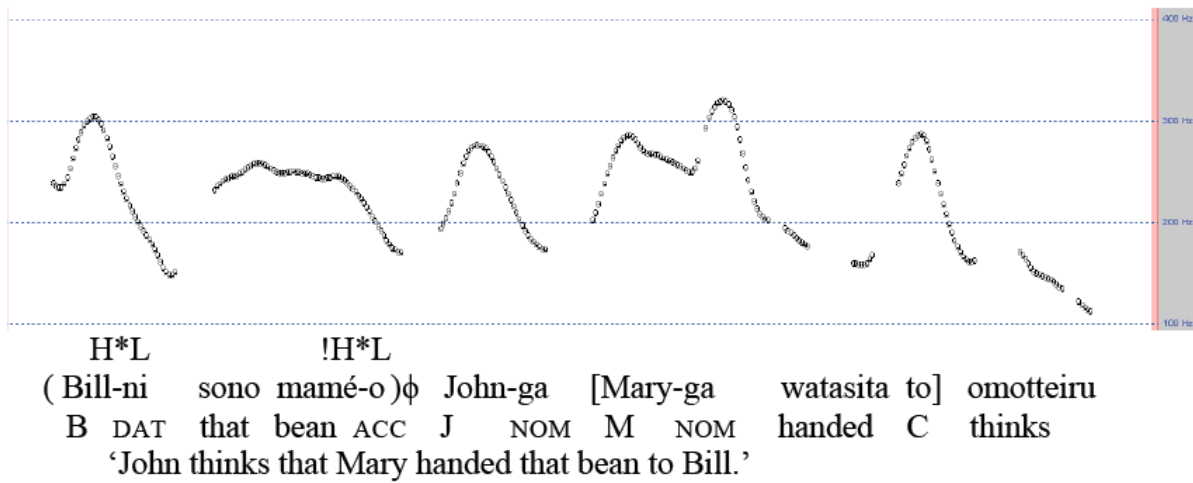

H*L   !H*L
(Bill-ni   sono mamé-o)ϕ John-ga   [Mary-ga   watasita to] omotteiru
  B DAT   that bean ACC J   NOM M   NOM   handed   C   thinks
    'John thinks that Mary handed that bean to Bill.'

Figure 1. Pitch track for scrambling of the ϕ (*Bill-ni sono mamé-o*)ϕ

Note that *Bill-ni* and *mamé-o* both have H tones (the former by general rule, the latter lexically), but that the H tone on *mamé-o* is visibly lower (!) than the H on *Bill-ni*. The H tone of *mamé-o* is downstepped (its pitch is lowered) in relation to that of the H tone on *Bill-ni* because they are contained within the same ϕ. The pitch register is reset with *John-ga, Mary-ga,* etc. which begin new ϕ domains. Thus the lowered H on *mamé-o* makes it clear that the IO *Bill-ni* and the DO *sono mamé-o* form a single prosodic constituent.[2]

The domain of downstep is traditionally the "Major Phrase" in Japanese (Martin 1952, McCawley 1968, Poser 1984, Kubozono 1988, Pierrehumbert and Beckman 1988, Selkirk & Tateishi 1988), but Itô & Mester 2012, 2013 argue convincingly that this prosodic domain is

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[2] See Hirotani (2005) for related discussion of processing constraints for prosodic packaging in single and multiple scrambling in Japanese.

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actually a recursive phonological phrase. We follow them here but note that our analysis only requires that the fronted material in (3a, b) form *some* prosodic constituent, which is completely uncontroversial given the tonal downstep. On the general need for recursive prosodic structure, see Inkelas 1989; Ladd 1986, 1992; McCarthy & Prince 1993ab; Selkirk 1995.

Clearly, the IO and DO in (3) do not form a constituent syntactically; if the fronted material in (3a,b) were scrambled directly in the syntax, it would involve moving a non-constituent, which we take to be syntactically impossible. Given the standard view that scrambling is a syntactic process, it might be tempting to argue that in these cases syntax targets a phonological constituent for movement. But this would constitute a radical departure from the strong thesis that syntax has no access to phonological structure, in accordance with the principle of *phonology-free syntax* (Zwicky & Pullum 1986a,b). Any account that allows syntax to move a phonological constituent would therefore depart undesirably from a restrictive theory of syntax-phonology interaction. Following Agbayani & Golston 2010, we propose that the movement in (3) takes place entirely within the phonological component away from any syntactic constituency or limitations on movement, moving multiple ɸs to the left edge of the intonational phrase (ι) they are part of.

We take the restrictive view that the interaction between syntax and phonology begins and ends with the mapping from syntactic constituency (clause, XP, X^0) to phonological constituency (ι, ɸ, ω) within a standardly assumed model in which syntax derivationally precedes and feeds phonology; *i.e.,* syntax receives no feedback from phonology, nor is there any further syntax-phonology interaction outside of the one-way mapping of syntactic structure to phonological structure. We pursue the parallel thesis to Zwicky and Pullum's 'phonology-free syntax' that the phonological component of the grammar applies operations and conditions that refer only to units of phonological structure, and has no direct access to syntactic constituency, syntactic features, or syntactic conditions—a 'syntax-free phonology' (Chen 1987; Selkirk 1986, 1995; Nespor and Vogel 1982, 1986; Hayes 1989). The phonological component applies its own operations on units of phonological structure to yield a PF representation for use by the articulatory-perceptual system.

The proposals in this paper therefore argue against Golston's (1995) claim that syntax outranks phonology (in Optimality Theoretic terms) and conceptions of grammar in which the phonology can outrank syntax or provide feedback information to syntactic operations (Harford & Demuth 1999). Our proposals also go against analyses in which syntax and phonology are co-present, in which prosodic conditions have the ability to constrain syntax (Zec & Inkelas 1990), or in which phonological information can serve as a trigger for syntactic operations

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(Szendrői 2001, Richards 2010). As suggested by an anonymous reviewer, our proposals are compatible with a multiple Spell-Out approach in which the construction of prosodic structure goes partly in parallel with syntactic derivation, where a new prosodic constituent is created and added to the phonological representation at each Spell-Out (Cheng & Downing 2009, Dobashi 2003, Kahnemuyipour 2009; Kratzer & Selkirk 2007; Ishihara 2007; Pak 2008). Even in this approach, there is a one-way feeding from syntax to phonology.

In this paper, we present evidence that cases of multiple scrambling in Japanese involve movement of ɸs within the phonology. We call this species of movement *prosodic scrambling*, following recent work on free word-order phenomena in Classical Greek (Agbayani & Golston 2010), Latin and Russian (Agbayani, Golston & Henderer 2011), and Ukrainian (Teliga 2011). The diagnostic properties of phonological movement in those languages are that (i) it affects only prosodic constituents, (ii) it is sensitive to conditions on prosodic structure (the OCP), and (iii) it is semantically vacuous and does not obey syntactic conditions of any kind. Our findings for Japanese are consistent with (i)-(iii), though we find no evidence in Japanese for (ii). A unique aspect of scrambling in Japanese is that it may apply syntactically (1) or—if forced to do so—phonologically (3). Our goal in this paper is to characterize the properties of prosodic scrambling, the conditions under which it occurs, and how it interacts with the well-studied case of syntactic scrambling.

2 Syntactic and prosodic scrambling

We first address two accounts of multiple scrambling mentioned earlier, Koizumi (2000) and Fukui and Sakai (2006). Koizumi (2000) claims that there is vacuous overt verb raising in Japanese and that cases like (3) are derived by scrambling of the remnant VP whose head V has been raised as shown in (4):

(4) [*Purezento-o Masami-ni Hawai-de* t_V]$_{VP}$ John-ga [Kiyomi-ga t_{VP} katta$_V$ to]
 present-ACC Masami-DAT Hawaii-in John-NOM Kiyomi-NOM bought C
 omotteiru ＜koto＞
 think fact
 'John believes that Kiyomi bought a present for Masami in Hawaii.'

Fukui and Sakai (2006) show, however, that it is possible to scramble just a portion of the alleged VP remnant as long as it forms a prosodic unit:

(5) (*Masami-ni   Hawai-de*)John-ga   [Kiyomi-ga   purezento-o katta   to] omotteiru ＜koto＞

    Masami-DAT Hawaii-in John-NOM Kiyomi-NOM present-ACC bought C think   fact

    'John believes that Kiyomi bought a present for Masami in Hawaii.'

Here a non-constituent portion of VP (IO and locative PP) is scrambled, leaving the DO and V *in situ,* and the result is acceptable. Under Koizumi's (2000) analysis there is no way to scramble just a portion of the VP remnant and the remnant analysis wrongly rules out examples like (5).[3] Moreover, Fukui and Sakai counter that there is no overt verb raising in Japanese. They examine three cases that, according to Koizumi (2000), involve syntactic processes operating on a VP whose head V overtly raises to T: coordination, pseudo-cleft, and the multiple scrambling seen in (4). They show that Koizumi's analysis faces serious problems in all three cases and that his arguments for the presence of overt verb raising in Japanese do not go through; in the absence of supporting evidence for overt verb raising, they conclude that it does not occur in Japanese. Instead, they propose that multiple XPs are scrambled individually in the syntax and undergo 'Phrase-Level Merger' (extending Marantz's (1988) Morphological Merger) at PF, where they form a phonological constituent. The nature of Phrase-Level Merger is unclear and we show below that multiple scrambling cannot result from multiple syntactic movement of XPs in any case; we propose instead that multiple scrambling always involves movement of ɸs within the phonological component.

     There is evidence against the idea that individual XPs scramble in syntax and are then parsed into a single phonological phrase in the phonology. Multiple long distance scrambled phrases cannot be split by anything scrambled in the higher clause; they are never parsed together prosodically. Boeckx and Sugisaki (1999) observe that XPs undergoing long distance scrambling cannot be split by an element in the higher clause. The following examples are taken from Hiraiwa (2010, p. 154):

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[3] Arguably, Koizumi (2000) could analyze (5) in the following way: the object *purezento-o* 'present-ACC' is first scrambled out of the VP (and the verb *kau* undergoes overt verb raising), and then the remnant VP undergoes long-distance scrambling. Such a derivation, however, results in a proper binding condition violation like (ii) (Saito 1989; Hiraiwa 2010):

(i)   Ken-ga   Naomi-o   tataki-sae   sita

       Ken-NOM   Naomi-ACC   hit-even   did

       'Ken even hit Naomi. '

(ii) * [[t_1 tataki-sae/wa]$_2$ Naomi-o$_1$ Ken-ga t_2 sita]

           hit-even/TOP   Naomi-ACC   Ken-NOM   did

                                (Hiraiwa 2010: 137)

We thank an anonymous reviewer for pointing this out.

(6) a. *Reizooko-kara ringo-o*   Naomi-ni   Ken-ga   [Yuuko-ga   nusunda to]   iituketa

       fridge-from   apple-ACC Naomi-DAT Ken-NOM Yuko-NOM stole   C   told

       'Ken told Naomi that Yuko stole some apples from the fridge.'

    b. * *Reizooko-kara* Naomi-ni   *ringo-o*   Ken-ga   [Yuuko-ga   nusunda to]   iituketa

       fridge-from   Naomi-DAT apple-ACC Ken-NOM Yuko-NOM stole   C   told

In (6ab), *reizooko-kara* 'fridge-from' and *ringo-o* 'apple-ACC' are scrambled out of the embedded clause through long distance scrambling. While (6a) is well-formed, (6b) is not, because the matrix element *Naomi-ni* 'Naomi-DAT' splits up the two scrambled phrases. The ill-formedness of (6b) suggests that scrambling individual XPs in the syntax and then parsing them into a phonological constituent cannot save multiple XP scrambling in syntax (cf. Fukui & Sakai 2006). If multiple XP scrambling out of the embedded clause were possible, nothing would rule out the interleaving of XPs in (6b). The locative PP *reizooko-kara* and DO *ringo-o* must end the day as a single constituent, if not in syntax then in phonology. The scrambled material cannot form a syntactic constituent but provably does form a prosodic constituent ɸ (recall the tonal downstep), which suggests that if multiple XPs cannot scramble in the syntax, the XPs bundle into a single ɸ in phonology and scramble there. This prosodic scrambling derives (7), where the scrambled ɸ is recursively built up from the ɸs that contain the locative PP and DO:

(7) *(Reizooko-kara*ɸ *ringo-o*ɸ*)*ɸ Naomi-ni   Ken-ga   [Yuuko-ga   nusunda to]   iituketa

      fridge-from   apple-ACC Naomi-DAT Ken-NOM Yuko-NOM stole   C   told

Again, it seems that the impossibility of scrambling multiple XPs in the syntax causes them to be scrambled and combined into a single ɸ in the phonology.

     We are *not* suggesting that independent XPs regularly unite to form a single ɸ in phonology; the regular syntax-to-phonology mapping that we adopt for Japanese (Itô & Mester 2013) generally maps independent XPs to independent ɸs:

(8)   [NP- DAT] [NP-ACC]   Syntax

                     ⇩

    (   )ɸ (   )ɸ   Phonology

However, whereas syntax cannot scramble multiple XPs, it seems that phonology can and does scramble multiple ϕs, if forced to do so. We hypothesize that material is targeted for scrambling within syntax, and is moved either in syntax or phonology, subject to the condition in (9):

(9) Scrambled material must be
    (i) non-predicative,
    (ii) maximal, and
    (iii) contained in a single domain-initial constituent. [4]

Exactly what motivates scrambling in Japanese is not presently understood, and is a topic for further research. We do know that scrambling changes the focus potential of a sentence and so seems to be motivated by Information Structure (Miyagawa 1998, Ishihara 2001), rather than by formal feature checking of phi-features (cf. Fukui 1993), or of the Edge feature used to activate Merge in syntax (Chomsky 2001, 2005). We assume that the effects induced by Information Structure are not limited to the syntax or to the phonology, but apply to both. This allows the task of scrambling to be 'passed on' to phonology if the material targeted for scrambling is not a single syntactic XP. If the material targeted for scrambling forms a single syntactic XP, it always scrambles in syntax and 'bleeds' prosodic scrambling; if the material targeted for scrambling cannot form a single syntactic XP, the phonology simply 'inherits' the job of fronting the material targeted for scrambling and ensuring that they form a single constituent. In fact, if the material targeted for scrambling is a syntactic XP, then it *must* scramble in the syntax and cannot be passed on to the phonology even if the movement causes the syntax to crash. We turn our focus to (9i – iii) and how they are interpreted by the syntax (when XPs are scrambled) and by the phonology (when ϕs are scrambled).

    (9i) requires that the scrambled material be non-predicative, excluding VP and AP. Saito has shown that there is no VP scrambling in Japanese (1985:236):

(10) a. John-ga   sono hon-o   katta   koto
           John-NOM that book-ACC bought fact
           'the fact that John bought that book'

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[4] This precludes 'early Spell-Out' analyses of scrambling, which send the scrambled XPs one-by-one to the phonological component for so-called 'PF scrambling' (Fukui & Kasai 2004; van Gelderen 2003).

b.*[*sono hon-o   katta*]$_1$ John-ga t_1 koto
    that book-ACC bought John-NOM   fact

Nor is there predicate AP scrambling:

(11) a.   John-ga   suugaku-ni tuyoi   koto
          John-NOM math-DAT   be-good-at fact
          'the fact that John is good at math'

     b.* [*suugaku-ni tuyoi*]$_1$ John-ga t_1 koto
          math-DAT   be-good-at   John-NOM   fact

Scrambling of a predicate NP is also ungrammatical:

(12) a.   John-ga   sono eiga sutaa-ni mutyuu datta koto
          John-NOM that film star-DAT was-crazed   fact
          'the fact that John was crazed about that film star'

     b. *[*sono eiga sutaa-ni mutyuu datta*]$_1$ John-ga t_1 koto
          that   film star-DAT was-crazed   John-NOM   fact

In (12), the predicate NP is scrambled together with the copula, which is presumably an element of INFL (Tense), and one might therefore argue that (12b) is not a case of NP scrambling. But, scrambling the NP alone, leaving the copula *in situ*, is not available either:

(13) *[*sono eiga sutaa-ni mutyuu*]$_1$ John-ga t_1 datta] koto
          that   film star-DAT crazed   John-NOM   was   fact

The only generalization we see that captures the patterns in (10-13) is that the scrambled material must not be predicative.

   (9ii) requires that the scrambled material be maximal, i.e., that scrambling a proper subset of a non-predicative XP is not allowed. The restriction is necessary to block stranding a possessor via prosodic scrambling. Selkirk and Tateishi (1991) discuss nominal phrases such as *Oomiya-no Inayama-no yuuzin* 'the friend of Mr. Inayama from Oomiya', which have a reading in which *Oomiya-no* 'Oomiya-GEN' modifies *yuuzin* 'friend'; in such a case, there is a

prosodic boundary before *Inayama*: *(Oomiya-no)_φ (Inayama-no…)_φ*. An anonymous reviewer suggests that we might expect the prosodic unit *Inayama-no yuuzin* 'Mr. Inayama-GEN friend' to be able to scramble together with the following NP, stranding *Oomiya-no* 'Oomiya-GEN'. However, stranding the possessor is ungrammatical:

(14) [Bill-ga [Oomiya-no <u>Inayama-no yuuzin-ga</u> <u>nattoo-o</u> tabeta to] omotteiru

   Bill-NOM Oomiya-GEN Inayama-GEN friend-NOM nattoo-ACC ate   that thinks

   'Bill thinks that Mr. Inayama's friend from Oomiya ate nattoo'

(15) *(Inayama-no yuuzin-ga nattoo-o)_φ (Bill-ga)_φ (Oomiya-no)_φ tabeta to omotteiru

The maximality requirement prohibits non-maximal XPs from being targeted for scrambling. The material targeted for scrambling is double-underlined in the syntactic representation in (14). Part of this material, *Inayama-no yuuzin-ga* 'Inayama-GEN friend-NOM', is not a maximal NP, but an intermediate projection of N, and therefore cannot be targeted for scrambling without having the genitive targeted as well. Similarly for *yuuzin-ga* 'friend-NOM', which cannot be targeted without involving its maximal NP.

   (9iii) requires that the scrambled material be contained in a single domain-initial constituent, relativized to the component in which the scrambling takes place. Syntactic scrambling must result in a single clause-initial (TP-adjoined) XP;[5] prosodic scrambling must result in a single ι-initial φ. (9iii) is satisfied straightforwardly when a single XP is scrambled in the syntax, as we saw in (1). But if the material targeted for scrambling includes multiple XPs that do not form a constituent in the syntax, (9iii) rules out syntactic scrambling and the scrambling is passed on to the phonological component. Prosodic scrambling moves the φs that correspond to the separate XPs to ι-initial position and packs them into a recursively embedded single φ.[6] (16) illustrates this for the scrambled material from example (3a). *XYZ* represents material at the left edge. Double underline in the syntactic representation indicates that material is targeted for scrambling.

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[5] We do not deal with so-called 'VP-internal scrambling', since it is not clear whether variable DO – IO order VP-internally is derived by movement or base-generation.

[6] Note that this also excludes 'multiple scrambling' cases in which one of the XPs scrambles syntactically, and the other scrambles prosodically. As we show in the next section, grammatical instances of 'multiple long-distance scrambling' do not obey syntactic conditions or have the same interpretive effects of single syntactic scrambling. This suggests that good cases of 'multiple scrambling' cannot involve *any* form of syntactic movement.

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(16) X...Y...Z [NP- DAT] [NP-ACC] Syntax
⇩

(ₗ (..)ɸ(..)ɸ(..)ɸ ((...........)ɸ (.............)ɸ)ɸ)ₗ Phonology
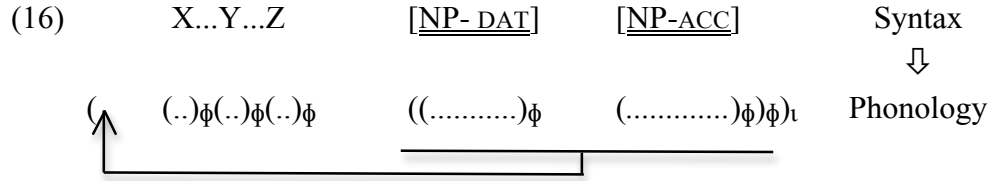
By (9iii), there is no way for the syntax to scramble the targeted material, because the IO and DO cannot be contained in a single XP. But (9iii) has better luck in the phonology, where recursive ɸs are licit *if forced by high-ranked constraints* (Itô & Mester 2013). Assuming that (9iii) acts as such a constraint, the targeted material is prosodically scrambled to the left edge of ι and forced into a single (recursive) ɸ.

Again, in Japanese scrambling, the effects induced by Information Structure are not limited to the syntax or to the phonology, but apply to both. The manipulation of structures in syntax and phonology by the outside system is heavily restricted, however, by the constraints of the grammatical sub-systems involved. Syntactic scrambling fronts XPs to clause-initial (TP-adjoined) position; prosodic scrambling fronts ɸs to ι-initial position; since syntax derivationally precedes phonology, syntactic scrambling 'bleeds' prosodic scrambling, and the latter applies only when the material targeted for scrambling cannot form a single syntactic constituent.

In (17) we consider a case in which the material targeted for scrambling is a constituent both in the syntax (an XP) and in the phonology (a recursive ɸ) and consider evidence that in such a case it is always scrambled in the syntax rather than in the phonology. In (17a) the DO *Suzy-no sono tegami-o* 'Suzy's that letter-ACC' scrambles syntactically to clause-initial position:

(17) a. *[Suzy-no [sono tegami-o]]₁* John-ga [Mary-ga Bill-ni *t₁* watasita to] itta ＜koto＞
         Suzy-GEN that letter-ACC John-NOM Mary-NOM Bill-DAT handed that said fact
         Lit. 'John thinks that Mary handed [Suzy's that letter] to Bill.'

     b. *((Suzy-no)ɸ (sono tegami-o)ɸ)ɸ* John-ga [Mary-ga Bill-ni watasita to] itta＜koto＞
         Suzy-GEN that letter-ACC John-NOM Mary-NOM Bill-DAT handed that said fact

(17b) shows what prosodic scrambling of the same material would look like. Although syntactic scrambling arguably leaves a trace in the base position of the scrambled phrase for preservation of thematic relations at LF (17a), there is no such motivation for prosodic scrambling. We therefore assume that prosodic scrambling does not leave a trace, and that the

syntax-phonology mapping ignores traces and the nodes that dominate them (Uechi 1998, Tokizaki 2011).

We can test whether the movement is syntactic or prosodic by seeing whether syntactic conditions are respected (syntactic movement) or ignored (prosodic movement). The following examples show that an NP with a genitive NP, when scrambled, is sensitive to the Complex NP Constraint (18), to Saito's (1985) ban on scrambling nominative subjects (19), and to the ban on scrambling from within adjuncts (20):

(18) ??*[Suzy-no   tomodati]-ni*₁ Mary-ga   [[*t₁* sono hon-o   watasi wasureta]
         Suzy-GEN friend-DAT   Mary-NOM   that book-ACC give   forgot
         hito]-o   sagasiteiru
         person-ACC look-for
         Lit: 'To Suzy's friend, Mary is looking for the person who forgot to give that book.'

(19) *?*[Suzy-no   kuruma]-ga*₁ John-ga   [*t₁* Tookyoo-eki-ni   tuita   to]   omotteiru
         Suzy-GEN car-NOM   John-NOM   Tokyo-station-at arrived C   think
         'John thinks that Suzy's car arrived at Tokyo station.'

(20) ??*[Suzy-no   tomodati]-ni*₁ Mary-ga   [John-ga   *t₁* sono tokei-o   ageta kara]   okotteiru
         Suzy-GEN friend-DAT   Mary-NOM John-NOM   that watch-ACC gave because be.angry
         Lit: 'To Suzy's friend, Mary is angry because John gave that watch.'

Our analysis models the ungrammaticality of (18-20) as follows: since the targeted material constitutes a syntactic constituent, it *must* undergo scrambling in the syntax, making it subject to the Complex NP Constraint, to the ban on nominative subject scrambling, and to the adjunct condition; prosodic scrambling is excluded in principle when syntactic scrambling is available.[7] If the material targeted for scrambling is a syntactic XP, then it *must* scramble in the syntax and cannot be passed on to the phonology even if the movement causes the syntax to crash. Again, syntactic scrambling 'bleeds' prosodic scrambling, and prosodic scrambling applies if and only if the material targeted for scrambling cannot form a single syntactic XP. This results

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[7] Note that 'heaviness' does not play a role in determining whether a string scrambles syntactically or prosodically in Japanese. The determining factor is whether the material can scramble as a syntactic constituent or not. If not, the material targeted for scrambling is scrambled in phonology and combined into a single φ.

from a fundamental architectural property of the grammar: syntax derivationally precedes phonology.[8]

Any targeted material that cannot scramble as a single XP in syntax will be scrambled and forced into a single constituent in phonology. This should also apply to cases in which the targeted XPs in syntax are (potentially) non-contiguous in the canonical ordering. Take, for example, a case in which the subject and the direct object are targeted to the exclusion of the indirect object within a clause. The subject and direct object would be non-contiguous targets, assuming the canonical ordering is Subj – IO – DO. Consider (21b), a variant of example (3), which is derived from the base structure in (19a) where the embedded subject and direct object are targeted for scrambling to the exclusion of the intervening indirect object. The targeted material would be impossible to scramble as a single constituent in syntax. They can, however, be prosodically scrambled, as the grammatical (21b) shows, where the scrambled material is parsed into a single recursive ɸ (as evidenced again by tonal downstep on *mamé-o*).

(21)   a.   John-ga   [<u>Bill-ga</u>   Mary-ni   <u>sono mamé-o</u>   watasita to] omotteiru
            John-NOM Bill-NOM Mary-DAT that bean-ACC handed   C   thinks
               'John thinks that Bill handed that bean to Mary'

       b.   *(Bill-ga   sono mamé-o)$_{ɸ}$*   John-ga   [Mary-ni   watasita to] omotteiru
            Bill-NOM   that bean-ACC   John-NOM Mary-DAT handed   C   thinks

Nothing in the phonology precludes the targeted XPs from forming a single phonological phrase at the left edge, since recursively embedded ɸs are independently well-attested in the language (Itô & Mester 2012, 2013). Such an output is impossible in syntax, however, where [IO DO]$_{XP}$ is not a possible XP.

To wrap up this section, consider again examples (1) – (3). If the material targeted for scrambling is an XP, it scrambles syntactically (1). If the targeted material is not an XP, it cannot be scrambled syntactically (2), and the problem is passed along to the phonology, where

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[8] Note that there is no need to appeal to anything like the Earliness Principle (Pesetsky 1989) to derive this effect, since an architecture in which syntax derivationally precedes and feeds phonology will derive this effect automatically. We also avoid the complication of appealing to reference sets that compare different derivational outputs which apply scrambling in syntax or in phonology, as operations in syntax and phonology are not comparable for the purposes of economy; there is no sense in which syntactic scrambling is 'less costly' than prosodic scrambling or vice-versa, and thus there is no need to appeal to notions such as Earliness or Procrastinate (Chomsky 1993, 1995) which would decide between the two operations.

the targeted material is fronted prosodically and put into a recursive ɸ (3). Since prosodic scrambling occurs entirely within the phonological component, it is not subject to syntactic conditions and the scrambled material can only be interpreted *in situ* at LF in terms of its binding and scope properties. Syntactic scrambling, on the other hand, occurs in the syntax proper, obeys syntactic conditions on movement, feeds LF, and gives the scrambled XP interpretive effects at LF in its surface position. In section 3 we contrast these properties of syntactic and prosodic scrambling for both long-distance and clause-internal scrambling.

3 Evidence from Long-Distance and Clause-Internal Scrambling

Scrambling in Japanese can be clause-internal or long-distance and, as we have seen, it can be syntactic or (if that is impossible) prosodic. We now look to how these types interact.

3.1 Long-Distance Scrambling

3.1.1 Scrambling of a 'True Adjunct'

Long-distance scrambling of a 'true adjunct' is ungrammatical (Saito 1985, p. 175; Koizumi 2000, p. 242):

(22) * *[Riyuu-mo naku]$_1$* Mary-ga [John-ga *t$_1$* sono setu-o sinziteiru to]
　　　reason-even without Mary-NOM John-NOM that theory-ACC believe C
　　　omotteiru ＜koto＞
　　　think fact
　　　'Mary thinks [that John believes in that theory without any reason].'

(23) * *Naze$_1$* Mary-wa [Bill-ga *t$_1$* sono hon-o katta to] itta no
　　　why Mary-TOP Bill-NOM that book-ACC bought C said Q
　　　'Why$_1$ did Mary say [that Bill bought the book *t$_1$*]?'

In (22-23), the 'true adjuncts' *riyuu-mo naku* 'without any reason' and *naze* 'why' in the matrix domains can be associated only with the matrix clauses. In other words, (20-21) are deviant if the scrambled material is interpreted *in situ*. As pointed out by Koizumi (2000, p. 243), however, when a 'true adjunct' is scrambled with another XP, the result is acceptable even under the *in situ* interpretation, as shown in (24, 25).

(24) a. *(Riyuu-mo naku sono setu-o)$_\phi$*   Mary-ga John-ga   sinziteiru to]
        reason-even without that theory-ACC Mary-NOM John-NOM believe   C
        omotteiru ＜koto＞
        think   fact
        'Mary thinks [that John believes in that theory without any reason].'

    b. *(Sono setu-o   riyuu-mo   naku)$_\phi$* Mary-ga [John-ga   sinziteiru to]
        that theory-ACC reason-even without   Mary-NOM John-NOM believe   C
        omotteiru ＜koto＞
        think   fact

(25) a. *(Naze sono hon-o)$_\phi$*   Mary-wa [Bill-ga   katta   to] itta no
        why that book-ACC Mary-TOP Bill-NOM bought C   said Q
        'Why$_1$ did Mary say [that Bill bought the book t_1]?'

    b. *(Sono hon-o   naze)$_\phi$* Mary-wa [Bill-ga   katta   to]   itta   no
        that book-ACC why   Mary-TOP Bill-NOM bought that said Q

If this movement is syntactic, it is hard to explain why moving an adjunct with another XP (24-25) is acceptable while simply moving the adjunct is not (22-23), especially since moving the adjunct and XP together involves moving a non-constituent.

    Under our analysis, the scrambling that applies in (24-25) has to be prosodic because the moved material does not form an XP and thus cannot have moved in the syntax. Because the movement takes place in the phonology, we can explain why it has no effect with respect to LF conditions on modification: the scrambled 'true adjuncts' in (24-25) are associated with the embedded clause because they remain *in situ* in the LF representation.

3.1.2 Scrambling of a Nominative Subject

Saito (1985) provides evidence for a syntactic constraint against scrambling of a nominative subject. This constraint rules out cases like (26-27):

(26) *? *Sono ressya-ga$_1$* John-ga   [t_1 Tookyoo-ni tuita   to] omotteiru ＜koto＞
        that train-NOM John-NOM   Tokyo-in   arrived C think   fact
        'John thinks that that train has arrived in Tokyo.'

(27) *? *Syatyoo-no   hoosin-ga*₁   John-ga [*t*₁ syain-no   urami-o   katteiru to]

      president-GEN policy-NOM John-NOM   employee-GEN hostility-ACC   earn   C

      omotteiru ＜koto＞

      think   fact

      'John thinks that the president's policy is making an enemy of the employees.'

It is clear from the semantics that the preposed nominatives *sono ressya-ga* 'that train-NOM' and *syatyoo-no hoosin-ga* 'president-GEN policy-NOM' are to be interpreted as subjects of the embedded clauses. But if the nominative subject scrambles with another XP, the result is acceptable (28-29):

(28)   *(Sono ressya-ga   Tookyoo-ni)*ϕ John-ga   [tuita   to] omotteiru ＜koto＞

       that   train-NOM Tokyo-in   John-NOM   arrived C   think   fact

       'John thinks that that train has arrived in Tokyo.'

(29)   *(Syatyoo-no   hoosin-ga   syain-no   urami-o)*ϕ   John-ga   [katteiru to]

       president-GEN policy-NOM employee-GEN hostility-ACC   John-NOM   earn   C

         omotteiru ＜koto＞

         think   fact

       'John thinks that the president's policy is making an enemy of the employees.'

Again, if this movement is syntactic, it is hard to explain why moving a nominative subject with another XP (28-29) is acceptable while simply moving the nominative subject is not (26-27), especially since moving the nominative subject and the other XP together involves moving a non-constituent. On our analysis, though, scrambling multiple XPs requires prosodic scrambling in the phonology; the scrambling ignores the syntactic constraint because it does not take place in the syntax.

3.1.3 *Wh*-scrambling

Takahashi (1993) shows that when a *wh*-phrase is syntactically scrambled out of an interrogative clause by itself as exemplified by (30), the dominant reading is one where the scrambled *wh*-phrase has matrix scope (30b). Deguchi & Kitagawa (2002) and Ishihara (2002) counter that examples like (30) are ambiguous once a proper prosody is assigned to them. Deguchi and Kitagawa claim that Japanese *wh*-questions have a characteristic prosodic contour called Emphatic Prosody (EPD). The *wh*-XP is prosodically focused, and everything else in the clause that is in its scope is defocused, which virtually suppresses lexical and phrasal pitch accents up to the end of

the *wh*-scope. The matrix *wh*-scope reading (30b) is associated with Long EPD, *i.e.* EPD which extends to the matrix C. Short EPD, which ends at the embedded C, renders the embedded *wh*-scope reading (30a):

(30) *Dono hon-o₁*   John-ga   [Mary-ga tosyokan-kara *t₁* karidasita ka] siritagatteiru no

    which book-ACC John-NOM Mary-NOM library-from   borrowed Q   want.to.know Q

    a. 'Which book does John want to know whether Mary borrowed from the library?'

    b. 'Does John want to know which book Mary borrowed from the library?'

When the *wh*-phrase is scrambled and phrased with another XP yielding a ɸ-boundary and a pitch reset after the fronted material as shown in (31), the embedded scope reading (31b) is still allowed but the matrix scope reading (31a) becomes very hard to get:

(31) *(Dono hon-o   tosyokan-kara)ɸ* John-ga [Mary-ga   karidasita ka] siritagatteiru   no

    which book-ACC library-from   John-NOM Mary-NOM borrowed Q   want.to.know Q

    a. *?'**Which book** does John want to know whether Mary borrowed from the library?'

    b. 'Does John want to know **which book** Mary borrowed from the library?'

This obligatory reconstruction effect follows from our analysis, since material prosodically scrambled in phonology can only take scope *in situ* at LF. In (31), we cannot form EPD due to the existence of the pitch reset after the prosodically scrambled material. It is then reasonable to claim that without any effect of EPD, the *in situ wh*-phrase cannot take matrix scope due to the *wh*-island constraint.

3.1.4 Adjacency Condition on Long Distance Scrambled Phrases

As mentioned above, multiple long distance scrambling does not allow scrambled XPs to be split by something in the higher clause (Boeckx and Sugisaki 1999). The following examples are taken from Hiraiwa (2010, p. 154):

(32) a. *Reizooko-kara ringo-o*   Naomi-ni   Ken-ga   [Yuuko-ga nusunda to] iituketa

       fridge-from   apple-ACC Naomi-DAT Ken-NOM Yuko-NOM stole   C   told

       'Ken told Naomi that Yuko stole some apples from the fridge.'

b. * *Reizooko-kara* Naomi-ni   *ringo-o*   Ken-ga   [Yuuko-ga nusunda to] iituketa

   fridge-from   Naomi-DAT apple-ACC Ken-NOM Yuko-NOM stole   C   told

In (32a, b), *reizooko-kara* 'fridge-from' and *ringo-o* 'apple-ACC' are scrambled out of the embedded clause. While (32a) is acceptable, (32b) is not, because the matrix element *Naomi-ni* 'Naomi-DAT' splits up the two scrambled phrases. Under our analysis, multiple long distance scrambling can only apply in the phonology, by scrambling the φs to ι-initial position and packing them into a single recursive φ. When those φs are scrambled, they move to ι-initial position and so cannot end up on opposite sides of something (*Naomi-ni* in 32b).

(33) *(Reizooko-kara*φ *ringo-o*φ*)*φ Naomi-ni   Ken-ga   Yuuko-ga nusunda to   iituketa

    fridge-from   *apple-ACC* Naomi-DAT Ken-NOM Yuko-NOM stole   C   told

Again, the ill-formedness of (32b) suggests that scrambling multiple XPs in the syntax and simply parsing them into a single φ cannot license the multiple scrambling cases we see (cf. Fukui & Sakai 2006). (33) involves both clause-internal syntactic scrambling of an XP and long-distance prosodic scrambling of a φ, and it is significant that the latter shows up further to the left than the former. On our analysis this follows from the fact that syntax derivationally precedes phonology: the XP *Naomi-ni* scrambles to the front of the clause in syntax, *then* the recursive φ *Reizooko-kara ringo-o* scrambles to the front of the ι-phrase. The opposite order, in which the syntactically scrambled XP precedes the prosodically scrambled φ, is ungrammatical and ruled out in principle by our analysis:

(34) *Naomi-ni   *(reizooko-kara ringo-o)*φ Ken-ga   [Yuuko-ga   nusunda to] iituketa

    Naomi-DAT *fridge-from*   *apple-ACC* Ken-NOM Yuko-NOM stole   C   told

The ungrammaticality of (34) follows directly from the fact that *Naomi-ni* is an XP while *reizooko-kara ringo-o* is not. The XP scrambles in the syntax but the non-XP must be scrambled in the phonology.

3.1.5 Condition C of the Binding Theory

There is an argument/adjunct asymmetry with binding reconstruction in English *wh*-movement (Van Riemsdijk and Williams 1981, Lebeaux 1988, Chomsky 1995, *inter alia)* and a similar argument/adjunct asymmetry with reconstruction effects in Japanese scrambling (Nishigauchi

2002; Miyagawa 2005, 2006), as the contrast between the (a) and (b) cases below shows (Miyagawa 2005, p. 193):

(35) a. ?* *[Minna-no   John$_i$-no   hihan-o]$_2$*   kare$_i$-ga   [Hanako-ga t_2
           everyone-GEN   John-GEN   criticism-ACC he-NOM   Hanako-NOM
       osiete-kureta   to] itta
       told-him   C   said
       'Everyone's criticism of John$_i$, he$_i$ said that Hanako told him.'

   b. *[[Minna-ga   John$_i$-kara   kakusite-ita] hihan-o]$_2$*   kare$_i$-ga
          everyone-NOM John-from   was-hiding   criticism-ACC he-NOM
       [Hanako-ga t_2 osiete-kureta   to] itta
        Hanako-NOM   told-him   C   said
       'The criticism that everyone was hiding from John$_i$, he$_i$ said that Hanako told him.'

While *John* and *kare* 'he' can be coreferential in (35b), they cannot be in (35a). The R-expression *John* is an argument of the noun *hihan* 'criticism' in (35a), whereas it is within the adjunct modifying *hihan* 'criticism' in (35b). Assuming Lebeaux's analysis, Nishigauchi and Miyagawa claim that in (35a), *John* must be merged with *hihan* 'criticism' when *hihan* 'criticism' first appears in the complement position of *osiete-kureta* 'told-him'. The copy of *John* is visible in this position, which results in a Condition C violation. In (35b), on the other hand, *John* may be merged after scrambling has taken place, in which case there is no Condition C violation.

This argument/adjunct asymmetry disappears when multiple XPs are scrambled (36). Crucially, (36b) violates Condition C, even though *John* is within the adjunct modifying *hihan* 'criticism':[9]

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[9] Note that (36a,b) are both acceptable if *kare* 'he' refers to someone other than *John*.

(36) a. ?* *(Ookuno tomodati-ni minna-no   John$_i$-no   hihan-o)$_\phi$*

         many   friend-to   everyone-GEN John-GEN criticism-ACC

        kare$_i$-ga   [Hanako-ga   barasita   to] itta

        he-NOM   Hanako-NOM disclosed C said

        Lit. '[Everyone's criticism of John$_i$ to many friends], he$_i$ said that Hanako disclosed.'

    b. ?* *(Ookuno tomodati-ni minna-ga   John$_i$-kara kakusite-ita hihan-o)$_\phi$*

         many   friend-to   everyone-NOM John-from was-hiding criticism-ACC

        kare$_i$-ga [Hanako-ga   barasita   to] itta

        he-NOM   Hanako-NOM disclosed that said

        Lit. '[The criticism that everyone was hiding from John$_i$ to many friends], he$_i$ said that Hanako disclosed.'

The degraded status of (36b) is unexpected under the analysis proposed by Lebeaux, Nishigauchi, and Miyagawa. However, if (36) involves prosodic scrambling in the phonological component, as it must under our analysis, then the entire prosodically scrambled phrase in (36b) is interpreted *in situ* with respect to binding at LF, leading to the Condition C violation.[10]

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[10] As pointed out by an anonymous reviewer, another striking contrast predicted by our analysis can be created by adding a modifier like *riyuumo-naku* 'without any reason' at the beginning of a sentence like (29b):

(i) Riyuu-mo   naku   minna-ga   John$_i$-kara   kakusite-ita   hihan-o

   reason-even   without   everyone-NOM   John-from   was-hiding   criticism-ACC

   kare$_i$-ga [Hanako-ga   osiete-kureta   to]   itta

   he-NOM   Hanako-NOM   told-him   C   said

   a.   'He$_i$ said that Hanako told him [the criticism that everyone was hiding form John$_i$ without any reason].'

   b. ?? 'He$_i$ said that Hanako told him [the criticism that everyone was hiding form John$_i$] without any reason.'

When *riyuu-mo naku* 'without any reason' is interpreted as modifying the relative clause (ia), (i) can still involve syntactic scrambling and thus no Condition C violation emerges. When *riyuu-mo naku* 'without any reason' is interpreted as modifying the intermediate clause (ib), (i) must involve prosodic scrambling, leading to a Condition C violation. Although the judgment is subtle, there exists such a contrast, as predicted by our analysis.

3.1.6 Scope Economy

Tada (1993) and Miyagawa (2005, 2006, 2008) show that long-distance scrambling does not lead to a new scope relation (Miyagawa 2005, p. 201):

(37) *Daremo-ni$_1$*   dareka-ga   [John-ga t_1 kisusita to] omotteiru
   everyone-DAT someone-NOM John-NOM   kissed   C   think
   Lit. 'Everyone, someone thinks that John kissed.'
     *everyone＞someone
      someone＞everyone

While the existential quantifier *dareka-ga* 'someone-NOM' may take scope over the universal quantifier *daremo-ni* 'everyone-DAT', the inverse scope reading is not allowed; the scrambled phrase *daremo-ni* 'everyone-DAT' must be reconstructed to its original position at LF. Miyagawa (2005, 2006, 2008) observes, however, that if the subject is replaced by a quantificational expression and we add a quantificational adverbial expression in the embedded clause, the sentence becomes ambiguous (cf. Miyagawa 2008, p. 20):[11]

(38) *Daremo-ni$_1$*   dareka-ga   [ituka hutari-no-kodomo-ga t_1 kisusita to] omotteiru
   everyone-DAT someone-NOM sometime two-GEN-kids-NOM   kissed   C   think
   Lit. 'Everyone, someone thinks that at some point two kids kissed.'
    OK/?? everyone＞someone
         someone＞everyone

Miyagawa argues that the contrast between (37) and (38) follows from Fox's (2000, p. 26) Scope Economy, which claims that optional application of QR is possible if it leads to a new scope relation.

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[11] The acceptability judgment on the wide scope reading of the universal quantifier *daremo* 'everyone' in (35) varies among speakers. Seven Japanese native speakers were consulted regarding the scope reading for these cases; four of the speakers found the wide scope reading of *daremo* 'everyone' acceptable and three of them found it marginal. It should be noted, however, that even for those who find the wide scope reading of *daremo* 'everyone' in (37) marginal, there is a clear contrast between (37) and (38). The wide scope reading of *daremo* 'everyone' in (37) is much worse than the one in (38), which needs an explanation. We thank an anonymous reviewer for pointing out this issue.

(39) Scope Economy

A Scope Shifting Operation can move XP$_1$ from a position in which it is interpretable only if the movement crosses XP$_2$ and $<$XP$_1$, XP$_2>$ is not scopally commutative.

Miyagawa assumes that scrambling of a quantifier counts as an instance of overt QR and that long-distance QR needs to go through the Spec of C or be adjoined to CP. In (37), the universal quantifier *daremo-ni* 'everyone-DAT' must move into the Spec of the embedded C or be adjoined to the embedded CP to be extracted out of the embedded clause. This movement, however, does not lead to a new scope relation; it does not count as QR due to its violation of Scope Economy. As a result, the universal quantifier *daremo-ni* 'everyone-DAT' cannot take scope over the existential quantifier *dareka-ga* 'someone-NOM' in the matrix subject position in (37). In (38), on the other hand, *daremo-ni* 'everyone-DAT' first moves to the *v*P edge, where it takes scope over *hutari-no kodomo-ga* 'two-GEN-kids-NOM', then moves to the CP edge, where it again creates a new scope relation relative to *ituka* 'sometime'. These movement operations are licensed as QR. *Daremo-ni* 'everyone-DAT' further moves across another quantifier, *dareka-ga* 'someone-NOM' in the matrix clause. This movement also leads to a new scope relation and thus counts as QR; the scrambled quantifier *daremo-ni* 'everyone-DAT' can take scope over *dareka-ga* 'someone-NOM'.

We observe that such scope economy effects disappear with prosodic scrambling:

(40) *(Daremo-ni   sono hon-o)*$_\phi$ dareka-ga   [ituka   hutari-no-kodomo-ga
    everyone-DAT that book-ACC) someone-NOM sometime two-GEN-kids-NOM
    ageta   to]   omotteiru
    gave   C   thinks
    'Someone thinks that at some point two kids gave that book to everyone.'
       *? everyone$>$someone
           someone$>$everyone

Although the embedded clause contains the two quantified expressions *ituka* 'sometime' and *hutari-no-kodomo-ga* 'two-GEN-kids-NOM', *daremo-ni* 'everyone-DAT' cannot take scope over the matrix subject *dareka-ga* 'someone-NOM', which is unexpected under Miyagawa's scope economy account. Under our analysis, prosodic scrambling has to take place in the phonology and *daremo-ni* 'everyone-DAT' can only be interpreted *in situ* with respect to scope at LF; it cannot take scope over the matrix subject.

3.1.7 Idiom Chunks

According to Miyagawa (1997), when part of an idiom chunk is long-distance scrambled, it loses its idiomatic meaning. This effect is compatible with the A-bar movement properties of syntactic long-distance scrambling. This is shown in the following example from Miyagawa (1997, p. 13), in which the idiomatic meaning of *te-o nobasu* 'become involved (Lit: 'extend hands')' is lost when the NP *te*-o 'hand-ACC' is syntactically long-distance scrambled (judgment is Miyagawa's):

(41) ?? *te-o₁*   Mary-ga   [John-ga   hoteru-gyoo-ni   *t₁* nobasita   to] hookokusita
        hand-ACC Mary-NOM John-NOM hotel-business-DAT   extended   C reported
      'Mary reported that John became involved in the hotel business.'

But it is possible to get an idiomatic reading if part of the idiom chunk is prosodically phrased and scrambled with another XP:

(42) *(hoteru-gyoo-ni   te-o)ɸ*   Mary-ga   [John-ga   nobasita   to]   hookokusita
        hotel-business-dat hand-acc Mary-nom John-nom extended   C   reported

The idiomatic reading is available in (42), where part of the idiom is scrambled as part of a prosodic constituent in phonology; in this case, the idiom remains intact for the purposes of interpretation.

3.1.8 Island Constraints

Saito (1985) observes that 'normal' long-distance scrambling is sensitive to island constraints like the Complex NP Constraint and the Adjunct Condition, as shown in (43b, c) and (44b, c), though the island effects with scrambling are weak.

(43) a. Mary-ga   imademo [[Bill-ni   sono hon-o   watasi wasureta] hito]-o
         Mary-NOM still   Bill-DAT that   book-ACC give   forgot   person-ACC
         sagasiteiru   ＜koto＞
         look-for   fact
         'Mary is still looking for the person who forgot to give that book to Bill.'

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b. ?? *Bill-ni*$_1$　Mary-ga　imademo [[t_1 sono hon-o　　watasi　wasureta]
　　Bill-DAT　Mary-NOM　still　　　　that　book-ACC　give　　forgot
hito]-o　　sagasiteiru　＜koto＞
person-ACC　look-for　　　fact

c. ?? *Sono hon-o*$_1$　　Mary-ga　imademo [[Bill-ni　t_1　watasi　wasureta]
　　that book-ACC　　Mary-NOM　still　　　Bill-DAT　give　　forgot
hito]-o　　　sagasiteiru　＜koto＞
person-ACC　look-for　　　fact

(44) a. Mary-ga　imademo [John-ga　Bill-ni　sono　tokei-o　　ageta　kara]
Mary-NOM　still　　　John-NOM　Bill-DAT　that　watch-ACC　gave　because
okotteiru ＜koto＞
be-angry　fact
'Mary is still angry because John gave that watch to Bill.'

b. ?? *Bill-ni*$_1$　Mary-ga　imademo [John-ga　t_1 sono tokei-o　　ageta kara]
　　Bill-DAT　Mary-NOM　still　　　John-NOM　　that　watch-ACC　gave　because
okotteiru ＜koto＞
be.angry　fact

c. ?? *Sono tokei-o*$_1$　Mary-ga　imademo [John-ga　　Bill-ni　t_1　ageta kara]
　　that　watch-ACC　Mary-NOM　still　　　John-NOM　Bill-DAT　　gave　because
okotteiru ＜koto＞
be.angry　　fact

Japanese scrambling is also subject to the left-branch condition: no genitive phrase can be syntactically scrambled out of a nominal phrase. In (45b), the genitive phrase *Suzy-no* 'Suzy-GEN' is syntactically scrambled out of the nominal phrase; the result is completely ungrammatical:

(45) a. John-ga　　imademo [Mary-ga　　[Suzy-no　imooto]-o izimeta to] omotteiru ＜koto＞
John-NOM　still　　　　Mary-NOM　Suzy-GEN sister-ACC bullied C　think　　　fact
'John thinks that Mary bullied Suzy's sister.'

b. * Suzy-no$_1$ John-ga   imademo [Mary-ga   [t_1 imooto]-o izimeta to] omotteiru＜koto＞

  Suzy-GEN John-NOM still   Mary-NOM   sister-ACC bullied C think   fact

Matters are improved if the scrambled elements form a (recursive) ɸ:

(46) *(Bill-ni   sono hon-o)$_\phi$*   Mary-ga   imademo watasi wasureta hito-o

  Bill-DAT that book-ACC Mary-NOM still   give forgot   person-ACC

  sagasiteiru ＜koto＞

  look-for   fact

  'Mary is still looking for the person who forgot to give that book to Bill.'

(47) *(Bill-ni   sono tokei-o)$_\phi$*   Mary-ga   imademo John-ga   ageta kara   okotteiru ＜koto＞

  Bill-DAT that watch-ACC Mary-NOM still   John-NOM gave because be.angry   fact

  'Mary is still angry because John gave that watch to Bill.'

(48)? *(Mary-ga   Suzy-no)$_\phi$* John-ga   imademo [imooto-o izimeta to] omotteiru ＜koto＞

  Mary-NOM Suzy-GEN John-NOM still   sister-ACC bullied C   think   fact

  'John thinks that Mary bullied Suzy's sister.'

As we mentioned in Section 1, when multiple XPs are moved out of an embedded clause through syntactic long-distance scrambling, the result is degraded. Hence, if (46-48) were derived by syntactic scrambling, they should be worse than (43b, c), (44b, c), and (45b), respectively, where only one constituent is scrambled out of an opaque domain. The result, however, is the opposite of what a syntactic scrambling analysis predicts. The prosodic scrambling analysis, however, does account for this. When a single XP is scrambled, it is scrambled in syntax and obeys the expected syntactic island conditions. When multiple XPs are scrambled, they are scrambled in phonology, and the scrambling is therefore insensitive to all syntactic locality constraints.[12]

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[12] A similar effect is observed in Classical Greek (Agbayani & Golston 2010), where pervasive left-branch extraction occurs under movement of prosodic constituents in phonology. Phonological movement is expected to be sensitive to phonological conditions (to which syntactic movement would be immune). Agbayani & Golston show that this expectation is confirmed for Classical Greek, in which phonological movement is sensitive to the Obligatory Contour Principle (OCP). Prosodic scrambling in Japanese is also expected to be sensitive to phonological conditions like the OCP; we have not yet found this effect in Japanese.

3.1.9 Alternative analyses

We now have substantial evidence that grammatical instances of 'multiple long distance scrambling' arise via prosodic scrambling, i.e., scrambling of ϕ in the phonology.

Alternatively, it could be argued that multiple scrambling of single syntactic XPs occurs in syntax, creating something like (2). These syntactically scrambled elements would then be phonologically adjusted to form a prosodic constituent, forming (3) in the phonological component (cf. Fukui and Sakai 2006). Another alternative would allow adjunction of these elements via 'oblique movement' into a single XP that undergoes movement as a single 'surprising constituent' in the sense of Takano (2002). The derivation for (3a) under this analysis would proceed as follows:

(49)　　$[_{\text{Clause}} \cdots [_{\text{Clause}} \cdots [_{\text{VP}} [_{\text{NP}} \text{IO}] [_{\text{NP}} \text{DO}] \text{V}]]]$　　　$\rightarrow$

　　　　$[_{\text{Clause}} \cdots [_{\text{Clause}} \cdots [_{\text{VP}} [_{\text{NP}}[_{\text{NP}} \text{IO}] [_{NP} \textbf{\textit{DO}}]_{1}] \textit{t}_{1} \text{ V}]]]$　　　$\rightarrow$

　　　　$[_{\text{Clause}} [_{NP}[_{NP} \textbf{\textit{IO}}] [_{NP} \textbf{\textit{DO}}]_{1}]_{2} \cdots [_{\text{Clause}} \cdots [_{\text{VP}} \textit{t}_{2} \textit{ t}_{1} \text{ V}]]]$

In this two-step process, DO first adjoins to IO, then the resulting NP scrambles out. Takano's approach would allow the multiply scrambled elements to move as a single constituent in syntax.

As we have seen, though, grammatical instances of multiple long distance scrambling do not obey syntactic conditions or have the same interpretive effects of single syntactic scrambling. Moreover, Takano's 'surprising constituent' is always a ϕ, but this goes unaccounted for in his analysis. We have shown that prosodic adjustment of syntactically scrambled elements cannot license multiple XP scrambling. This suggests that grammatical cases of multiple long distance scrambling, where the scrambled elements form a ϕ but not an XP, cannot involve syntactic movement *of any kind*.[13] Single XP scrambling, however, must be syntactic movement.

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[13] The prosodic scrambling analysis is distinct from so-called 'PF movement' proposals which posit for the most part post-Spell-Out movement of syntactic XPs (Chomsky 1995, Ueyama 1999, Hayashishita 2000, Sauerland & Elbourne 2002, van Gelderen 2003, and Fukui & Kasai 2004).

3.2 Clause-internal scrambling

Sentences with multiple instances of clause internal scrambling (50) are also degraded compared to those with a single instance (51), though the contrast is subtle (Kuno 1978, p. 58; Saito 1985, p. 261).

(50) a.? *Tom-o$_2$ Mary-ni$_1$* John-ga t_1 t_2 syookaisita
       Tom-ACC Mary-DAT John-NOM   introduced
       'John introduced Tom to Mary.'

    b.? *Mary-ni$_1$ Tom-o$_2$* John-ga t_1 t_2 syookaisita
       Mary-DAT Tom-ACC John-NOM   introduced

(51) a. *Tom-o$_1$*   John-ga   Mary-ni t_1 syookaisita
       Tom-ACC John-NOM Mary-DAT   introduced
       'John introduced Tom to Mary.'

    b. *Mary-ni$_1$* John-ga t_1 Tom-o   syookaisita
       Mary-DAT John-NOM   Tom-ACC introduced

We observe that multiple clause-internal scrambling improves if the scrambled elements form a ɸ, just as we saw for multiple long distance scrambling:

(52) a. *(Tom-o   Mary-ni)$_ɸ$* John-ga   syookaisita
       Tom-ACC Mary-DAT John-NOM introduced
       'John introduced Tom to Mary.'

    b. *(Mary-ni   Tom-o)$_ɸ$* John-ga   syookaisita
       Mary-DAT   Tom-ACC John-NOM introduced

Recall that under our analysis there is a difference between syntactic and prosodic scrambling regarding syntactic conditions and LF interpretations. Prosodic scrambling occurs completely within the phonological component and is therefore not subject to conditions on interpretation for syntactic scrambling. Prosodically scrambled material is interpreted *in situ* for binding and scope at LF, which is counter to what we find with syntactic scrambling, where the moved

element is interpreted for binding and scope in its surface position. In this section we show that these predictions are borne out for clause-internal scrambling.

3.2.1 Quantifier Scope

It was first observed by Kuroda (1970) that clause-internal scrambling has an effect on quantifier scope, as schematically represented in (53):

(53) a. QP_1-Nom QP_2-Dat/Acc V (Unambiguous)

  $QP_1 > QP_2$, *$QP_2 > QP_1$

 b. QP_2-Dat/Acc QP_1-Nom V (Ambiguous)

  $QP_1 > QP_2$, $QP_2 > QP_1$

(53a) can only be understood as stating that the subject QP_1 takes scope over QP_2. When we scramble QP_2 (53b), on the other hand, the result is ambiguous; QP_1 takes scope over QP_2 or QP_2 takes scope over QP_1.

Hoji (2003) claims that although there are cases where Kuroda's generalization does not hold, we can still maintain this generalization by using quantifier phrases that cannot be used to refer to a specific group of entities like NP-*dake* 'only NP' (Hoji 2003, p. 410):

(54) a. *3-tu-no   ginkoo-ga Toyota-dake-ni* monku-o   itta
    3-CL-GEN bank-NOM Toyota-only-DAT complaint-ACC said
    'Three banks complained only to Toyota.'
    three banks > only Toyota
    *only Toyota > three banks

 b. *Toyota-dake-ni   3-tu-no   ginkoo-ga* monku-o   itta
    Toyota-only-DAT 3-CL-GEN bank-NOM complaint-ACC said
    'To only Toyota, three banks complained.'
    three banks > only Toyota
    only Toyota > three banks

(54a) is true under situation (55) but not under situation (56). (54b), on the other hand, is true under either (55) or (56). In (55, 56), 'A → B' indicates that A complains to B (Hoji 2003, p. 406-7):

(55) Situation 1

There are six banks (1-6) and three companies (T(oyota), N, M). Three out of six banks complained only to Toyota:

1 → T; 2 → T; 3 → T; 4 → T, N, M; 5 → N, M; 6 → M

(56) Situation 2

There are three banks (1-3) and three companies (T(oyota), N, M). It is only Toyota that three companies complained to:

1 → T; 2 → T, N; 3 → T, N, M

We observe, however, that prosodic scrambling does not affect quantifier scope at all. In (57), *Toyota-dake-ni* 'Toyota-only-DAT' is scrambled together with *monku-o* 'complaint-ACC' with which it forms a ɸ; it has only the interpretation in which the subject QP 'three banks' has scope over the object QP 'only Toyota':

(57) *(Toyota-dake-ni   monku-o)*ɸ   3-tu-no   ginkoo-ga   itta

     Toyota-only-DAT complaint-ACC 3-CL-GEN bank-NOM   said

'Three banks complained only to Toyota.'

three banks > only Toyota

??only Toyota > three banks

In other words, (57) is compatible with (55) but not (56). This can be accounted for by the prosodic scrambling analysis, since the scrambled ɸ can only be interpreted *in situ* at LF and thus (57) should have the same interpretation as its unscrambled counterpart.

3.2.2 Variable Binding and Reconstruction

Hoji argues that there are two types of bound variable anaphora. One is constrained by the c-command requirement at LF that an NP β can be construed as a variable bound by an NP α only if β is c-commanded by α and its trace at LF (Hoji 2003, p. 395). This type of bound variable anaphora shows reconstruction effects with clause-internal scrambling of a single XP (Hoji 2003, p. 394):

(58) *So-ko$_i$-no* kantoku-o *Mettu-sae$_i$-ga* uttaeta ＜koto＞
   that-place-GEN manager-ACC Mets-even-NOM sued fact
   'Its$_i$ manager, even the Mets$_i$ sued.'

The other type of bound variable anaphora, on the other hand, is constrained by the precedence requirement that an NP β can be construed as a variable bound by an NP α only if β is preceded by α at PF (Hoji 2003, p. 396). Unlike the c-command type, the precedence type of bound variable anaphora does not show any reconstruction effects (Hoji 2003, p. 394):

(59) * *So-no$_i$* kyuudan-no   kantoku-o *do-no$_i$* kyuudan-mo uttateta ＜koto＞
    that-GEN baseball.club-GEN manager-ACC which-GEN baseball.club-also sued fact
    '**That**$_i$ (baseball) team's manager, **every**$_i$ (baseball) team sued.'

Hoji (2003) claims that on a descriptive level, the bound variable construal between the NP-*sae* 'NP-even' type (as the binder) and the *so-ko* NP 'that place NP' type (as the bindee) must be based on LF c-command whereas the one between the *do-no* NP 'which NP' type (as the binder) and the *so-no* NP 'that-GEN NP' type (as the bindee) must be based on PF precedence.

  We observe that when prosodic scrambling applies, the reconstruction effects emerge even with the 'precedence type' of bound variable anaphora:

(60) *(Komissyonaa-ni so-no$_1$ kyuudan-no   kantoku-o)$_\phi$* do-no$_1$
   commissioner-DAT that-GEN baseball.club-GEN manager-ACC which-GEN
   kyuudan-mo   uttateta ＜koto＞
   baseball.club-also sued   fact
   '**Every**$_1$ (baseball) team sued **that**$_1$(baseball) team's manager to the commissioner.'

Under the prosodic scrambling analysis, this displacement occurs in the phonology, which does not have any effect on LF. It follows that in (60), the scrambled elements are interpreted as if they are *in situ*, and thus the reconstruction effects emerge.[14]

_____

[14] Note also that in Hoji's (2003) analysis, his 'PF representation' still feeds information to LF in terms of variable binding. Our prosodic scrambling, on the other hand, is purely phonological in the sense that it does not have any effect on variable binding at all.

3.2.3 *Otagai* 'Each Other'

Saito (1992, 2003) claims that clause-internal scrambling in Japanese can be 'A-movement' in the sense that the scrambled phrase can function as an 'A-binder' (Saito 2003, p. 485):

(61) a. *Karera$_i$-ga* *[otagai$_i$-no* sensei]-o hihansita ＜koto＞

   they-NOM each other-GEN teacher-ACC criticized fact

   'They$_i$ criticized each other$_i$'s teacher.'

 b. *? [*Otagai$_i$-no* sensei]-ga *karera$_i$-o* hihansita ＜koto＞

   each other-GEN teacher-NOM they-ACC criticized fact

   'Each other$_1$'s teacher criticized them$_1$.'

(62) ? *Karera$_i$-o$_2$* [[otagai$_i$-no sensei]-ga *t$_2$* hihansita] ＜koto＞

   they-ACC each other-GEN teacher-NOM criticized fact

   'Each other$_i$'s teacher criticized them$_i$.'

Saito argues that (61a, b) show that the reciprocal *otagai* 'each other', which he assumes is a local anaphor, requires a c-commanding antecedent. (62) is derived from (61b) by scrambling the object *karera-o* 'they-ACC'. The fact that (62) improves indicates that the scrambled phrase *karera-o* 'they-ACC' is in an 'A-position', serving as an 'A-binder.'

   Hoji (2003, 2006) counters that *otagai* 'each other' is not a local anaphor. He argues that the internal structure of *otagai* 'each other' is *[pro [otagai]]* 'each other', where *pro* is a phonetically empty argument, and that what has been considered as an anaphoric relation between *otagai* 'each other' and its antecedent should be understood as the relation between *pro* and its antecedent. As evidence for his analysis, Hoji shows that there are cases where the antecedent of *otagai* 'each other' (more precisely, *pro*) need not c-command *otagai* 'each other' (*pro*) as shown below, in contrast to Saito's (61b) example (Hoji 2003, p. 433):

(63) [[*pro$_i$* otagai]-no koibito]-ga [John to Bill]$_i$-o yuuwakusita

   each.other-GEN lover-NOM [John and Bill]-ACC seduced

   'Each other$_i$'s lovers seduced [John and Bill]$_i$.'

Hoji claims that the relevant relation in (61) is that of coreference. The availability of the relevant coreference relation is affected by various lexico-semantic, pragmatic, and syntactic

factors, especially notions like salience. Hence, contrary to Saito's claim, Hoji argues that the improvement seen in (62) cannot be used as evidence for the 'A-position' status of the landing site of clause-internal scrambling.

Hoji (2006) argues that in contrast to (61-63), (64), where the antecedent is a quantifier, involves variable binding rather than coreference (Hoji 2006, p. 4):

(64) (Watasi-wa) [kanarino   kazu-no   nihonzin huuhu]$_i$-ga
       I-TOP   considerable number-GEN Japanese couple-NOM
       [*pro$_i$* otagai]-no   (katute no) onsi-o   batoosuru
              each other-GEN   former   teacher-ACC harshly.criticize
       (no-o   mita)
        COMP-ACC saw
       '(I saw) [a good number of Japanese couples]$_1$ harshly criticize each other$_1$'s (former) teacher.'

This bound variable reading becomes unavailable in a typical LF weak crossover configuration (Hoji 2006, p. 4):

(65) *? (Watasi-wa) [*pro$_i$* otagai]-no   (katute no) onsi-ga   [kanarino
         I-TOP   each other-GEN   former   teacher-NOM considerable
       kazu-no   nihonzin huuhu]$_i$-o batoosuru   (no-o   mita)
       number-GEN Japanese couple-ACC harshly.criticize COMP-ACC saw
       '(I saw) each other$_1$'s (former) teacher harshly criticize [a good number of Japanese couples]$_1$.'

As pointed out by, among others, Mahajan (1990) and Saito (1992), clause-internal scrambling remedies a weak crossover effect:

(66) (Watasi-wa) [kanarino   kazu-no   nihonzin huuhu]$_i$-o
       I-TOP   considerable number-GEN Japanese couple-ACC
       [*pro$_i$* otagai]-no   (katute no) onsi-ga   batoosuru   (no-o   mita)
              each.other-GEN former   teacher-NOM harshly.criticize COMP-ACC saw
       '(I saw) each other$_1$'s (former) teacher harshly criticize [a good number of Japanese couples]$_1$.'

We observe that even in cases like (67), prosodic scrambling of ɸ does not remedy a weak crossover violation as shown in (69) below. This is in contrast with (68), where syntactic clause-internal scrambling remedies a weak crossover violation:

(67)   *?[*pro$_i$* otagai]-no   (katute no) onsi-ga   [nikkei   kigyoo]-ni
            each other-GEN   former   teacher-NOM Japanese   company-DAT

       [kanarino   kazu-no   nihonzin huuhu]$_i$-o   syookaisita ＜koto＞
        considerable   number-GEN Japanese couple-ACC introduced   fact

       'Each other$_1$'s (former) teacher introduced [a good number of Japanese couples]$_1$ to a
       Japanese company.'

(68)   [kanarino   kazu-no   nihonzin huuhu]$_i$-o   [*pro$_i$* otagai]-no
        considerable   number-GEN Japanese   couple-ACC   each other-GEN

       (katute no) onsi-ga   [nikkee   kigyoo]-ni   syookaisita ＜koto＞
        former   teacher-NOM Japanese company-DAT introduced   fact

(69)   *? *([kanarino   kazu-no   nihonzin huuhu]$_i$-o   [nikkee   kigyoo]-ni)$_ɸ$*
            considerable   number-GEN Japanese   couple-ACC Japanese   company-DAT

       [*pro$_i$* otagai]-no   (katute no) onsi-ga   syookaisita ＜koto＞
            each other-GEN   former   teacher-NOM introduced   fact

No remedy of a weak crossover violation in (69) follows from the prosodic scrambling analysis: the scrambling applies to a ɸ in phonology, and thus does not have any effects on variable binding. The prosodically scrambled string is interpreted as if it were *in situ*.

   The same pattern is observed with the bound variable construal between QP and its dependent term whether it is of the LF c-command type or of the PF precedence type (70-75)[15]:

(70)   *? So-ko$_i$-no   kantoku-ga   Mettu-sae$_i$-o   saibansyo-ni uttaeta ＜koto＞
            that-place-GEN   manager-NOM Mets even-ACC court-DAT   sued   fact

       'Its$_i$ manager sued even the Mets$_i$ in court.'

[15] An anonymous reviewer asks of (72) whether the judgment remains the same if the order of the constituents within the ɸ is reversed (i.e., *saibansho-ni Mettu-sae-o*). It seems to us that it does, though the judgment is subtle.

(71) Mettu-sae_i-o   so-ko_i-no   kantoku-ga   saibansyo-ni uttaeta ＜koto＞
      Mets even-ACC   that-place-GEN   manager-NOM court-DAT   sued   fact

(72) *? *(Mettu-sae_i-o   saibansyo-ni)_ϕ* so-ko_i-no   kantoku-ga   uttaeta ＜koto＞
      (Mets even-ACC   court-DAT)   that-place-GEN   manager-NOM sued   fact

(73) *? So-no_i kyuudan-no   kantoku-ga   do-no_i   kyuudan-mo
         that-GEN baseball club-GEN manager-NOM which-GEN baseball.club-also
         saibansyo-ni uttaeta ＜koto＞
         court-DAT   sued   fact
         'That_i (baseball) team's manager sued every_i (baseball) team in court.'

(74) Do-no_i   kyuudan-mo   so-no_i kyuudan-no   kantoku-ga
      which-GEN baseball.club-also that-GEN baseball club-GEN manager-NOM
      saibansyo-ni uttaeta   ＜koto＞
      court-DAT   sued   fact

(75) *? *(Do-no_i   kyuudan-mo   saibansyo-ni)_ϕ* so-no_i kyuudan-no
         which-GEN   baseball.club-also court-DAT   that-GEN baseball.club-GEN
         kantoku-ga   uttaeta ＜koto＞
         manager-NOM sued   fact

In (71) and (74), syntactic scrambling remedies a weak crossover violation, while in (72) and (75) prosodic scrambling does not.

4 Conclusion

This paper has presented evidence for a species of scrambling which applies to ϕs in the phonology. Prosodic scrambling is blind to syntactic constituency and is not subject to syntactic conditions, and the scrambled material can only be interpreted *in situ* at LF. The existence of a prosodic counterpart to syntactic scrambling provides new evidence for an intriguing parallelism between the two components of grammar.

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