# Major Phrase, Focus Intonation, Multiple Spell-Out (MaP, FI, MSO)*

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*Abstract.* The paper discusses interactions between syntactic derivation, semantic scopal relations, and prosodic phrasing in Japanese. I claim that the Major Phrase (MaP) is a result of the mapping of Multiple Spell-Out (MSO) domains onto prosody. I also claim that a Focus Intonation (FI), a prosodic domain triggered by focus, is created independently of MaP phrasing, contrary to previously proposed analyses, in which a FI is created by modifying MaP phrasing. The interactions between prosodic phrasing and semantic scope can be better explained by distinguishing between MaP and FI. I claim that quantifiers and their scopes are sensitive to MaP boundaries, while focus-related scope-taking elements such as *wh*-phrase and negative polarity item are sensitive to FI domains. This generalization is explained under the MSO analysis of MaP/FI formation proposed in this paper.

## 1. Introduction: MaP, FI, MSO

This paper discusses the interaction of the following three notions:

(1)     a.     Major Phrase (*MaP*)

        b.     Focus Intonation (*FI*)

        c.     Multiple Spell-Out (*MSO*)

*MaP* (a.k.a. *intermediate phrase*) is one level in the prosodic hierarchy (Selkirk 1986; Nespor and Vogel 1986). In this paper, we adopt the standard assumption that MaP is the domain of *downstep* (a.k.a. *catathesis*), a strong $f_0$-downtrend triggered by lexical H\*L pitch accent (Poser 1984; Pierrehumbert and Beckman 1988; Kubozono 1993).[1] If there is more than one accented word within a MaP, only the first pitch accent is realized in a full pitch range, while the non-initial pitch accents will be lowered. At the beginning of the next MaP, this lowering effect is canceled, and *pitch reset* takes place. This means that a MaP can be identified by (i) a fully realized initial $f_0$-peak, followed by (ii) downstepped non-initial $f_0$-peaks.[2] A non-downstepped $f_0$-peak following a downstepped $f_0$-peak would indicate the beginning of the next MaP. MaP phrasing usually shows a strong correlation with syntactic structure. There are a number of analyses of syntax-prosody mapping principle for various languages (e.g., Selkirk and Tateishi

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[1]This standard definition of downstep and MaP has been recently questioned, as pointed out by an anonymous reviewer. Kubozono (to appear) reports a case where the lowering effect triggered by pitch accents is observed across a syntactic XP-boundary, which, under the assumption adopted here, corresponds to a MaP boundary (see also Ishihara 2007b). This could mean that the domain of downstep is larger than what we assume as MaP. This accent-triggered lowering effect across MaPs is, however, much smaller than the lowering effect observed within a MaP, and easily distinguishable. In the discussion below, we maintain the terminology "downstep" to refer to the latter effect, namely, the lowering within a MaP.

[2]In this paper, we abstract away from the notion of *Minor Phrase* (MiP, a.k.a. *accentual phrase*) for expository purposes, and simply assume that each word forms a MiP. See Pierrehumbert and Beckman (1988); Selkirk and Tateishi (1988); Kubozono (1993) for phrasing patterns of MiP.

1991; Kubozono 1993 for Japanese, Selkirk 2003; Truckenbrodt 2003 for Bengali). In general, the left or right edge of a MaP corresponds to the left or right of certain syntactic boundary.

*FI*[3] is a special intonation pattern observed in a sentence containing a narrow focus or a contrastive focus. (Throughout this paper, the term 'focus' refers to narrow/contrastive/identificational focus, not broad/new/informational focus.) Focus is typically marked by a raised $f_0$-peak on the focused element (*focal $f_0$-rise*), followed by a downtrend of the post-focal material (*post-focal downtrend*).[4] It has been claimed that a FI is created by modifying the MaP structure of the sentence (Pierrehumbert and Beckman 1988; Nagahara 1994); that is to say, that the downtrend observed in a FI is analyzed as downstep phenomenon as a result of MaP rephrasing.

In this paper, however, I claim that MaP and FI are independent prosodic domains. The first goal of this paper is to show the different properties of MaP and FI and claim that they need to be distinguished.

*MSO* is a notion proposed by Chomsky (2000, 2001). In the latest Minimalist framework, syntactic operations such as movement operate within a limited domain called *phase*. *Spell-Out* (SO) is an operation that sends lexical information within a phase (except the material in the so-called 'edge' position) to the PF component for phonological computation. In this framework, SO operations take place successively to build a single syntactic derivation, hence Multiple SO.

The second goal of this paper is to show the relevance of MSO to the two prosodic domains mentioned above: MaP and FI. In Ishihara (2003, 2005), I proposed that FIs are computed cyclically, at certain relevant SO cycles. I will extend this analysis to MaPs and propose that MaP is formed by direct mapping of SO domains onto prosody.

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[3]FI is called *Emphatic Prosody* (*EPD*) in Deguchi and Kitagawa (2002).

[4]In earlier works of mine and others, several different terms have been used to refer to these two phenomena (Deguchi and Kitagawa 2002; Ishihara 2002, 2003, 2004, 2005; Sugahara 2003).

The paper is organized as follows. §2. presents the data from Miyagawa (2001, 2003), which we will use for our discussion. In §3. I propose that MaP is created as a result of the syntax-prosody mapping of SO domains onto prosody. We also discuss Hirotani's (2004) scope-prosody correspondence. In §4. I claim that FI and MaP are independent, different kinds of prosodic domains, contrary to earlier analyses. In §5. we discuss FIs triggered by *wh*-questions and *negative polarity items* (*NPI*). The MSO-based analysis proposed in Ishihara (2003, 2004) will be briefly introduced. In §6. we sum up the relation between semantic scope and prosody. I suggest that quantifiers and focus-related items are sensitive to different kind of prosodic domains, namely, MaP and FI, respectively.
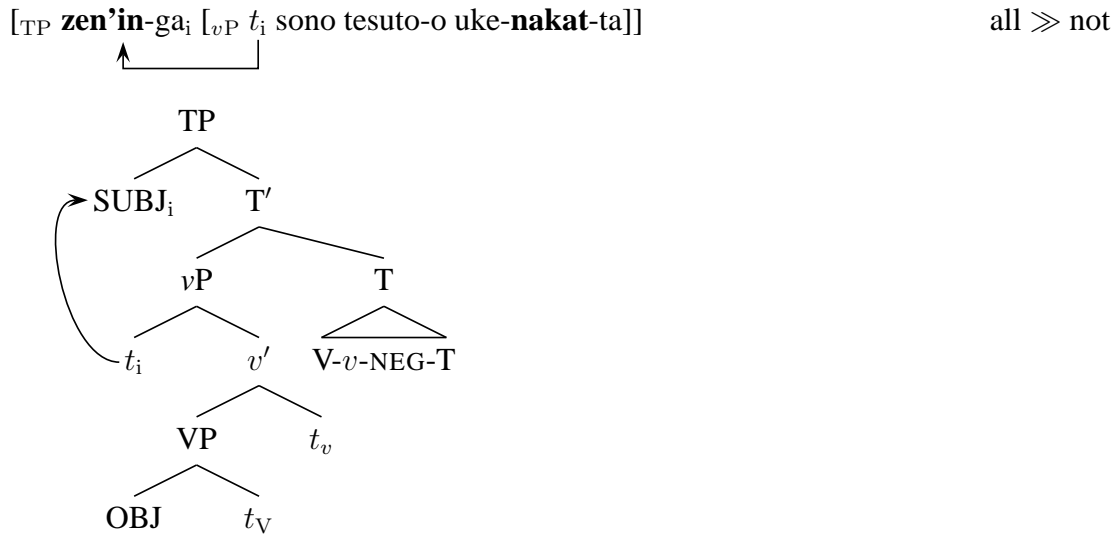
2. **Scrambling and Semantic Scope**

We start our discussion with (2) from Miyagawa (2001, 2003), who observed that a universal quantifier in the subject position obligatorily takes wide scope over negation (all ≫ not) in SOV word order as in (2a), while it may optionally take a narrow scope (not ≫ all) in OSV word order as in (2b):

(2)  a.  **zen'in**-ga sono tesuto-o uke-**nakat**-ta  (SOV)
         all-NOM  that  test-ACC take-NEG-PST
         'All did not take that test.'                    *not ≫ all, all ≫ not

     b.  sono tesuto-o$_i$ **zen'in**-ga $t_i$ uke-**nakat**-ta  (OSV)
         that  test-ACC all-NOM    take-NEG-PST
         'That test, all didn't take.'                    not ≫ all, (all ≫ not)

                                                          (Miyagawa 2003: 183–184)

In order to account for the contrast, Miyagawa proposed the following syntactic structures for (2a) and (2b). First, in (2a), assuming that the negation is in the verbal complex V-$v$-NEG-T and stays in the T$^0$ position, the subject (containing the universal quantifier) moves from its in-situ position (Spec,$v$P) to Spec,TP to satisfy the EPP feature of T, as in (3). As a result, the subject
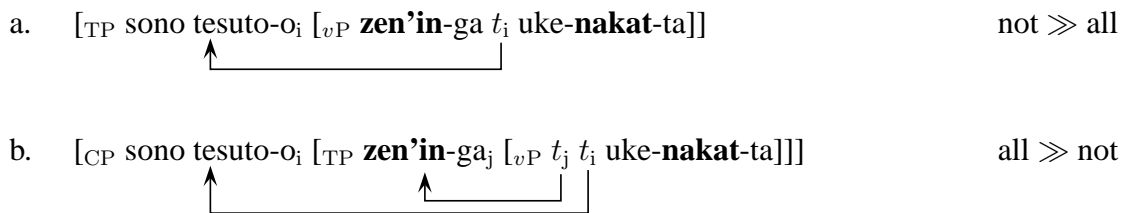
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c-commands the negation and hence takes wide scope over it.

(3)  *SOV word order*

[$_{TP}$ **zen'in**-ga$_i$ [$_{vP}$ $t_i$ sono tesuto-o uke-**nakat**-ta]]                    all ≫ not

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                TP
              /    \
        SUBJ_i      T′
                  /    \
                vP       T
              /    \    /  \
            t_i     v′  V-v-NEG-T
                  /    \
                VP      t_v
              /    \
            OBJ     t_V
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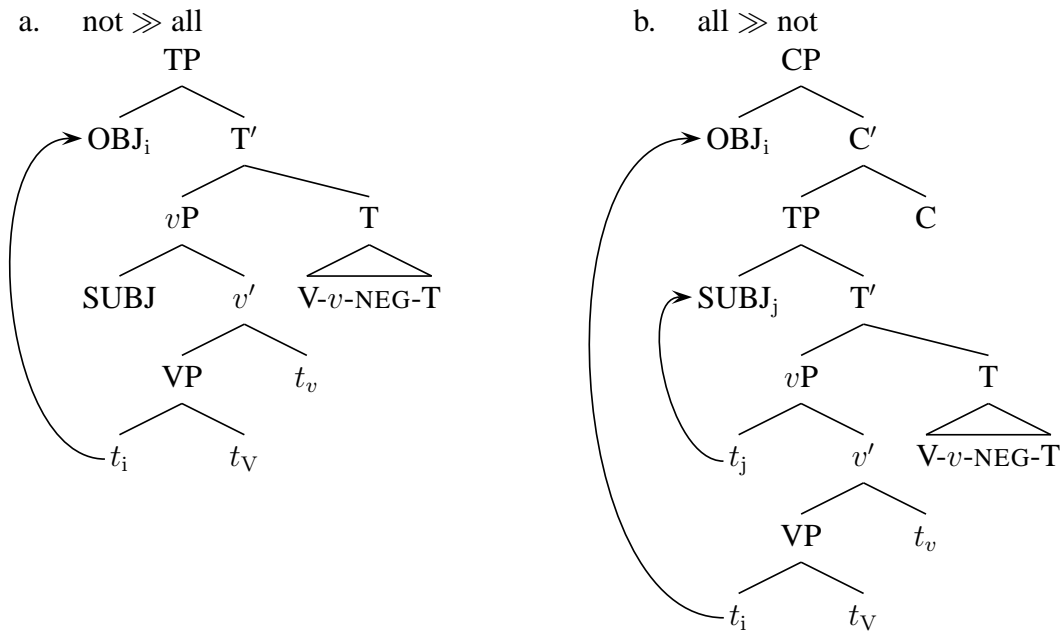
For (2b), he proposed the two syntactic structures in (4). He claimed that when the object scrambles above the subject, it can satisfy the EPP requirement of T instead of the subject. As a result, the subject stays in-situ (Spec,*v*P), and hence the negation takes wide scope over the subject (=(4a)). Alternatively, the subject moves to Spec,TP and satisfies the EPP requirement, and the object undergoes an A′-scrambling, moving to Spec,CP (=(4b)).[5]

(4)  *OSV word order*

a.  [$_{TP}$ sono tesuto-o$_i$ [$_{vP}$ **zen'in**-ga $t_i$ uke-**nakat**-ta]]                    not ≫ all

b.  [$_{CP}$ sono tesuto-o$_i$ [$_{TP}$ **zen'in**-ga$_j$ [$_{vP}$ $t_j$ $t_i$ uke-**nakat**-ta]]]                    all ≫ not

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[5]Miyagawa does not assume the phase-based framework we will adopt in this paper. In order to incorporate his analysis into the phase-based analysis, we need to assume an intermediate landing site for the scrambled object. Given that VP-internal scrambling in Japanese shows properties of A-movement (Tada 1993), I assume the landing site is the (outer-)Specifier of *v*P, an instance of A-movement.

a. not ≫ all

$$\text{TP}$$
$$\text{OBJ}_i \quad \text{T}'$$
$$v\text{P} \quad \text{T}$$
$$\text{SUBJ} \quad v' \quad \text{V-}v\text{-NEG-T}$$
$$\text{VP} \quad t_v$$
$$t_i \quad t_V$$

b. all ≫ not

$$\text{CP}$$
$$\text{OBJ}_i \quad \text{C}'$$
$$\text{TP} \quad \text{C}$$
$$\text{SUBJ}_j \quad \text{T}'$$
$$v\text{P} \quad \text{T}$$
$$t_j \quad v' \quad \text{V-}v\text{-NEG-T}$$
$$\text{VP} \quad t_v$$
$$t_i \quad t_V$$

In the following discussion, we assume this syntactic structure. In the next section, we discuss how the syntactic structures above will be mapped onto the prosodic MaP structure.

## 3.   MaP = MSO

We first need to make explicit how MaP phrasing is formed. In this section, I propose that the MaP phrasing is a result of cyclic syntax-prosody mapping of SO domains onto prosody. This proposal sets the ground for the further discussion on FI in the following sections.
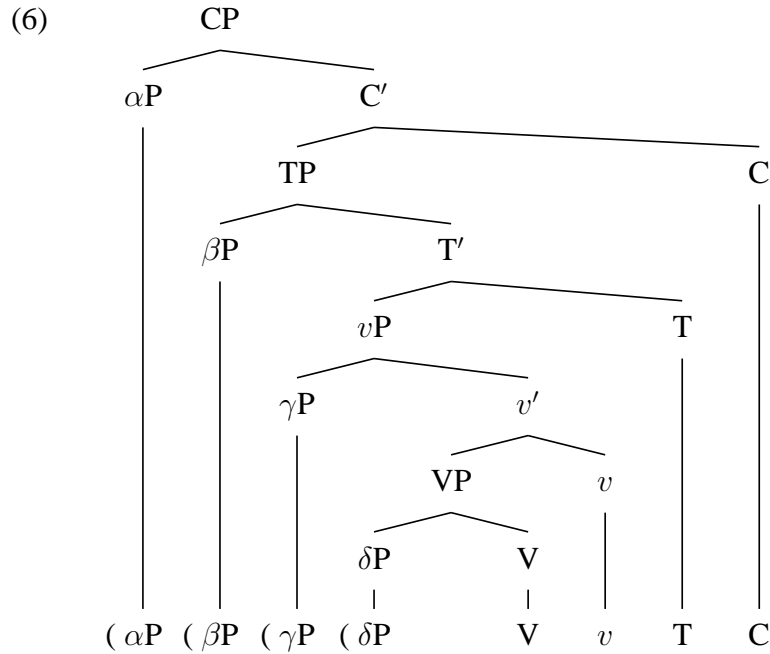
### 3.1.   *XP-alignment Analysis*

Selkirk and Tateishi (1991) proposed that left edges of maximal projections (XPs) are mapped onto prosody as MaP boundaries.

(5)     *XP-alignment Analysis* (Selkirk and Tateishi 1991: 529)

Major Phrase: {Left, XP}

This constraint basically states that whenever there is some maximal projection, there will be a MaP boundary at its left edge. In the schematic structure in (6), for example, there will be a MaP boundary at the beginning of all XPs ($\alpha$P, $\beta$P, $\gamma$P, $\delta$P):

(6)

```
              CP
         ┌────┴────┐
        αP         C′
         │     ┌────┴──────┐
         │    TP           C
         │  ┌──┴───┐       │
        βP      T′         │
         │  ┌────┴────┐     │
         │ vP         T     │
         │ ┌─┴──┐     │     │
        γP     v′     │     │
         │  ┌───┴─┐   │     │
         │ VP     v   │     │
         │ ┌─┴─┐  │   │     │
         │ δP  V  │   │     │
         │ │   │  │   │     │
 (  αP ( βP ( γP ( δP    V   v   T   C
```

If we apply this analysis to the syntactic structures in (3) and (4), we can derive the MaP phrasings of (2).[6,7]

(7)   *MaP phrasing for (2a) (unambiguous: all $\gg$ not)*

[$_{TP}$ **zen'in**-ga$_i$      [$_{vP}$ $t_i$ sono tesuto-o uke-**nakat**-ta ]]
(     **zen'in**-ga )$_{MaP}$ (        sono tesuto-o uke-**nakat**-ta )$_{MaP}$

(8)   *MaP phrasings for (2b) (ambiguous)*

a.   *(not $\gg$ all)*

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[6] All the intermediate traces are omitted because they are irrelevant in this analysis.

[7] The following data were collected by judgement task, presenting sentences with certain phrasing patterns to native speakers, and asking what scope readings is available. Production experiments would be needed to further support the claim.

$[_{\text{TP}}$ sono tesuto-o$_i$    $[_{v\text{P}}$ **zen'in**-ga $t_i$ uke-**nakat**-ta ]]

(    sono tesuto-o )$_{\text{MaP}}$ (    **zen'in**-ga    uke-**nakat**-ta )$_{\text{MaP}}$

b.  *(all ≫ not)*

$[_{\text{CP}}$ sono tesuto-o$_i$    $[_{\text{TP}}$ **zen'in**-ga$_j$    $[_{v\text{P}}$ $t_j$ $t_i$ uke-**nakat**-ta ]]]

(    sono tesuto-o )$_{\text{MaP}}$ (    **zen'in**-ga )$_{\text{MaP}}$ (        uke-**nakat**-ta )$_{\text{MaP}}$

Note that the ambiguous OSV sentence, which has two syntactic structures for the two readings, also has two different MaP phrasings. If the negation *nakat* takes wide scope over the universal quantifier *zen'in*, the universal quantifier and the negation are within a single MaP. If the universal quantifier takes wide scope over the negation, they are phrased separately.

### 3.2.  *Scope-Prosody Correspondence (SPC)*

The correlation between prosodic phrasing and semantic scope mentioned above can be captured by the processing principle called *Scope-Prosody Correspondence* (*SPC*), proposed by Hirotani (2004).

(9)    *Scope-Prosody Correspondence* (Hirotani 2004: 7)

The scope of a term X should not extend beyond the Major (phonological) Phrase (MaP) containing X.

In (7) and (8), "a term X" refers to the negation.[8] In the case of the first OSV example (8a), the universal quantifier and the negation are phrased together. With this phrasing, the negation takes scope over the universal quantifier, yielding the *not ≫ all* reading. In the SOV example (7) and the second phrasing option of the OSV example (8b), on the other hand, the negation and the universal quantifier are not in the same prosodic phrase. Thus, the negation is *not* expected to take scope over the universal quantifier. The SPC correctly describes the correlation between

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[8]It appears that the SPC is not straightforwardly applicable to quantifiers. I will assume that the SPC applies to scope-taking lexical/functional heads relative to some scope-taking XP (e.g., negation relative to a quantifier/NPI, +[WH] Complementizer relative to a *wh*-phrase).

scope and MaP phrasing.

It should be noted that if we adopt the syntactic structures introduced in §2. and a syntax-prosody mapping principle like Selkirk and Tateishi's (1991), this prosody-scope correlation is derived automatically; hence we do not need an independent principle like the SPC. For expository purposes, however, we keep the term SPC to refer to this prosody-semantics correlation.

### 3.3. *Proposal: MSO analysis*

The alternative analysis proposed in this paper is that MaP phrasing is the result of the mapping of SO domains onto prosodic structure.

(10)  *MaP = MSO Hypothesis*

   Spell-Out domains are mapped onto prosody as MaPs.

This proposal is among a group of recent works on the interaction between prosody and syntactic architecture in the Minimalist framework (Dobashi 2003; Kahnemuyipour 2004; Adger 2006, Kratzer and Selkirk this volume, among others). In particular, Dobashi (2003) and Kratzer and Selkirk (this volume) entertain essentially the same line of thought as the one proposed here, predicting MaP structures from the theory of phase and SO, though with a crucially different formulation.

### 3.3.1. Phase and MSO

The property of MSO relevant for our discussion is that the phonological component receives the lexical/syntactic information more than once during the course of derivation. If the MSO model is on the right track, some phonological substance that corresponds to the chunk of information sent to PF at each SO. The proposal in (10) is an attempt to capture this idea: SO

domains are mapped cyclically onto prosody as MaP.[9]

One important question concerning the MSO model is what exactly counts as a phase, and as a SO domain. Chomsky (2001) proposed that CP and *v*P are phases, and that the complement of each phase head (i.e., TP for the CP-phase; VP for the *v*P-phase) is a SO domain.

(11)     *Chomsky (2000, 2001)*

    a.    Phase: *v*P and CP

    b.    SO domain: VP and TP

In this analysis, phase and SO domain are not identical and strictly fixed. The Specifier of a phase head (C and *v*) will be always excluded from the SO of that phase. The reason for the mismatch between phase and SO domain is that phrases which move further need some 'escape hatch', to avoid being sent to PF before moving to the appropriate syntactic position. They first move to the Specifier of the phase head—the so-called phase 'edge' position—before the SO sends the rest of the material to PF.[10]

There are other interpretations of phase and SO. In Fox and Pesetsky (2005), for example, phase and SO domain are essentially the same: CP and *v*P.[11] In their analysis, SO is an operation that establishes the relative linear order of words, which must be preserved throughout the derivation. This set of linear order relations functions as a restriction on syntactic move-

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[9]Kratzer and Selkirk (2007) make a slightly different proposal as to the relation between SO and MaP phrasing, based on German data. They propose that only the leftmost phrase in the SO domain is phrased into a MaP. All non-SO-initial phrases are not included in any MaP, and are as a result realized unstressed.

[10]There are different proposals as to when exactly SO takes place, namely, whether the SO of a phase $\alpha$ takes place as soon as the computation of $\alpha$ is completed, or it is postponed until the next phase $\beta$ is created (cf. Chomsky 2000, 2001). Although this is technically a relevant issue, we do not discuss it in detail due to space limitations.

[11]In fact they do not make a distinction between *v*P and VP, and use VP as the label of the lower phase/SO domain. We use the label *v*P instead, to keep it parallel to Chomsky's notion of phase.

ments: as long as the relative order is preserved, elements may be moved out of the SO domain. If a moved element contradicts any of the ordering relations established at an earlier SO, the derivation crashes.

(12)    *Fox and Pesetsky (2005)*

    a.   Phase: *v*P and CP

    b.   SO domain: *v*P and CP

In this analysis, the phase 'edge' position is flexible. The leftmost element in a phase bears a special property due to its location within a SO domain: it precedes all the other words in a phase. Therefore it can move further in the syntax without contradicting any linear order relation with other words. That means that the leftmost phrase in a phase can always be the phase 'edge' material, whatever syntactic position it occupies. Also, the leftmost element need not be excluded from the SO domain. It can always move, but may also stay in-situ, and hence be part of the SO domain. Furthermore, a non-leftmost element can also move, as long as all the elements on its left also move and maintain the order relation. In this sense, the 'edge' position is not restricted to the leftmost syntactic position, nor does it have to be the Specifier of a phase head.

3.3.2.   MSO-based Syntax-Prosody Mapping

In this paper, we entertain an analysis which tries to capture the basic concepts of Chomsky (2001) and Fox and Pesetsky (2005). While I adopt Fox and Pesetsky's (2005) assumption that phase and SO are the same (*v*P and CP), I stipulate the following additional assumption.

(13)    Phrases that are 'adjoined' to a phase (i.e., adjuncts and A′-moved phrases) are outside the SO domain of this phase.

This means that while phase and SO are essentially the same projections (*v*P and CP), adjuncts and A′-moved phrases are excluded from the SO domain. This modification has the following two consequences. First, at the *v*P phase, Spec,*v*P (i.e., *v*P-internal subjects and scrambled objects) are SO internal, while adjuncts are SO-external. Second, at the CP phase, Spec,TP (an A-position) is SO-internal, while Spec,CP (an A′-position) is SO-external.

(14)    *Proposal in this paper*

    a.    Phase: *v*P and CP

    b.    SO domain: *v*P and CP (excluding adjuncts and A′-moved material)

Although (13) is just a stipulation at this point and requires further study to be fully supported, it is not an unreasonable assumption to make, given the special prosodic properties of adjuncts and A′-moved elements reported in the literature, such as a difference in prosodic integration behavior between arguments and adjuncts (e.g., Gussenhoven 1983; Jacobs 1993) and prosodic independence of topicalized elements and clitic left-dislocation (Frascarelli 2000; Feldhausen 2006).

    With this assumption in mind, let us consider the MaP = MSO Hypothesis in (10). It predicts, unlike the XP-alignment analysis in §3.1., that there is no MaP boundary at the left edge of VP.[12] If the subject stays at its base-generated position, i.e., Spec,*v*P ($\gamma$P), no MaP boundary is expected between the *v*P-internal subject and any material within the VP, as shown

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[12]There is another crucial difference between the two analyses, which we will not discuss in this paper. The MSO analysis derives MaP representation with embedding, which is banned in the standard prosodic hierarchy due to the *Strict Layer Hypothesis* (SLH, Selkirk 1984; Nespor and Vogel 1986). I believe this is in fact a welcome result, as prosodic phrasing with embedding gives more satisfactory explanations for a wide range of phenomena which are far beyond the scope of this paper (but see, for example, Ladd 1986, 1988; Kubozono 1989, to appear; Féry and Truckenbrodt 2005). Note, however, that the MSO model is also compatible with a flat representation. Tentatively, I assume the following rules for 'flattening' the embedded MaP structure ($\alpha$ and $\beta$ are material of the 1st and 2nd SO, respectively):

in (15).

(15)
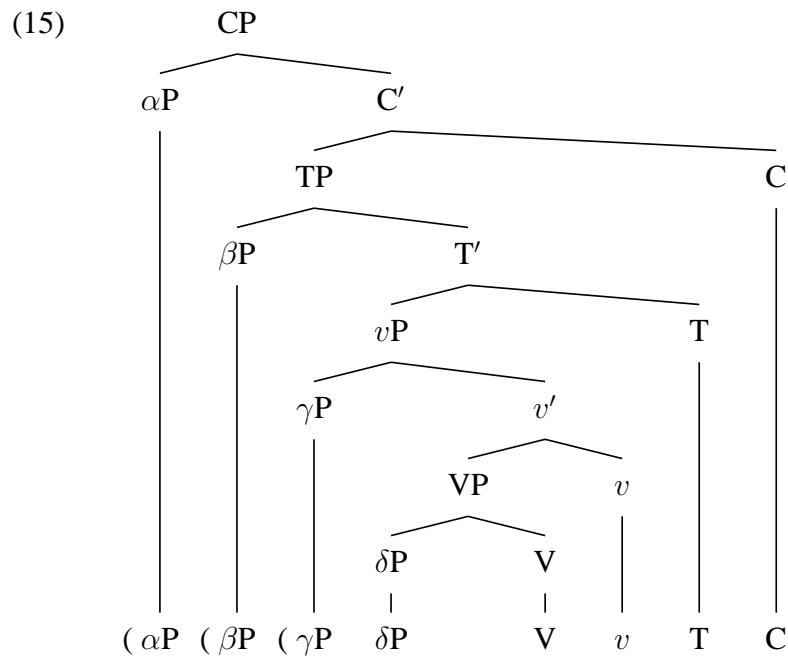


If we apply this analysis to Miyagawa's sentences in (2), based on the structures in (3) and (4), we get the same MaP phrasings as the XP-alignment analysis predicts.

(16)  *MaP phrasing for (2a) (unambiguous: all ≫ not)*

[$_{TP}$ **zen'in**-ga$_i$    [$_{vP}$ $t_i$ sono tesuto-o uke-**nakat**-ta ]]
(    **zen'in**-ga )$_{MaP}$ (    sono tesuto-o uke-**nakat**-ta )$_{MaP}$

(17)  *MaP phrasings for (2b) (ambiguous)*

a.  *(not ≫ all)*
[$_{TP}$ sono tesuto-o$_i$    [$_{vP}$ $t_i$ **zen'in**-ga [$_{VP}$ $t_i$ uke-**nakat**-ta ]]]
(    sono tesuto-o )$_{MaP}$ (    **zen'in**-ga       uke-**nakat**-ta )$_{MaP}$

b.  *(all ≫ not)*
[$_{CP}$ sono tesuto-o$_i$    [$_{TP}$ **zen'in**-ga$_j$    [$_{vP}$ $t_i$ $t_j$ [$_{VP}$ $t_i$ uke-**nakat**-ta ]]]]
(    sono tesuto-o )$_{MaP}$ (    **zen'in**-ga )$_{MaP}$ (       uke-**nakat**-ta )$_{MaP}$

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(i)    a.    ( $\beta$ ( $\alpha$ )) ⟶ ( $\beta$ )$_{MaP}$ ( $\alpha$ )$_{MaP}$

b.    (( $\alpha$ ) $\beta$ ) ⟶ ( $\alpha$ )$_{MaP}$ ( $\beta$ )$_{MaP}$

13

In (16), the subject moves out of the *v*P. The SO domain of the *v*P phase, which will be mapped as a MaP, contains the object and the verb. In (17a), where the negation takes wide scope over the subject, the subject stays within the *v*P. The object first (A-)moves to the left of the subject within the *v*P (so that it establishes a legitimate ordering relation with the subject at the SO of the *v*P phase),[13] and then moves further to Spec,TP to satisfy the EPP of T. As a result, a MaP corresponding to the *v*P-SO contains the in-situ subject and the verb. In (17b), both the subject and the object move out of the *v*P. First, the object moves to the left edge of the *v*P (for ordering requirement), then the subject moves to Spec,TP to satisfy the EPP of T. Lastly, the object moves further to Spec,CP via A′-scrambling. In this structure, the three words are phrased separately, given (13).

### 3.4. *Disambiguating (2b)*

Until now, there is no observable difference between the two analyses. Let us look at the OSV sentence (2b) in a little more detail. In order to disambiguate the two syntactic structures of the OSV sentence, Miyagawa (2001) used the contrast shown in (18) and (19). If a high-attachment adverb such as *saiwaini* 'fortunately' appears after the subject, as in (18), the universal quantifier in the subject can only take wide scope over the negation (all ≫ not). If a low-attachment adverb such as *isoide* 'quickly' appears after the subject, on the other hand, the OSV word order allows the partial negation reading (not ≫ all).

(18)    *High-attachment Adv:* saiwaini *'fortunately'*

sono tesuto-o **zen'in**-ga saiwaini    uke-**nakat**-ta
that   test-ACC all-NOM   fortunately take-NEG-PST
'That test, all didn't take fortunately.'                    *not ≫ all, all ≫ not

(19)    *Low-attachment Adv:* isoide *'quickly'*

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[13]Note that this movement is also obligatory under Chomsky's (2000, 2001) analysis as a movement to the phase 'edge' position.

sono tesuto-o **zen'in**-ga isoide uke-**nakat**-ta
that test-ACC all-NOM quickly take-NEG-PST
'That test, all didn't take quickly.'                          not ≫ all, all ≫ not

(Miyagawa 2003: 186)

Miyagawa proposed the following syntactic structures for (18) and (19). For the high-attachment adverb case (18) there is only one possible structure, namely the subject moving to Spec,TP, because the high-attachment adverb, which adjoins to $v$P, follows the subject, as shown in (20). In the low-attachment adverb case (19), on the other hand, there are still two possible positions for the subject, as in (21). With the adverb adjoining to the VP, the subject may either stay in-situ as in (21a) or move to the Spec,TP as in (21b). In the former structure, the sentence has the partial negation reading (not ≫ all), while in the latter it has the total negation reading (all ≫ not).[14]

(20)    [$_{CP}$ sono tesuto-o$_j$ [$_{TP}$ **zen'in**-ga$_i$ [$_{vP}$ saiwaini   $t_j$ $t_i$ [$_{VP}$ $t_j$ uke-**nakat**-ta]]]]
        that test-ACC          all-NOM          fortunately          take-NEG-PST

        'That test, all didn't take fortunately.'                     *not ≫ all, all ≫ not

(21)    a.    [$_{TP}$ sono tesuto-o$_j$ [$_{vP}$ $t_j$ **zen'in**-ga [$_{VP}$ isoide   $t_j$ uke-**nakat**-ta]]]
              that test-ACC          all-NOM          quickly   take-NEG-PST

              'That test, all didn't take quickly.'                          not ≫ all

        b.    [$_{CP}$ sono tesuto-o$_j$ [$_{TP}$ **zen'in**-ga$_i$ [$_{vP}$ $t_j$ $t_i$ [$_{VP}$ isoide $t_j$ uke-**nakat**-ta]]]] all ≫ not

If we consider the prosodic phrasing of these sentences, the MSO analysis proposed above predicts the following phrasing for (20) and (21).[15]

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[14]Head movements (cf. (3) and (4)) are not indicated for expository purposes.

[15]For (22), it seems also possible to phrase the adverb together with the verb instead of the subject, or to phrase it by itself. I will leave this optionality issue for future research. The crucial observation here is that there is always

15

(22)    (sono tesuto-o) (**zen'in**-ga saiwaini) (uke-**nakat**-ta)          \*not ≫ all, all ≫ not

(23)    a.    (sono tesuto-o) (**zen'in**-ga isoide uke-**nakat**-ta)          not ≫ all, \*all ≫ not

        b.    (sono tesuto-o) (**zen'in**-ga) (isoide uke-**nakat**-ta)          \*not ≫ all, all ≫ not

In (20), the adverb adjoins to the *v*P. Under (13), an adjoined element is excluded from the SO domain. Therefore it will be phrased together with the material in the higher SO domain, in this case, the subject. Accordingly there will be a MaP boundary between the adverb and the verb, as in (22). In (21), the low-attachment adverb adjoins to the VP, which is *not* a phase, and hence will be included within the SO domain of the *v*P phase, and hence phrased together in a MaP with the verb. If the subject stays within the *v*P, as in (21a), it will also be phrased together with the adverb and the verb, as in (23a). If it moves to the Spec,TP, it will be phrased separately, as in (23b).

The resulting phrasings are all compatible with the SPC (9). In (22) and (23b), the subject and the negation are phrased separately. Therefore the negation cannot take wide scope over the universal quantifier (all ≫ not). In (23a), the subject and the verb are phrased together, which allows the negation to take scope over the universal quantifier (not ≫ all).

Note that the XP-alignment analysis by Selkirk and Tateishi (1991) does not distinguish between the two structures in (21), always producing a phrasing pattern as in (23b) with MaP boundaries at each XP. As such it fails to account for the correlation between semantic scope and prosodic phrasing.

In this section, we discussed the syntax-prosody mapping principle that determines the MaP phrasing according to the syntactic structure. The MSO analysis is proposed as an alternative to the XP-alignment analysis. In the next two sections, we will discuss FI. First, it will be shown that FI and MaP are two different prosodic domains (§4.). In §5., the creation of FIs under the

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at least one MaP boundary between the subject and the verb.

MSO analysis will be illustrated.

## 4. FI ≠ MaP

In this section, we discuss various differences between MaP and FI. We first review the earlier analysis of FI, and then point out several problems of the analysis.

### 4.1. *MaP analysis of FI*

Since Pierrehumbert and Beckman (1988), it has often been claimed that focus modifies MaP phrasing (e.g., Nagahara 1994).

(24)    *MaP rephrasing by Focus*

    a.   FOCUS-LEFT-EDGE (Pierrehumbert and Beckman 1988)

        Left edge of focus = left [MaP] edge

    b.   FOCUS-TO-END

        No intervening [MaP boundary] between any focus constituent and the end of sentence.

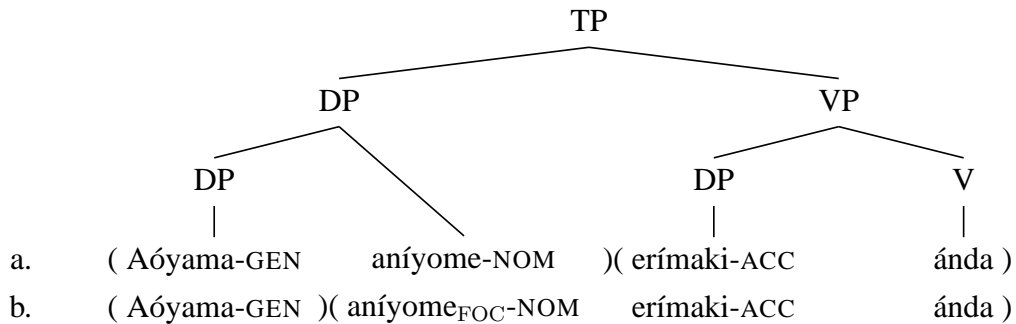                                                     (Nagahara 1994: 42)

The following example illustrates how the analysis works. In (25), according to the syntax-prosody mapping principle—be it the XP-alignment analysis (§3.1.) or the MSO model proposed here (§3.3.)—a MaP boundary will be created between the nominative DP *aniyome-ga* 'sister-in-law-NOM' and the VP *erimaki-o anda* 'knitted a scarf', as shown in (26a). Let us call this phrasing the default MaP phrasing—the MaP phrasing predicted by the syntax-prosody mapping principle.

When there is a focus on the nominative phrase *aniyome-ga*, the default MaP phrasing will be changed, according to (24). A new MaP boundary is inserted on the left of the focused

phrase *aniyome-ga*, and the MaP boundary between the subject and the VP is deleted. As a result, a large MaP that stretches from the focused phrase until the end of the sentence will be formed, as in (26b).

(25)    [$_{TP}$ [$_{DP}$ [$_{DP}$ Aóyama-no   ] aníyome$_{(FOC)}$-ga   ] [$_{VP}$ erímaki-o ánda   ] ]
                    Aoyama-GEN   sister-in-law-NOM     scarf-ACC knitted
        'Aoyama's sister-in-law knitted a scarf.'

(26)    a.    No Focus (= default MaP phrasing)

        b.    Focus on *aníyome-ga* 'sister-in-law-NOM'

$$
\begin{array}{c}
\text{TP}\\
\diagup\qquad\diagdown\\
\text{DP}\qquad\qquad\text{VP}
\end{array}
$$

|   | DP | | DP | V |
|---|----|---|----|---|
| a. | ( Aóyama-GEN    aníyome-NOM | )( erímaki-ACC | | ánda ) |
| b. | ( Aóyama-GEN )( aníyome$_{FOC}$-NOM | erímaki-ACC | | ánda ) |

There are two crucial points to be noted for this line of analysis. First, FI is analyzed here instead as a large MaP, created by the MaP rephrasing constraints in (24). Under the Strict Layer Hypothesis, this would mean that there will be no MaP boundaries within a FI domain. Second, the $f_0$-downtrend observed after the focused phrase is analyzed as downstep, thus the prosodic properties of downstep and those of post-focal $f_0$-downtrend are expected to be identical.

(27)    *MaP rephrasing analysis of FI (to be refuted)*

        a.    FI = MaP

        b.    Post-focal $f_0$-downtrend = Downstep

An alternative proposal exists in which focus bears an Intonation Phrase (IntP) prominence that needs to be aligned to the right edge of IntP (Truckenbrodt 1995; Selkirk 2003; Sugahara 2003). In this analysis, FI = IntP. Although such an analysis circumvents one of the problems discussed below, a few problems remain.

### 4.2. *Problems*

There is abundant evidence that MaP and FI domain are independent.

### 4.2.1. MaP boundaries within FI (Sugahara 2003)

Sugahara (2003) showed experimentally that there are cases where MaP boundaries are observed after a focused element in a certain context. She showed that when a discourse-new element follows a focused phrase, the MaP boundaries at the start of the post-focal, discourse-new elements are not completely deleted, even though its realization is indeed reduced.

If focus always eliminates MaP boundaries on its right (due to FOCUS-TO-END in (24b)), we do not expect MaP boundaries within a FI. Furthermore, Sugahara showed that there is $f_0$-reduction after the focused element even when the MaP boundaries are maintained. This in turn indicates that Post-focal $f_0$-downtrend is not identical to downstep.

### 4.2.2. FI embedding

Ishihara (2003, 2004, 2007a) showed experimentally that a FI can be embedded inside another FI.[16] As we will see in more detail in §5.1., Japanese *wh*-phrases always behave prosodically as a focused phrase. In both sentences in (28) below, the matrix subject is a *wh*-phrase. Hence a FI will be created starting from the beginning of the sentence until the end of the sentence.

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[16]The experimental data here and in the following section are from Ishihara (2007a). The data shown here are from just one of the twelve speakers in the experiment. For more detailed discussion of the data, see Ishihara (2007a).

The difference between the two sentences is that there is another *wh*-phrase in the embedded clause in (28b), but not in (28a). If this embedded clause *wh*-phrase in (28b), which takes the embedded clause as its scope, also triggers a focal $f_0$-rise, we expect a difference in $f_0$-height between (28a) and (28b). (In the examples hereafter, expected FI domains are indicated by { curly brackets }$_{\text{FI}}$.)

(28)    a.    Wh-*question with an indirect Yes/No-question*

| { **dáre**-ga | [ Mári-ga | **wáin**-o | nomíya-de nónda | **ka** ] | ímademo | obóeteru |
|---|---|---|---|---|---|---|
| who-NOM | M.-NOM | wine-ACC | bar-LOC | drank Q | even.now | remember |

**no**? }$_{\text{FI}}$
Q
'Who still remembers whether Mari drank wine at the bar?'

    b.    Wh-*question with an indirect* wh-*question*

| { **dáre**-ga | [ Mári-ga | { **náni**-o | nomíya-de nónda | **ka** }$_{\text{FI}}$ ] | ímademo |
|---|---|---|---|---|---|
| who-NOM | M.-NOM | what-ACC | bar-LOC | drank Q | even.now |

obóeteru   **no**? }$_{\text{FI}}$
remember Q
'Who still remembers what$_i$ Mari drank $t_i$ at the bar?'

This prediction is borne out, as can be seen on the third peak from the left in Figure 1. (The dashed and the solid line indicate the mean $f_0$-height for (28a) and (28b), respectively.)

Note here that the raised $f_0$-peak of the embedded clause *wh*-phrase is much lower than that of the *wh*-phrase in the matrix clause. Ishihara (2003, 2004) claims that this is because the FI in the embedded clause is contained inside the other, larger FI of the matrix clause. The post-focal $f_0$-downtrend of the matrix FI lowers the $f_0$-height of the embedded clause *wh*-phrase, even though it is raised due to its focus.

If FI = MaP, as the MaP analysis of FI assumes, MaPs would need to be embedded to account for the result above, which would violate the Nonrecursivity of the Strict Layer Hypothesis. The standard prosodic hierarchy would have to be modified to allow such a prosodic structure. If, on the other hand, one tries to maintain the SLH, all the focused phrases would
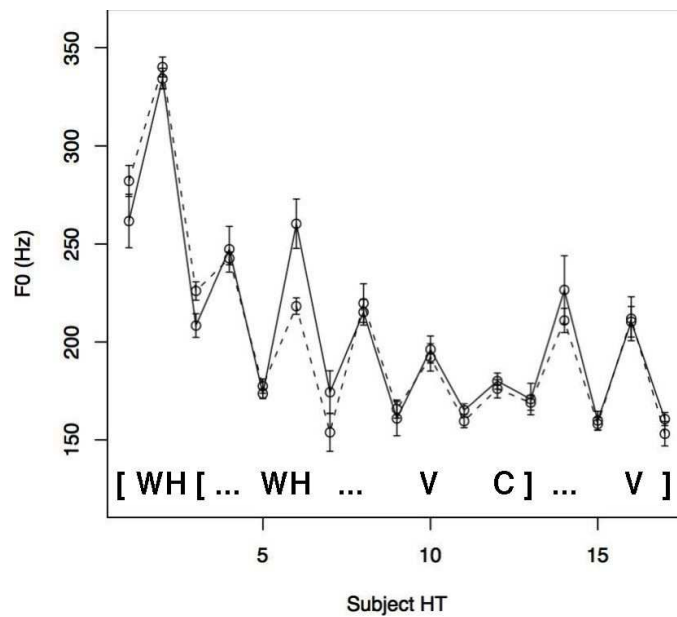
Figure 1: Mean $f_0$ for (28a) (dashed line) and (28b) (solid line) with 95% CI

start a new MaP in the same way. Then it remains unexplained why the realizations of the two FIs in (28b)—the $f_0$-rise on the matrix *wh*-phrase and that of the embedded one—are clearly different (the embedded FI is realized in a much more compressed pitch range). Recall that in the MaP analysis of FI, the post-focal $f_0$-downtrend is explained in terms of downstep. The embedded *wh*-phrase, which would start a new MaP in this analysis, is not expected to be downstepped. Note that the same criticism applies to an IntP analysis as well. If FI = IntP, IntP should be able to be embedded. Otherwise, we expect the same amount of $f_0$-rise at the start of both *wh*-phrases in (28b).

### 4.2.3. Independent pitch resets after downstep and FI

The results of FI embedding experiment discussed above also show that the pitch reset after downstep (canceling of the downstep effect at the beginning of the following MaP) and the pitch reset after post-focal downtrend (canceling of post-focal downtrend at the phrase outside the scope of the focus) take place independently. Let us look at the following pair of sentences.

21

(29)   a.  *Indirect Yes/No-question* (No FI; MaP boundary on *ímademo*)

        **Náoya**-wa [ Mári-ga **wáin**-o   nomíya-de nónda **ka** ] ímademo obóeteru
        Naoya-TOP  Mari-NOM wine-ACC bar-LOC   drank Q   even.now remember
        'Naoya still remembers whether Mari drank wine at the bar.'

   b.  Wh-*question with an indirect Yes/No-question* (FI; MaP boundary on *ímademo*)

        { **dáre**-ga   [ Mári-ga **wáin**-o   nomíya-de nónda **ka** ] ímademo obóeteru
         who-NOM   M.-NOM wine-ACC bar-LOC   drank Q   even.now remember
        **no**? }$_{\text{FI}}$
        Q
        'Who still remembers whether Mari drank wine at the bar?'

In (29a) there is no *wh*-phrase. In this sentence, we expect a default pitch contour derived from the syntax-prosody mapping principle discussed in §3.. It is expected that there is a MaP containing the preverbal PP, the verb, and the complementizer in the embedded clause, followed by another MaP containing the matrix adverbial phrase and the verb. (Relevant MaPs are marked by ( round brackets )$_{\text{MaP}}$.)

(30)   MaP phrasing for (29a)

        ( wain-o     )$_{\text{MaP}}$ ( nomiya-de nonda ka )$_{\text{MaP}}$ ( imademo oboeteru   )$_{\text{MaP}}$
         wine-ACC      bar-LOC   drank Q      even.now remember

As briefly explained in §1., within each MaP there is downstep on non-MaP-initial phrases. This effect is reset at the beginning of the following MaP. This means that downstep would be expected on the embedded verb and on the matrix verb, while a reset is expected at the matrix adverbial phrase.

   In (29b), on the other hand, a FI is expected to start from the *wh*-phrase (matrix subject) and to continue until the end of the sentence. For this sentence, the analysis proposed here, and the MaP analysis of FI make different predictions. In the proposed analysis, the MaP phrasing is not changed by a FI, although the entire pitch contour is realized in a compressed pitch range, due to the post-focal $f_0$-downtrend of FI. Therefore we expect downstep and pitch

reset within a compressed pitch range just like in (29a). In the MaP analysis of IF, on the other hand, all the MaP boundaries will be eliminated, resulting in a single large MaP containing everything after the *wh*-phrase. That is, no MaP boundary is expected between the embedded clause complementizer and the matrix adverbial phrase, i.e., no reset would be expected.

(29b)    Relevant FI/MaP phrasing

   a.    Proposed analysis:

         {... (wain-o)$_{\text{MaP}}$ (nomiya-de nonda ka)$_{\text{MaP}}$ (imademo oboeteru   no?)$_{\text{MaP}}$}$_{\text{FI}}$
               wine-ACC    bar-LOC    drank Q       even.now remember
   b.    MaP analysis of FI:

         ( ... wain-o nomiya-de nonda ka imademo oboeteru no? )$_{\text{MaP}}$
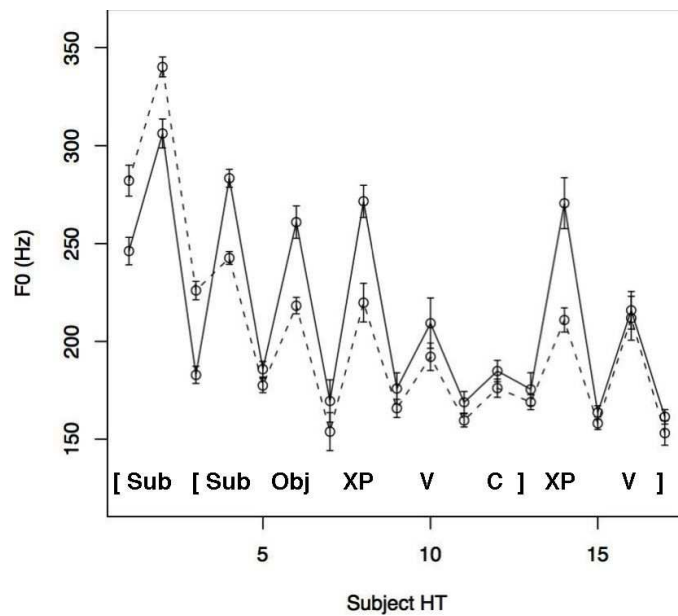


Figure 2: Mean $f_0$ of (29a) (solid line) and (29b) (dashed line), with 95% CI

The mean $f_0$ of (29a) and (29b) are shown in Figure 2. (29a) (solid line) represents the default MaP phrasing. Note that in this solid line, the $f_0$-peaks on the embedded verb and on the complementizer (i.e., the fifth and sixth peak from the left) are considerably lower than the first

23

four peaks. This is due to downstep. After the Complementizer, there is a new MaP starting from the matrix preverbal phrase, which is grouped together with the matrix verb in a MaP. As a result, at the $f_0$-peak of the matrix preverbal phrase we can observe a pitch reset from the downstepped pitch range.

The dashed line in Figure 2 is the mean $f_0$ values of (29b), where the entire sentence is in a single FI. The $f_0$ of the *wh*-phrase (the matrix subject) is raised while all the $f_0$-peaks of the following phrases are clearly reduced compared to the default values (=(29a), solid line). In the MaP analysis of FI, this lowering effect would be analyzed as downstep. It should be noted, however, the downstep effect and the subsequent pitch reset effect observed in the default pitch contour—at the embedded verb and at the following matrix phrase, respectively—can be still observed in a reduced pitch contour as well. It appears that the entire default pitch contour—or the default MaP phrasing—is maintained as it is, but in a compressed pitch range, rather than that all the MaP boundaries are deleted. This means that MaP-related effects (downstep and pitch reset) are taking place independently of the existence or absence of FI. Under the MaP analysis of FI such effects are not expected within a FI.

### 4.3.   *FI ≠ Prosodic Phrase*

We have seen evidence that FI and MaP are independent prosodic domains. Now the next question is the exact nature of FI. In the discussion below, I will assume that FI is created by manipulation of the pitch register (range) of the focused phrase and of the post-focal domain, completely independently of prosodic phrasing. This means FI does not correspond to any level of the prosodic hierarchy. Under this assumption, it is possible to form a FI independent of MaP, as well as to embed a FI inside another FI. The FI effects on pitch register will be superimposed onto the default pitch contour created according to syntax. Similar proposals have been made for other languages as well, e.g., 'focus pitch accent' in European Portuguese, which does not introduce or delete a p-phrase boundary (Frota 2000, 2002a,b). Although the

exact mechanism of the superimposition of FI still needs to be investigated, I tentatively assume that it is achieved by the FI rules below.

(31)    *FI rules*

      a.    Focal $f_0$-rise: Expand the pitch register of the focused phrase.

      b.    Post-focal $f_0$-downtrend: Compress the pitch register of the post-focal material.

Note that this set of rules does not refer to any level of the prosodic hierarchy, indicating that FI is independent of prosodic phrasing.

In this section, we discussed FI phenomena in relation to MaP phrasing. Given all the data we have seen here, it is reasonable to consider that FI and MaP are independent prosodic entities. In the next section, we examine the nature of FI more in detail, especially in relevance to the notion of MSO.

5.  **FI and MSO**

In §3. and §4., I proposed (i) MaP = MSO and (ii) FI ≠ MaP, respectively. In this section, we discuss the relation between FI and MSO. I illustrate that a FI is also created at certain SOs, but only at the phases where focus semantics is computed. The basic idea here is similar to Truckenbrodt's (1995) claim that the semantic domain of focus is relevant for the computation of the phonological consequences of focus. The difference is that the analysis proposed here derives this correspondence, rather than stipulating a semantics-prosody interface principle.

5.1.    *FI in* Wh-*questions*

In §3.2. we saw cases where the Scope-Prosody Correspondence (SPC) is at work with respect to MaP phrasing. In this section, we will see that FI is also used as a scope-marking strategy for

certain elements, namely *wh*-phrase and *negative polarity item* (*NPI*), both of which require an Agreement relation with a scope-taking functional head (Q-particle/negation). *Wh*-questions, for example, always exhibit FIs, but the domain of FI is limited within the scope of the *wh*-question, as shown in (32) (Deguchi and Kitagawa 2002; Ishihara 2002, 2003).

(32)    *FI–*Wh*-scope Correspondence* (Ishihara 2003)

   a.    *Non-interrogative sentence (No FI, default pitch contour)*

   Náoya-wa [ Mári-ga  nánika-o        nomíya-de nónda to ] ímademo omótteru
   N.-TOP     M.-NOM something-ACC bar-LOC    drank  that even.now think
   'Naoya still thinks that Mari drank something at the bar.'
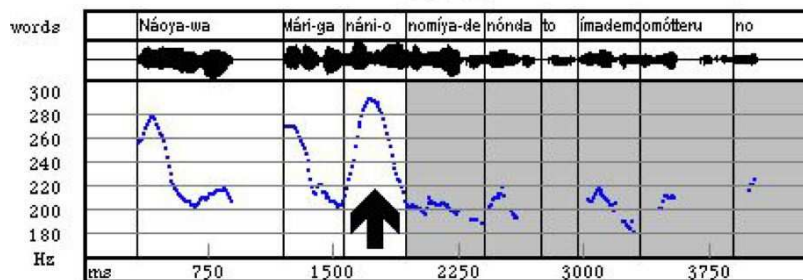

ah12a2t
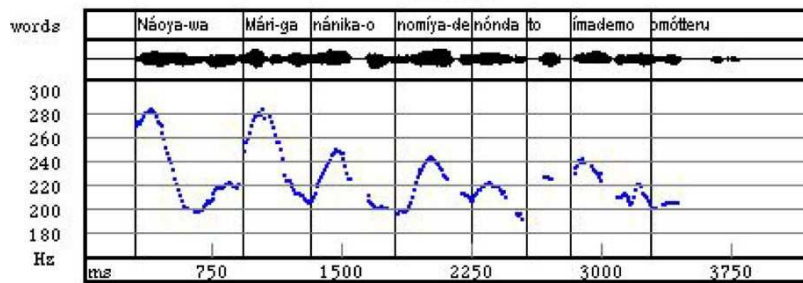
   b.    *Matrix wh-question (FI at the matrix clause)*

   Náoya-wa [ Mári-ga  { **náni**-o    nomíya-de nónda to ] ímademo omótteru **no**?
   N.-TOP     M.-NOM   what-ACC bar-LOC    drank  that even.now think     Q
   }FI

   'What$_i$ did Naoya still think that Mari drank $t_i$ at the bar?'
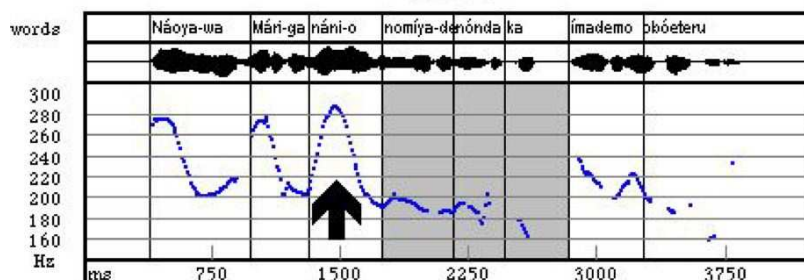

ah12b2t

   c.    *Indirect wh-question (FI at the embedded clause)*

   Náoya-wa  [ Mári-ga    { **náni**-o    nomíya-de nónda **ka** }FI] ímademo
   Naoya-TOP  Mari-NOM   what-ACC bar-LOC    drank Q        even.now

26

obóeteru
remember
'Naoya still remembers what$_i$ Mari drank $t_i$ at the bar.'



(32a) exhibits a default pitch contour without any FI. In the matrix *wh*-question in (32b), the FI

is observed from the raised *wh*-phrase until the end of the sentence. In the indirect *wh*-question

in (32c), the FI starts from the *wh*-phrase, but the post-focal $f_0$-downtrend stops at the end of

the embedded clause, and a pitch reset is observed at the matrix preverbal phrase.


5.2. *FI in NPI Sentences*

Lee and Tomioka (2001) and Hirotani (2004), both of whom adopt the MaP analysis of FI (see

§4.1.), claimed that an NPI and the negation associated with it must be within the same MaP.

Assuming this prosodic property of NPI, they tried to account for the so-called 'LF intervention

effect' (Hoji 1985; Beck and Kim 1997).

   Ishihara (to appear a) showed experimentally that NPIs behave similarly to *wh*-phrases, in

that they create a FI that includes the negation. One of the stimulus sets used in the experiment

is shown below. The NPI *sika*, together with the negation, means 'only'.


(33)   a.   *No NPI*

Náoya-wa   [ Mári-ga    rámu-o   nomíya-de nomá-**nakat**-ta to ] Yúmi-ni
Naoya-TOP   Mari-NOM rum-ACC bar-LOC    drink-NEG-PST that Yumi-DAT
itta
said
'Naoya said to Yumi that Mari didn't drink rum at the bar.'

b. *NPI in the embedded clause*

Náoya-wa [ { Mári-**sika** rámu-o nomíya-de nomá-**nakat**-ta to }<sub>FI</sub> ]
Naoya-TOP Mári-SIKA rum-ACC bar-LOC drink-NEG-PST that
Yúmi-ni itta
Yumi-DAT said
'Naoya said to Yumi that only Mari drank rum at the bar.'

c. *NPI in the matrix clause*

{ Náoya-**sika** [ Mári-ga rámu-o nomíya-de nónda to ] Yúmi-ni iwa-**nákat**-ta
  N.-SIKA          M.-NOM rum-ACC bar-LOC drank that Y.-DAT say-NEG-PST
}<sub>FI</sub>

'Only Naoya said to Yumi that Mari drank rum at the bar.'

The results show that the phrase to which *sika* attaches behaves as a focused phrase, like a *wh*-phrase: The FI induced by an NPI contains the negation that binds the NPI. If the NPI is bound in the embedded clause, the FI is created at the embedded clause as in (33b): if the NPI is bound in the matrix clause, the FI is created at the matrix clause, as in (33c).

### 5.3. *MSO analysis of FI*

Ishihara (2003, 2004) proposed that FI is created cyclically, at relevant SO domains. While a MaP is created at every SO, as proposed in §3., a FI is created only at the SO of the phase in which a focus-related functional category (e.g., [+WH] Complementizer) and a focused phrase (e.g., *wh*-phrase) establish a syntactic Agreement relation. When a FI is created, it will be superimposed onto the default MaP phrasing. Therefore, the created FI will be a new prosodic domain containing a focus and its operator. The following is an illustration of the MSO model. (See Ishihara 2003, 2004 for more detailed explanation of the model.)

(34)    [<sub>CP2</sub> XP-NOM [<sub>vP</sub> [<sub>CP1</sub> WH-NOM [<sub>vP</sub> YP-ACC V Q ]] V ]]

a. Embedded *v*P phase: [<sub>vP</sub> YP-ACC V ]

SO: ⟹ ( YP-ACC V )<sub>MaP</sub>

b. Embedded CP phase: [$_{\text{CP}}$ WH-NOM ( ~~YP-ACC V~~ )$_{\text{MaP}}$ Q ]

SO: $\Longrightarrow$ { ( WH )$_{\text{MaP}}$ ( YP-ACC V Q )$_{\text{MaP}}$ }$_{\text{FI}}$

c. Matrix $v$P phase: [$_{v\text{P}}$ ~~{ ( WH )$_{\text{MaP}}$ ( YP-ACC V Q )$_{\text{MaP}}$ }$_{\text{FI}}$~~ V ]

SO: $\Longrightarrow$ { ( WH )$_{\text{MaP}}$ ( YP-ACC V Q )$_{\text{MaP}}$ }$_{\text{FI}}$ ( V )$_{\text{MaP}}$

d. Matrix CP phase:

[$_{\text{CP}}$ XP-NOM ~~{ ( WH-NOM )$_{\text{MaP}}$ ( YP-ACC V Q )$_{\text{MaP}}$ }$_{\text{FI}}$ ( V )$_{\text{MaP}}$~~ ]

SO: $\Longrightarrow$ ( XP-NOM )$_{\text{MaP}}$ { ( WH-NOM )$_{\text{MaP}}$ ( YP-ACC V Q )$_{\text{MaP}}$ }$_{\text{FI}}$ ( V )$_{\text{MaP}}$

Suppose there is an indirect *wh*-question, in which the subject is a *wh*-phrase. At the embedded *v*P phase (=(34a)), no WH-Q Agreement takes place, therefore only the default MaP phrasing will be created at the SO of this phase. At the next phase (the embedded CP phase, (34b)), the *wh*-phrase and the Q-particle establishes a WH-Q Agreement relation. At this SO, a FI will be superimposed on top of the MaP phrasing. As a result, the FI will contain two MaPs, one containing the subject *wh*-phrase, and the other containing the embedded VP (i.e., the MaP created at the previous SO). The Q-particle, which cannot be a prosodic word by itself, will be included in the latter MaP as a result of cliticization to the verb. The next phase (the matrix *v*P phase, (34c)) contains the entire embedded CP (the previous SO) and the matrix verb. Since the FI was already created at the previous SO, no FI will be formed. Hence, only a MaP will be created. If we assume a non-recursive MaP structure (cf. fn. 12), a new MaP boundary will be inserted after the right MaP boundary after the Q-particle.[17] Note that the FI created at an

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[17]If we assume a recursive MaP structure, the MaP created at this SO will contain the previous SO (the embedded CP) and the matrix verb, as in (35):

(i) ( [ { ( WH )$_{\text{MaP}}$ ( YP-ACC V Q )$_{\text{MaP}}$ }$_{\text{FI}}$ ]$_{\text{SO}}$ V )$_{\text{MaP}}$

In such a structure, I assume that downstep on the matrix V is relative to the prominent peak of the previous SO (WH), not relative to the previous phrase (Q) (see Féry and Truckenbrodt 2005 for a similar recursive analysis of

early SO does not affect the $f_0$ of the material that is spelled-out at a later SO. Therefore we observe a pitch reset after the post-focal $f_0$-downtrend in the embedded clause. Finally, at the matrix CP phase (=(34d)), a new MaP is created which contains the matrix subject.

The gist of this analysis is that the proposed model automatically *derives* the FI-*Wh*-scope correspondence observed in (32), instead of stipulating it. In this model, both the semantic WH-Q dependency and the prosodic FI are computed at the same phase. In the case of a matrix *wh*-question like (32b), that phase is the matrix CP, while in the case of the indirect wh-question like (32c), it is the embedded CP. As a result of the phase-based computation of semantics and prosody, we observe a correspondence between them. We do not need any stipulation that there is a correspondence between the PF and LF representations.[18]

Another point of interest is that both MaP and FI are created cyclically as a result of SO, an operation originally proposed for purely syntactic reasons. The MSO model proposed here suggests that SO also has a direct impact on syntax-prosody mapping, which is naturally expected if there are multiple points of interaction between syntax and phonology, as proposed in the recent Minimalist model.


6. **MaP, FI, and SPC**

Let us come back to the discussion on the relation between semantic scope and prosodic phrasing. In §3., we saw that MaPs show the SPC effect. Even though we saw in §4. that FI $\neq$ MaP, we saw in §5. that FIs also exhibit the SPC effect. In this section, I propose a refinement of the SPC that explains this somewhat paradoxical situation.

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downstep). As a result, one would expect a pitch reset from Q to V. Further investigation is needed to examine which analysis (non-recursive vs. recursive) makes more accurate predictions. For the sake of the discussion here, either analysis will do, in the sense that a pitch reset is expected at the matrix V.

[18]See Ishihara (2005) for a case of the scope-prosody *mismatch* which is also accounted for by the proposed analysis.

### 6.1.  *FI and SPC*

Recall that Hirotani (2004) originally defined the SPC in terms of MaP phrasing, as in (9), because she adopted the MaP analysis of FI discussed in §4.1.. With this definition, an NPI or a *wh*-phrase needs to be in the same MaP with the relevant negation or the question particle. If MaP and FI are different prosodic domains, however, the SPC cannot be applied to *wh*-questions and NPIs in the subject position, because there will be an intervening MaP boundary in the default MaP phrasing between the subject and the relevant heads, as in (35).

(35)　　a.　Syntax:　　$[_{CP}\ [_{TP}\ \text{SUBJ-}\textbf{NPI}\ [_{vP}\ [_{VP}\ \text{OBJ V-}\textbf{NEG}\ ]\ ]\ ]\ ]$

　　　　b.　Prosody:　$\{\ (\text{SUBJ-}\textbf{NPI})_{\text{MaP}}\ (\text{OBJ V-}\textbf{NEG})_{\text{MaP}}\ \}_{\text{FI}}$

I propose that *wh*-phrase and NPI are FI-sensitive elements. As long as they are together with their operators within a FI, they do not violate the SPC. Putting it differently, FI has the effect of putting the focus and the focus operator—which are not always in the same MaP—together in the same prosodic domain.

### 6.2.  *MaP and SPC*

Quantifiers, on the other hand, are MaP-sensitive scope-taking elements. Given that MaP phrasing straightforwardly reflects SO domains, however, this essentially means that quantifiers are in principle c-command sensitive. As discussed above, FI and MaP are independent. In other words, FI does not eliminate the MaP phrasing. Therefore we predict that the scopal behavior of MaP-sensitive scope-taking elements such as quantifiers will not be affected by FI.

Let us look again at Miyagawa's examples with phrasing in (7) and (8), and suppose further that a focus is placed on the first phrase of these sentences (the subject in (7), the object in (8)). The FIs of these sentences will contain all the phrases in the sentence, as shown below.

(36)　　*(2a) with a focus on the subject (unambiguous: all $\gg$ not)*

31

[$_{TP}$ **zen'in**-ga$_{iFOC}$     [$_{vP}$ $t_i$ sono tesuto-o uke-**nakat**-ta ]]
{(     **zen'in**-ga$_{FOC}$ )$_{MaP}$ (          sono tesuto-o uke-**nakat**-ta )$_{MaP}$}$_{FI}$

(37)     *(2b) with a focus on the object (ambiguous)*

    a.   *(not $\gg$ all)*
      [$_{TP}$ sono tesuto-o$_{iFOC}$     [$_{vP}$ **zen'in**-ga $t_i$ uke-**nakat**-ta ]]
      {(     sono tesuto-o$_{FOC}$ )$_{MaP}$ (     **zen'in**-ga     uke-**nakat**-ta )$_{MaP}$}$_{FI}$
    b.   *(all $\gg$ not)*
      [$_{CP}$ sono tesuto-o$_{iFOC}$     [$_{TP}$ **zen'in**-ga$_j$     [$_{vP}$ $t_j$ $t_i$ uke-**nakat**-ta ]]]
      {(     sono tesuto-o$_{FOC}$ )$_{MaP}$ (     **zen'in**-ga )$_{MaP}$ (          uke-**nakat**-ta )$_{MaP}$}$_{FI}$

Even if a focus is added, it appears that the scope availability remains the same. The SOV sentence in (36), which has only one syntactic structure and hence only one MaP phrasing, remains unambiguous with or without focus. The OSV sentence, on the other hand, is ambiguous, because the ambiguity is derived from the different syntactic structures. Since the entire pitch contour is compressed due to the post-focal downtrend, the prosodic difference between (37a) and (37b) is expected to be minimal. Although the actual existence of this prosodic difference (both in production and in perception) still needs to be examined experimentally, at least the semantic contrast between the unambiguous SOV sentence and the ambiguous OSV sentence is not at all a surprise for us.

If we do find a difference, we can further maintain that in both sentences the SPC is conformed to in terms of MaP phrasing: When the negation and the quantifier are in the same MaP, the negation takes wide scope. Such an analysis is only possible if clear distinction is made between MaP and FI. If we do not distinguish between MaP and FI, as in the MaP analysis of FI, this fact would be a puzzle. The focus on the first phrase of the sentence would eliminate all the MaP boundaries. As a result, all the contrast in MaP phrasing would be lost. Under this analysis we would no longer be able to account for the scope fact using the SPC. Both sentences would have the same MaP structure, namely one large MaP containing both the universal quantifier and the negation. Yet, one sentence is unambiguous while the other is ambiguous.

(38)     SOV (unambiguous)

$(\textbf{zen'in-ga}_{\text{FOC}} \text{ sono tesuto-o uke-}\textbf{nakat}\text{-ta})_{\text{MaP}}$      *not ≫ all,   all ≫ not

(39)     OSV (ambiguous)

$(\text{sono tesuto-o}_{\text{FOC}} \textbf{zen'in}\text{-ga uke-}\textbf{nakat}\text{-ta})_{\text{MaP}}$      not ≫ all,   all ≫ not

### 6.3. *SPC in the MSO analysis*

With the minimal refinement suggested above, the SPC nicely captures the relation between prosodic phrasing and semantic scope: quantifiers conform to the SPC with respect to MaP, and focus-related elements (*wh*-phrase/NPI) with respect to FI. It should be noted, however, that in the MSO analysis, this generalization is derived as a result of the cyclic MSO-based syntax-prosody mapping.

In the case of quantifiers, we could assume that their scope relation is determined purely in terms of syntactic structure. The MaP phrasing is a result of direct syntax-prosody mapping of SO domain onto prosody. Thus it is a natural consequence that scope relations (represented in the syntactic c-command relation) will be reflected in MaP phrasing.

The same is true for FI. FI is created according to the MSO model, triggered by the syntactic Agreement relation between a focused element and a focus operator. At this trigger, a FI is created at the SO. This means that a FI will not be created until both elements enter into the syntactic derivation. At the phase where both elements become available, Agreement takes place. As a result, the FI will contain both the focused phrase and the relevant functional head. Again, the prediction of the SPC is a result of the MSO-based computation of FI.[19]

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[19]One additional note is that Hirotani in fact argues against the one-to-one syntax-prosody correspondence in *wh*-questions adopted here, based on her experimental results. It appears, however, that her data need reconsideration to take account of the fact that the two readings compared in the experiment have a strong bias toward one of them. See Kitagawa and Fodor (2003) for relevant discussion.

## 7.  **Conclusion**

In this paper, I claimed (i) that MaP is the result of the mapping of SO domains onto prosody (MaP = SO); (ii) that FI and MaP are different prosodic domains (FI ≠ MaP), with FI phonetically superimposed on the MaP phrasing; and, (iii) that both MaP and FI are created cyclically during the course of derivation by MSO. MaPs are created at each SO, while FIs are created at specific SO domains, at which a focus-operator Agreement is established.

The MSO model proposed here accounts for the interaction between semantic scope and prosodic phrasing. The SPC captures the relation between scope and phrasing once we assume that quantifiers are MaP-sensitive while focused phrases (*wh*-phrase, NPI) are FI-sensitive. The generalization described by the SPC is in fact derived from the proposed MSO model. The scope relation is established at a certain phase (simply by c-command relation in the case of quantifiers, and by focus-operator Agreement in the case of a focused phrase). At the SO of this phase, MaP and FI are created, and as a result, we observe a scope-prosody correspondence.

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