

On the (lack of) correspondence between syntactic clauses and intonational phrases

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Abstract

This paper discusses the syntax–prosody mapping at the clause-level, or the potential absence thereof. The main goal of this paper is to bring up some of the empirical and theoretical questions related to the MATCH-CLAUSE constraint in Match Theory (Selkirk 2009, 2011), and to reexamine the validity and the necessity of the clause-level mapping principle proposed in the theory.

Empirical discussion includes a critical review of Selkirk’s (2009) discussion of the *wh*-prosody in Fukuoka Japanese. It is shown, based on additional data from Fukuoka and Tokyo Japanese, that Selkirk’s claim that Fukuoka Japanese provides empirical support for MATCHCLAUSE is untenable. The theoretical questions discussed in this paper also challenge the validity and the necessity of the clause-level mapping. An alternative model is suggested in which the intonational phrase (ι) is related to the pragmatics–prosody mapping rather than the syntax–prosody mapping.

1 Introduction

This paper deals with the syntax–prosody mapping at the clause-level, or the potential absence thereof. Recently proposed theories of intonation (in particular, Itô and Mester 2007, 2012, 2013 and Selkirk 2009, 2011) assume a correspon-

dence principle between syntactic *clauses* and prosodic constituents commonly referred to as the *intonational phrase* (ι hereafter). While the syntax–prosody mapping at the clause-level appears theoretically well-motivated and attractive in its simplicity, it is still empirically much less frequently attested compared to the word and phrase-level mapping. Furthermore, there are several theoretical questions regarding the syntactic status of clauses that are still unanswered. The main goal of this paper is to bring up some of the empirical and theoretical questions related to the clause-level syntax–prosody mapping, and to reexamine the validity and the necessity of the clause-level mapping principle from both empirical and theoretical perspectives.

The paper is organized as follows. §2 briefly presents some background information. §2.1 introduces the Syntax–Prosody Mapping Hypothesis (SPMH) put forward by Itô and Mester (2007, 2012, 2013) and Selkirk (2009, 2011) and, in particular, Selkirk’s (2011) analysis of the clause-level syntax–prosody mapping. §2.2 presents the assumption made in this paper regarding the status of ι in the prosodic hierarchy of Japanese.

In §3, previous studies on the prosody of Japanese embedded clauses will be reviewed. It will be shown that the majority of these studies cannot be considered evidence for the clause-level mapping (§3.1). Also, Selkirk’s (2009) analysis of *wh*-prosody in Fukuoka Japanese will be discussed in detail (§3.2). It will be argued that her proposal cannot be maintained due to several empirical problems. Since additional data go against the prediction of the analysis, the arguments for the clause-level mapping made by Selkirk (2009) are no longer tenable.

§4 discusses several theoretical issues regarding the clause-level mapping. §4.1 questions the assumption that the clause is a syntactic category distinct from phrases. §4.2 discusses cases in which clauses do not map to ι , as well as cases where non-clauses map to ι just like clauses. Based on the discussion, it will be suggested in §4.3 that the pragmatic notion of speech act seems more relevant to ι -mapping than syntactic clauses.

Building on the idea presented in §4.3, an alternative model will be suggested §5, in which ι is no longer relevant for the syntax–prosody mapping but is instead responsible for the discourse–prosody mapping. In particular, it will be proposed, along with previously made proposals on root clauses, parentheticals (Potts 2005; Selkirk 2005) and certain types of topics (Ebert 2009; Bianchi and Frascarelli 2010), that a constituent that performs a speech act, be it a clause or a phrase, is mapped to an ι . This model implies a new perspective of the interfaces between prosody and other modules of grammar: only the phonological word (ω) and the phonological phrase (φ) are responsible for the syntax–prosody mapping, as proposed in the previous theories, while ι is responsible for the discourse/pragmatics–prosody mapping.

2 Background

2.1 The Syntax–Prosody Mapping Hypothesis

There are two recent theories of prosodic hierarchy and the syntax–prosody mapping which put forward a strong version of the *Syntax–Prosody Mapping Hypothesis* (SPMH). The first one is the *prosodic adjunction theory* by Itô and Mester (2007; 2012; 2013), and the other is *match theory* proposed by Selkirk (2009; 2011). They both assume three levels of prosodic categories in the hierarchy, namely, the phonological word (ω), the phonological phrase (φ), and the intonational phrase (ι).¹ The strong version of the SPMH advocated in these theories states that these three prosodic categories systematically correspond to three syntactic categories, words, phrases, and clauses. (1) is the syntax–prosody mapping principles assumed in match theory.

- (1) Match theory of syntactic-prosodic constituency correspondence (Selkirk 2011:439)
 - a. Match clause

¹To replace with the intonational phrase, the term *phonological clause* is also suggested by Itô and Mester (2013).

A clause in syntactic constituent structure must be matched by a corresponding prosodic constituent, call it ι , in phonological representation.

b. Match phrase

A phrase in syntactic constituent structure must be matched by a corresponding prosodic constituent, call it φ , in phonological representation.

c. Match word

A word in syntactic constituent structure must be matched by a corresponding prosodic constituent, call it ω , in phonological representation.

Among these three levels of the syntax–prosody correspondence, the phrase-level correspondence in (1b) has been widely attested cross-linguistically and discussed in the literature since the earlier analyses of the syntax–prosody interface, such as the relation-based mapping (Nespor and Vogel 1986), the end-based mapping (Selkirk 1984, 1986; Chen 1987), and the arborial mapping (Zec and Inkelas 1990; Inkelas and Zec 1995).²

According to Selkirk (2011), the clause-level correspondence is sensitive to clause types. The motivation for the distinction of clause types comes from an observation that certain types of clauses show consistent mapping to an ι than other types of clauses. Selkirk calls the former *illocutionary clauses* and the latter *standard clauses*. The standard clause is defined as “the constituent that is the complement of the functional head Comp^0 ,” and “may be syntactically embedded, whether as a complement to a verbal or nominal head, or as a restrictive relative clause within determiner phrase, or in other positions” (Selkirk 2011:452). The illocutionary clause, on the other hand, is “the highest syntactic projection of the sentence and carries its illocutionary force” (Selkirk 2011:452),

²In this paper, the mapping at the level of words is not discussed. See, e.g., studies in Grijzenhout and Kabak (2009) for recent relevant discussions. Setting aside an independent question of whether another category, *Clitic Group*, should be maintained in the universal prosodic hierarchy (Vogel 2009, 2020), there seems abundant evidence for the mapping relation between syntactic and phonological words.

which Selkirk assumes to be the complement of Force Phrase (ForceP, Rizzi 1997). With the common assumption that only the root (topmost) sentence can carry illocutionary force, ForceP (illocutionary clause) is not embeddable.

Selkirk (2009, 2011) actually mentions the possibility of embedded ForceP as well, to account for cases of non-root clauses that obligatorily map to ι . She assumes, adopting Potts’s (2005) analysis of parenthetical expressions, that “a Force Phrase is syntactically embedded in the case of parentheticals, nonrestrictive relatives and so on, and that it triggers the multi-tier semantic interpretation Potts proposes which gives rise to multiple speech acts” (Selkirk 2009:49). In §4 we will discuss more in detail the specific syntactic constructions mentioned here in relation to illocutionary clauses (parentheticals and nonrestrictive relative clauses) and their relations to multiple speech acts. For now, the crucial assumptions are that there are two types of clauses, illocutionary and standard clauses, and that they differ in terms of the syntax–prosody mapping: while illocutionary clauses consistently map to ι , standard clauses may or may not be mapped to ι .

In order to capture the difference between the two clause types, Selkirk (2009, 2011) proposes that there are two different versions of MATCHCLAUSE constraints, namely, the more general version MATCH(clause, ι) and the more specific version MATCH(illocutionary clause, ι). These two versions of MATCHCLAUSE may be ranked differently with respect to some constraint that masks the effect of an lower-ranked MATCH constraint. If there is a ranking in which MATCH(illocutionary clause, ι) dominates a match-blocking prosodic wellformedness constraint (PWC) that, in turn, dominates MATCH(clause, ι), it is expected that only illocutionary clauses exhibit mapping to ι while standard clauses do not map to ι . In contrast, if MATCH(clause, ι) is ranked above the PWC, together with MATCH(illocutionary clause, ι), then ι -mapping is expected with all clauses. Selkirk (2009) proposes that Fukuoka Japanese is an example of the latter case. (In §3.2, however, I will show that this proposal is not tenable from empirical grounds.) It is also suggested (Selkirk 2011:453) that

MATCH(illocutionary clause, ι) is universally ranked above MATCH(clause, ι), which results in the universal tendency to show more consistent ι -mapping with illocutionary clauses than with standard clauses.

Under this analysis, the potential lack of mapping between (standard) clauses and ι is explained by the constraint ranking in which the general MATCH(clause, ι) constraint is ranked lower by another constraint that may mask the matching effect. Therefore, the absence of clause-level mapping in a language does not necessarily constitute a counterargument against MATCHCLAUSE. At the same time, however, there are several unanswered questions that may threaten the validity and the necessity of the syntax-prosody mapping constraint at the clause-level, as I will try to show in the remainder of this paper.

2.2 The Intonational Phrase in Japanese

Before going into the discussion of the empirical and theoretical questions regarding the clause-level syntax-prosody mapping, it is necessary to make an explicit assumption that the level of intonational phrase (ι) exists in Japanese, as the question of whether this level exists in the prosodic hierarchy of Japanese or not is not entirely a settled issue.

Earlier analyses of Japanese intonation all assumed two distinct levels that correspond to the level of phonological phrase in other languages, which have been referred to with different terms: *minor phrase* and *major phrase* (McCawley 1965; Poser 1984; Kubozono 1993), *accentual phrase* and *intermediate phrase* (Beckman and Pierrehumbert 1986; Pierrehumbert and Beckman 1988), *accentual phrase* and *intonation phrase* (Venditti 2005; Maekawa et al. 2002; Venditti et al. 2008; Igarashi 2015), *accent component* and *phrase component* (Fujisaki and Sudo 1971; Fujisaki and Hirose 1984). Itô and Mester (2012), however, convincingly demonstrate that these two levels can be considered to belong to a single category, φ , with the minor phrase defined as the minimal projection of φ , and the major phrase as all instances of φ .³

³See Ishihara (2015:570–576) for a summary of terminologies and the phonological proper-

As for the level of ι , Pierrehumbert and Beckman (1988) claimed that there is no empirical evidence that supports the existence of the level of ι , and hence adopted a hierarchy lacking this level. Japanese ToBI models, both the original J_ToBI (Venditti 2005) and the extended version, i.e., X-JToBI, (Maekawa et al. 2002), adopted the prosodic hierarchy proposed by Pierrehumbert and Beckman (1988) (though the term *intermediate phrase* was replaced by *intonation phrase*).

Kawahara and Shinya (2008), however, reported, based on the results of their production experiment, that there are phonetic cues that neither belong to φ nor the utterance (v), and claimed accordingly that Japanese does have the level of ι . Kawahara and Shinya (2008) examined sentences containing three conjoined (main) clauses, and found that each of the coordinated clauses is realized as an ι in the prosodic structure. According to Kawahara and Shinya (2008), the ι in Japanese can be distinguished from φ by 1) final lowering, 2) creakiness and a pause in final position, and 3) a distinctively large initial F_0 -rise as well as pitch reset at initial position. It is also distinguished from v by the lack of a phrasal H-tone at the right edge.

Note that their finding is fully compatible with the prediction of match theory. MATCHCLAUSE constraint in (1a) calls for the mapping of coordinated clauses onto prosodic structures as ι 's. In the following discussion, I will assume that ι is a distinct level in the prosodic hierarchy of Japanese.⁴

3 Empirical Questions Regarding MatchClause

The main purpose of this section is to examine whether there is enough empirical motivation for MATCHCLAUSE based on Japanese data. From the discussion below, it will be concluded that Japanese does not provide strong empirical support for MATCHCLAUSE.

ties of φ in Japanese.

⁴As for the level of v , I will assume, following Itô and Mester (2012), that it is not a distinctive category, but a subcategory within the level of ι , namely, the maximal projection of ι .

We will review some of the relevant studies which either touch upon the prosody of embedded clauses in Japanese, or explicitly argue for the clause-level mapping in Japanese. Most of the studies belong to the first group, which will be reviewed in §3.1. These studies do not distinguish between phrase-level and clause-level mapping. This is presumably because it has long been accepted widely that Japanese does not have the level of ι , as mentioned above. There are also a few studies that unambiguously indicate that embedded clauses do not behave differently from phrases. Even though Kawahara and Shinya (2008) have found empirical evidence for the presence of ι in Japanese, none of the other studies reviewed here can be considered strong evidence for the clause-level mapping. The discussion will be extended to a more general question regarding the syntax–prosody mapping of embedded clauses. It will be pointed out that even those cases where embedded clauses are reported to map to ι (in other languages), it is not entirely clear whether it is the clause as a syntactic category that triggers the mapping, or other potential factors, such as the length, that are responsible for the mapping.

In §3.2, we will discuss in detail the proposal by Selkirk (2009). Based on the prosody of *wh*-questions in Fukuoka Japanese, Selkirk argues for the clause-level mapping. It will be shown below, however, that there are several problems in the empirical claims made by Selkirk (2009). Once these problems are taken into consideration, the argument will no longer hold.

3.1 Previous empirical studies on the prosody of embedded clauses in Japanese

3.1.1 Relative clauses

There are studies that show that the beginning of relative clauses in Japanese are marked prosodically by a large F_0 -rise on the clause-initial word, which is, according to Kawahara and Shinya (2008), one of the phonetic cues for ι . One of the earliest studies on relative clauses was conducted by Uyeno et al. (1979).

They compared the pitch contours of sentences like (2a) and (2b), where the left edge of the relative clause is varied.

- (2) a. [[ototoi koronda]_{RC} otona-ga waratta]
 day.before.yesterday fell adult-NOM laughed
 ‘The adult [who fell the day before yesterday] laughed.’
 b. [ototoi [koronda]_{RC} otona-ga waratta]
 ‘The adult [who fell] laughed the day before yesterday.’

(Uyeno et al. 1979:184)

They found a high F_0 -rise at the beginning of the utterance in (2a), followed by a gradually declining pitch contour, and in (2b), an F_0 -rise at the beginning of the relative clause in addition to the utterance-initial one. Uyeno et al. (1981) also found that pauses also indicate clause-initial boundaries.

Kubozono (1993) compared the four different phrase structures in (3) in order to investigate the correlation between phrase structure and prosodic structure. The results showed that the second word of (3d) showed a larger F_0 -rise compared to the second words in the other examples.

- (3) a. [[na’oko-no a’ni-no] [ao’i eri’maki]]
 Naoko-GEN brother-GEN blue muffler
 ‘Naoko’s brother’s blue muffler’
 b. [ma’riko-no [o’okina [ao’i eri’maki]]]
 Mariko-GEN big blue muffler
 ‘Mariko’s big blue muffler’
 c. [[a’yako-no [me’n-no eri’maki-no] iromo’yoo]
 Ayako-GEN cotton-GEN muffler-GEN design
 ‘design of Ayako’s cotton muffler’
 d. [ao’i [[yu’miko-ga a’nda] eri’maki]]
 blue Yumiko-NOM knit(past) muffler
 ‘the blue muffler Yumiko knit’

(Kubozono 1993:211)

The purpose of his experiment was, however, not to compare relative clauses and

other phrases, but to examine how the different syntactic branching structures are realized prosodically. (3d) is used as an example of the phrase structure that has two phrase-boundaries (at the onset of the second word). Also, Kubozono (1993) does not assume the level of ι . His conclusion from this experiment is that the more syntactic (left) edges appears at one place, the higher F_0 -rise (which he calls *metrical boost*) results.

While it seems clear from these studies that relative clauses tend to show a large F_0 -rise at its onset, it is difficult, if possible at all, to draw a definitive conclusion to the relevant question here, namely, whether these findings can be considered evidence for the clause-level syntax–prosody mapping, because no distinction was made between ι and φ in their analyses of the results. In addition, there is a study that shows opposite results. Hirayama and Hwang (2019) show that relative clauses undergo downstep triggered by the lexical accent of the preceding phrase, indicating that the relative clause and the preceding phrase are contained in a single φ .⁵

3.1.2 Clausal objects

When it comes to clausal objects, there seems no empirical confirmation that they consistently correspond to an ι in Japanese. Ishihara (to appear) compared sentences with different numbers of phrase-boundaries in front of a target word and those with a clause boundary at the same position, as shown in (4) below (where the second word is the target word, marked in **boldface**). This study was, unlike the previous studies mentioned above, specifically designed to examine possible phonetic differences between phrase and clause boundaries.

- (4) a. No XP boundary (0xp)

[_{DP} Yuuta-to **Naoya**]-wa [_{VP} imooto-o paatyii-ni maneita]
 Yūta-and Naoya-TOP sister-ACC party-to invited
 ‘Yuta and Naoya invited their sisters to the party.’

⁵Downstep is a phonologically conditioned F_0 -downtrend triggered by lexical pitch accents. The domain of downstep has been assumed to be φ (Poser 1984; Pierrehumbert and Beckman 1988; Kubozono 1993). At the onset of a φ , downstep is cancelled and a pitch reset results. See, e.g., Ishihara (2015, 2016) for overviews.

- b. One XP boundary (1xp)

Yuuta-wa [VP **Naoya-o** [DP imooto-no paatyii]-ni maneita]
 Yūta-TOP Naoya-ACC sister-GEN party-to invited
 ‘Yuta invited Naoya to his sister’s party.’

- c. Two XP boundaries (2xp)

Yuuta-wa [VP [DP **Naoya-no** imooto]-o paatyii-ni maneita]
 Yūta-TOP Naoya-GEN sister-ACC party-to invited
 ‘Yuta invited Naoya’s sister to the party.’

- d. Clause boundary (cp)

Yuuta-wa [CP **Naoya-ga** imooto-o paatyii-ni maneita to]
 Yūta-TOP Naoya-NOM sister-ACC party-to invited that
 omotteita
 was.thinking
 ‘Yuta believed that Naoya invited his sister to the party.’

The results from 12 speakers, as summarized in Figure 1, show that the F_0 -peak of the target word is higher when it is preceded by an XP-boundary (1xp), and is even higher when preceded by two boundaries (2xp), which confirms the previous claim by Kubozono (1993). The results further show that clause boundaries is not necessarily marked with a distinctively higher F_0 (cp) than phrase boundaries (1xp, 2xp).⁶ There was no indication that pauses distinguish between phrase- and clause-boundaries, either.

There is another study that shows that the left edge of an embedded clause does not coincide with a strong F_0 -rise that would be expected at the edge of φ or ι . Hirayama and Hwang (2016) examined the prosody of embedded clauses containing a single content word followed by a complementizer as in (5), and found that the lexical pitch accent in the matrix subject triggers downstep on the sole content word in the embedded clause, indicating that these two noun phrases are contained in a single φ .

- (5) [a’ni-wa [CP hana’-to] itta.]
 brother-TOP flower say-PST
 ‘My brother said flower.’ (Hirayama and Hwang 2016:96)

⁶There were some inter-speaker variations. See Ishihara (to appear) for details.

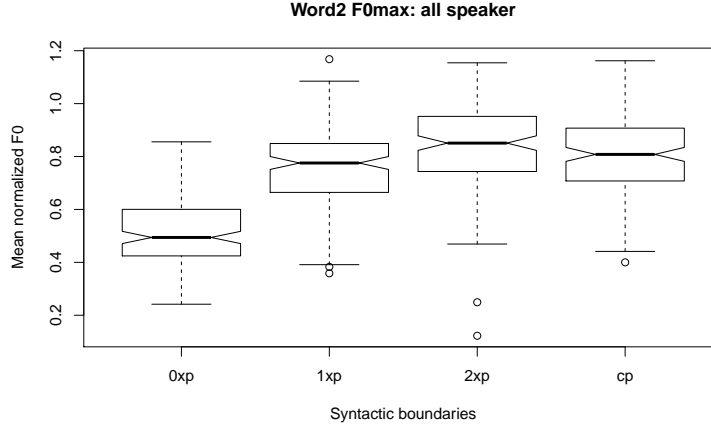


Figure 1: Normalized F₀-maximum on the target word in Ishihara’s (to appear) stimuli in (4d), based on the data from 12 speakers

As mentioned in §2.1, the lack of clause- ι correspondence reported in these studies does not serve as counterargument for MATCHCLAUSE, as match theory has an account for the absence of correspondence between embedded (standard) clauses and ι . However, as far as (Tokyo) Japanese is concerned, none of the previous studies provides strong support for MATCHCLAUSE, either. The only case that seems to provide clear support for MATCHCLAUSE would be Kawahara and Shinya (2008). Their data, however, does not make any further prediction as to whether the clause-level mapping applies to syntactically embedded clauses, such as relative clauses and clausal objects of main clause verbs, as their data do not involve embedded clauses.⁷

⁷There is another potential factor that might be influencing Kawahara and Shinya’s (2008) data, namely, coordination. Coordinated structures have often been used to study the prosodic realization of syntactic branching structures (Ladd 1986, 1988; Wagner 2005; Kentner and Féry 2013; Truckenbrodt and Féry 2015). Many of these studies show that differences in the coordinated structure are realized prosodically by differentiating boundary strengths. If a similar disambiguation effect is present in Japanese, it might be the case that the ι -boundaries found at clause boundaries in Kawahara and Shinya’s (2008) data are motivated by the coordinated structure, rather than the syntactic status as a clause, in order to disambiguate the clause-internal syntactic structures and the coordination structure. This question needs to be further investigated in future research.

3.1.3 The prosody of clauses or the prosody of long phrases?

So far, we have seen that the majority of the Japanese data in previous studies do not constitute empirical support for MATCHCLAUSE. Crosslinguistically, the empirical evidence for the clause-level mapping is much more scarce in comparison to the phrase-level mapping. While the scarcity *per se* does not necessarily raise a problem for the MATCHCLAUSE constraint, the clause-level mapping should be supported empirically in order to be fully established.

Here I would like to point out two factors that become potentially relevant when examining the clause-level mapping. First, as for relative clauses, it should be noted that relative clauses are always embedded in an NP headed by the head noun of the relative clause. This means that one of the syntactic edges (either the left or the right one, depending on the language) of a relative clause coincides with the edge of the NP containing it. Because of that, any syntax-prosody correspondence found at this position may be due to the clause boundary of the relative clause, or the phrase boundary of the NP containing the relative clause. This means that, even when a relative clause shows a correspondence to an ι in some language, it is not clear whether the correspondence is between the relative clause itself and the ι , or between an NP that contains the relative clause and ι (unless a prosodic boundary appears between the head N and the relative clause).

A second point, which applies to any kind of embedded clauses, that should be taken into consideration is the length of the relevant constituent. When looking at previous studies, it is often not entirely clear whether it is the difference in the syntactic category (phrase vs. clause) or the general length (short vs. long constituent) that is affecting the prosodic phrasing.

Truckenbrodt (2005), for example, convincingly shows that right edges of embedded clauses in German consistently coincides with right edges of an ι . He examined the prosody of sentences containing a subject clause, a (restrictive) relative clause, or an object clause, in different syntactic positions, as well as compared root and embedded coordinated clauses. In all of these cases, the

right boundary of an ι is found consistently at the right edge of a clause, be it a matrix one or an embedded one.

It should be noted, however, that the embedded clauses contained in his sentences make the relevant constituent relatively long, as each clause contains at least two or more content words. (6) is an example with a relative clause in a sentence-medial position:⁸

- (6) [CP Die Lola hat dem Mann, [CP der einem Maurer
the.NOM Lola has the.DAT man REL.NOM a.DAT mason
einen Löwen gemalt hat], ein Lob gegeben]
a.ACC lion painted has a.ACC praise given
‘Lola praised the man who painted a lion for a mason.’ (Truckenbrodt
2005, punctuation marks, glosses and translation added by S.I.)

If the ι -boundary found at the end of the relative clause is the result of MATCH-CLAUSE, it would be predicted that there will be no ι -boundary if the relative clause is replaced by XPs of the same length. If the same kind of ι -boundary is found, contrary to the prediction, they are likely to be due to some other factor. For example, an ι -boundary may be indicating the start and/or the end of a relatively long XP, as a result of promotion of long φ that dominate many φ ’s to an ι . Future studies might need to take such a possibility into consideration.

As for clausal objects, there are separate studies that clearly indicate the presence of ι -boundary at the onset of embedded clauses, such as Truckenbrodt and Darcy (2010) and Schubö (accepted) for German.⁹ In the case of German in particular, object clauses are considered to be extraposed, possibly to different landing sites, as suggested by Truckenbrodt and Darcy (2010). If this assumption is correct, then it is again unclear whether it is the syntactic status as a clause or as an extraposed constituent that triggers mapping to ι .

⁸Besides the length, it might potentially be relevant as well that commas before and after a relative clause are obligatory in German (both for restrictive and non-restrictive relative clauses).

⁹In fact, Truckenbrodt (2005) reports, contrary to the more recent studies mentioned here, that the left edge of embedded clauses does not coincide with the left edge of an ι . See Truckenbrodt and Darcy (2010) and Schubö (accepted) for relevant discussion. See also Schubö (accepted) for an MATCH-based account.

In this section, several studies on the prosody of embedded clauses have been reviewed. All in all, the empirical basis for MATCHCLAUSE still needs to be strengthened by further studies. In the next section, we turn to a claim by Selkirk (2009), which specifically argues for the effect of MATCHCLAUSE on embedded clauses.

3.2 *Wh*-prosody in Fukuoka Japanese

Selkirk (2009) claims, based on the literature on the prosody of *wh*-questions in Fukuoka Japanese (FJ hereafter), that this dialect of Japanese shows the mapping of standard clauses to ι and hence supports the syntax–prosody mapping at the clause-level. It will be shown in this section that there are a few empirical problems in this claim. Additional data from the relevant literature show the apparent clause– ι correspondence cannot be maintained as a general pattern of the *wh*-prosody in FJ. Crucially, the lack of correspondence is not due to some prosodic wellformedness constraint that suppresses the effect of MATCHCLAUSE. The domain of the special *wh*-prosody (be it the one in FJ or that of Tokyo Japanese, TJ hereafter) is determined by two factors that are independent of MATCHCLAUSE. As such, Japanese *wh*-question data do not constitute supporting evidence for MATCHCLAUSE.

3.2.1 *Wh*-prosody in Tokyo Japanese

The prosody of *wh*-questions in the Tokyo and Fukuoka dialects of Japanese has been discussed extensively since the early 2000’s. Deguchi and Kitagawa (2002) and Ishihara (2002, 2003) claimed that in (Tokyo) Japanese, a *wh*-in-situ language, the scope of the *wh*-questions is marked prosodically by the obligatory focus prosody. This obligatory *wh*-prosody starts from the *wh*-phrase and continues until the question particle that binds the *wh*-phrase.^{10,11}

This special *wh*-prosody in TJ is illustrated in Fig. 2, which shows sample

¹⁰See also Maekawa (1991, 1997) for an earlier observation on matrix *wh*-questions.

¹¹Richards (2010) extends the idea of obligatory prosodic marking of *wh*-phrase(s) and functional Q-heads to a theory of the typology of *wh*-movement.

pitch contours for the sentences in (7). The *wh*-phrase *dare* ‘who’ in (7b) shows a higher F_0 -peak (= focal F_0 -rise) compared to a non-*wh*-counterpart in (7a) *Naoya*, while the pitch contour of the post-*wh*-area *erimaki-o anda* ‘knitted a scarf’ is compressed (= post-focal reduction) until the question particle *ka* at the end of the embedded clause. The matrix material after the embedded clause *Yuko-ni morasita* ‘divulged to Yuko’ shows the pitch range comparable to the one preceding the focus prosody, i.e., *Mari-wa Yumi-ga* ‘Mari-NOM Yumi-NOM’.¹²

(7) a. Indirect Yes/No-question

Mari-wa [Yumi-ga Naoya-ni erimaki-o anda ka] Yuuko-ni
M.-TOP Y.-NOM N.-DAT scarf-ACC knitted Q Y.-DAT
morasita
divulged
‘Mari divulged to Yuko whether Yumi knitted a scarf for Naoya.’

b. Indirect *wh*-question

Mari-wa [Yumi-ga ↑**dare**-ni↓ erimaki-o anda ka] Yuuko-ni
M.-TOP Y.-NOM who-DAT scarf-ACC knitted Q Y.-DAT
morasita
divulged
‘Mari divulged to Yuko who Yumi knitted a scarf for.’

In the *wh*-scope marking analysis by Deguchi and Kitagawa (2002) and Ishihara (2002, 2003), the domain of the special *wh*-prosody is determined by two factors. The first factor is the semantic scope of the *wh*-question, which is determined by the syntactic location of the question particle that semantically binds the *wh*-phrase. In the case above, the scope of the indirect *wh*-question is the embedded clause, and hence, the *wh*-prosody ends at the end of the embedded clause.

The second factor is the (linear) location of the *wh*-phrase within that scope.

When the *wh*-phrase is at the clause-initial position, the *wh*-prosody starts at

¹²In the following TJ examples, the focal F_0 -rise is indicated by ↑ at the beginning of a *wh*-phrase, and the post-focal reduction is indicated with the ↓ at the end of the *wh*-phrase and the underline on the following words. The sentence-final rising contour, which is obligatory for matrix *wh*-questions in FJ and TJ, is not indicated, as it is not directly relevant for the discussion here.

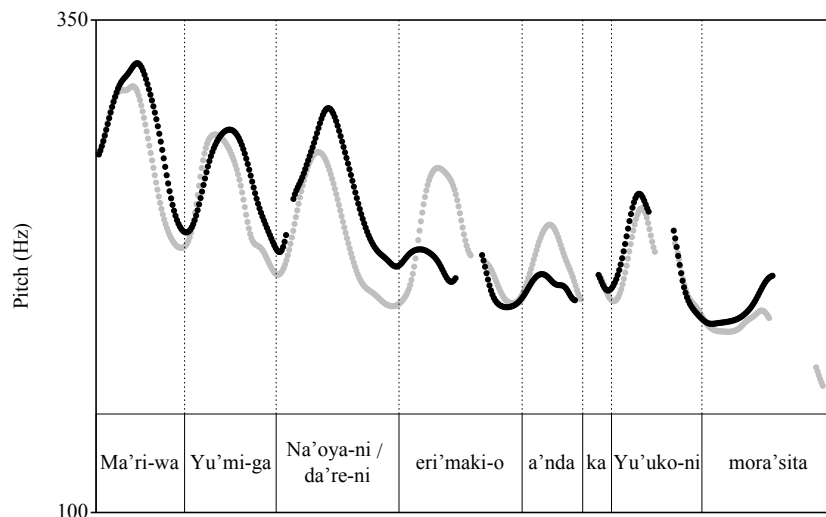


Figure 2: A sample pitch contour of (7b) (black line) superimposed onto that of (7a) (gray line).

the beginning of the clause. When the *wh*-phrase appears clause-medially, as in (7b), the *wh*-prosody also starts sentence-medially, as in Fig. 2.

3.2.2 Selkirk's (2009) analysis of *wh*-prosody in Fukuoka Japanese

FJ is also known to exhibit a special prosody between the *wh*-phrase and the question particle (Hayata 1985; Kubo 1989, 2001, 2005; Smith 2005, 2013, 2014; Hwang 2011). What is special about FJ is that the *wh*-prosody in this dialect is, unlike that of TJ, distinct from the focus prosody and unique to *wh*-questions (Hwang 2011; Smith 2014). It is especially noteworthy that it overrides lexical pitch accent pattern by deleting any accentual F₀-falls between the *wh*-phrase and the question particle that binds it. The result is a high plateau starting from the *wh*-phrase (to be more precise, from the second mora of the *wh*-phrase, following the so-called *initial lowering*, Pierrehumbert and Beckman 1988) and ending right before the question particle (which may be phonologically null in

matrix *wh*-questions in both FJ and TJ).¹³

- (8) Declarative sentence in FJ (Kubo 2005:199; Selkirk 2009:56)

kyóo bīru nónda
 today beer drank
 ‘I drank beer today.’

- (9) *Wh*-prosody in FJ (matrix) *wh*-questions (Kubo 2005:199; Selkirk 2009:56)

- a. kyóo dare-ga bīru nonda
 today who-NOM beer drank \emptyset COMP
 ‘Who drank beer today?’
 b. dare-ga kyoo bīru nonda
 who-NOM today beer drank \emptyset COMP
 ‘Who drank beer today?’

- (10) *Wh*-prosody in FJ indirect *wh*-question (Kubo 2005:201; Selkirk 2009:56)

[[[dare-ga kyoo bīru nonda] ka] sittóo]
 who-NOM today beer drank COMP know \emptyset COMP
 ‘Do you know who drank beer today?’

Making an assumption that MATCHCLAUSE applies to any clause in FJ (embedded or not), Selkirk (2009:57) suggests the following ι -phrasing given in (11) and (12) for (9a) and (10), respectively:

- (11) { ι kyoo dare-ga bīru nonda }
 who-NOM \emptyset COMP

- (12) { ι { ι dare-ga kyoo bīru nonda } ka sittoo }
 who-NOM COMP \emptyset COMP

Selkirk’s (2009) analysis is that the *wh*-phrase carries a high tone *wh*-morpheme $[H]_{+wh}$ which has to be autosegmentally associated with the right edge of the ι containing the *wh*-phrase. The association of $[H]_{+wh}$ and the right edge of the ι causes the deletion of intervening lexical tones, yielding a high plateau. In this analysis, it is predicted that the high plateau always ends at the right edge of

¹³In the following FJ examples, pitch accent locations are marked with acute accents, whenever relevant, and the high plateau of the *wh*-prosody with overlines. The sentence-final rising contour is not indicated, as in TJ examples (see fn. 12).

the ι that contains the *wh*-phrase.

This generalization is empirically not correct, however. When there is a *wh*-phrase in an embedded clause, and the scope of the *wh*-question is the matrix clause, as in (13) and (14), the high plateau does not end at the end of the embedded clause, where the right edge of an ι is predicted by MATCHCLAUSE, but instead, continues until the end of the matrix clause. The *wh*-prosody continues past the relative clause boundary in (13), and past the adjunct clause boundary in (14):

- (13) [CP donna sigoto syoo] hito-to ano-hito kekkonsita to?
 what.kind job do person-with that-person married Q
 ‘(lit.) The person [who does what kind of job] did that person get
 married to?’
 ‘What kind of job is x such that that person married to the person who
 does x ?’ (Kubo 1989:81)
- (14) Táro-wa [CP dare-ga kita tokorode] kaeru?
 Taro-TOP who-NOM came at.which.point go.home
 ‘Who is x such that Taro will go home when x comes?’
 (Kubo 2001:29)

If we assume that all embedded clauses are mapped to an ι and that the $[\text{H}]_{\text{wh}}$ gets associated at the right edge of that ι , we predict wrongly that the high plateau triggered by the *wh*-phrase stops at the end of the embedded clauses in (13) and (14). Instead, together with the examples of indirect *wh*-questions like (10), where the *wh*-prosody ends at the end of the embedded clause, these examples indicate that the *wh*-prosody of FJ marks the scope of the *wh*-question, exactly like that of TJ.

Selkirk (2009:61) states that her ι -phrase-based account of *wh*-prosody of FJ cannot be extended to the *wh*-prosody in Tokyo Japanese, because it has been claimed in the literature that the post-*wh* pitch compression goes beyond the (embedded) clause boundary if the *wh*-phrase is in an embedded clause and the

scope of *wh*-question is the matrix clause, as shown in (15):

- (15) Matrix scope question with embedded *wh*-phrase

Naoya-wa [[Mari-ga ↑**nani**-o↓ nomiya-de nonda] to] Yumi-ni
 Naoya-TOP Mari-NOM what-ACC bar-LOC drink Yumi-DAT
morasita no
 divulged Q
 ‘What did Naoya divulge to Yumi that Mari drank at the bar?’

The FJ examples in (13) and (14), however, show that FJ behaves exactly in the way when the *wh*-phrase is in the embedded clause in a matrix *wh*-question.

In fact, Selkirk (2009:61) casts doubt on the claim that Tokyo Japanese marks *wh*-scope prosodically (Deguchi and Kitagawa 2002; Ishihara 2002, 2003), based on the counterarguments made by Hirotani (2005). Hirotani claims that the results of her experiments did not confirm the predictions of the *wh*-scope marking analysis by Deguchi and Kitagawa (2002) and Ishihara (2002, 2003).

Hirotani’s arguments against the *wh*-scope marking analysis, however, have been criticized by other researchers (Ishihara 2003; Hwang 2011; Kitagawa and Hirose 2012), due to several problems with the methodology of the experiments as well as her interpretation of the results. Among the problems pointed out by these researchers, the most serious problem is that Hirotani disregards the overall preference toward the embedded scope reading in scopally ambiguous *wh*-question sentences like (16), where a *wh*-phrase can possibly be interpreted either within the embedded clause (= (16a)) or at the matrix clause (= (16b)).

- (16) Scopally ambiguous *wh*-question sentences

[Naoya-wa [[Mari-ga nani-o nomiya-de nonda ka] Yumi-ni
 Naoya-TOP Mari-NOM what-ACC bar-LOC drank Q Yumi-DAT
morasita no?]
 divulge Q

- a. Embedded *wh*-question:

‘Did Naoya divulge to Yumi what Mari drank at the bar?’

- b. Matrix *wh*-question:

‘(lit.) What_i did Naoya divulged to Yumi whether Mari drank t_i at the bar?’

This preference for the embedded *wh*-scope has been pointed out and experimentally confirmed in the literature (Kitagawa and Fodor 2003, 2006; Hirose and Kitagawa 2011). Once this bias is taken into consideration, Hirotani’s results are still compatible with the *wh*-scope marking analysis. Considering that the data in newer studies are in support of the *wh*-scope marking analysis, it seems more reasonable to conclude that the *wh*-prosody in TJ functions as the *wh*-scope marker, contrary to the claim made by Hirotani (2005).

Furthermore, the *wh*-scope marking property has also been confirmed experimentally for FJ *wh*-questions by Hwang (2011). In her production experiment, scopally ambiguous sentences parallel to (16) was consistently distinguished prosodically depending on the interpretation, as illustrated in Figure 3.

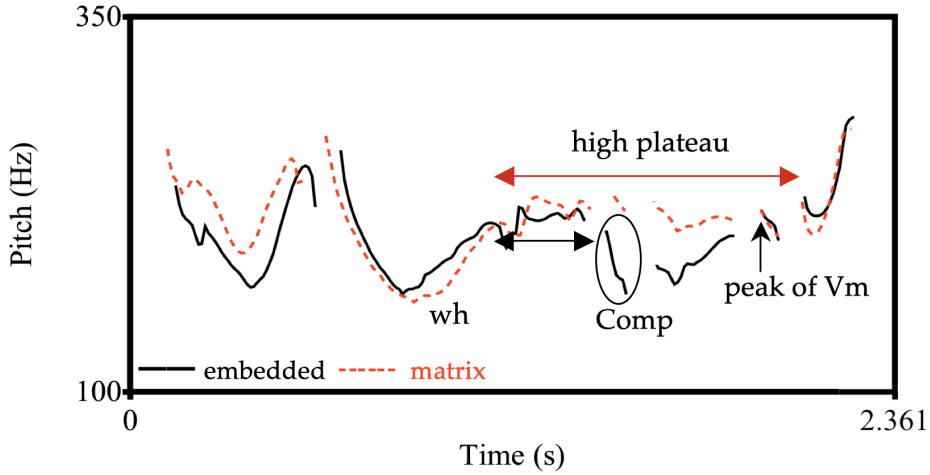


Figure 3: Sample pitch contours of an embedded *wh*-question (black line) and an matrix *wh*-question (red dashed line), taken from Hwang (2011:125).

In Figure 3, the (matrix Yes/No-question containing an) embedded *wh*-question (black solid line) shows a high plateau (indicated by black \leftrightarrow), which is followed by a sharp F_0 -fall (marked with a circle) at the embedded clause complementizer, i.e., question particle. In the matrix *wh*-question reading, in contrast, the high plateau (indicated by red \leftrightarrow) continues until the end of the

sentence, where a H% boundary tone indicating the matrix question can be observed. The prosodic pattern like the latter is not expected under Selkirk’s (2009) analysis of FJ. MATCHCLAUSE would predict an ι -boundary at the end of the embedded clause. Then, Selkirk’s analysis predicts that the [H]_{wh} on the *wh*-phrase would be associated with this ι -boundary. The resulting prosodic phrasing would be like the one for the embedded *wh*-question, not the one for the matrix *wh*-question, contrary to the fact.

In summary, given the data from the literature on FJ, such as (13) and (14) above, as well as experimental evidence from Hwang (2011), it is safe to conclude that the domain of *wh*-phrase is determined by the scope of the *wh*-question, just like in TJ.¹⁴

3.2.3 *Wh*-prosody in indeterminate constructions

In addition to the data we looked at so far, there is yet another set of facts that go against Selkirk’s (2009) claim that FJ provides evidence for the effect of MATCHCLAUSE on standard clauses. The special *wh*-prosody that we have been discussing can be observed not only in *wh*-questions, but also in another *wh*-construction, namely, the so-called *indeterminate constructions* (Kuroda 1965, 2013; Nishigauchi 1990; Kishimoto 2001; Shimoyama 2001, among others). In this construction, a *wh*-prosody appears between a *wh*-element and quantificational particle *mo*.

Starting with TJ, there are two points worth mentioning regarding the *wh*-prosody found in indeterminate constructions in this dialect. First, unlike the case of *wh*-questions, in which the *wh*-prosody is always identical to the focus prosody (i.e., focal F₀-rise on the *wh*-phrase, followed by a post-focal reduction), there are two prosodic patterns that can appear between a *wh*-phrase and *mo* (Ishihara 2003:73–75, Kuroda 2013). The first patterns is the focus prosody, just like in *wh*-questions of this dialect. The other pattern is, interestingly,

¹⁴This is true at least in terms of sentence production. When it comes to perception, several studies on both FJ and TJ have shown some mismatches (Hirotani 2005; Hirose and Kitagawa 2011 for TJ, Hwang 2011; Smith 2013 for FJ).

a high plateau, identical to the *wh*-prosody in FJ *wh*-questions. Examples of these two patterns are shown in Figure 4, which are sample pitch contours for the indeterminate construction sentence in (17), produced by a single speaker. The *wh*-prosody is marked with two different types of shades. In either pattern, the *wh*-prosody starts at the *wh*-phrase, and ends at the particle *mo*.

- (17) áru nyúusu-wa [Nómo-ga **dáre**-ni nákkuru-o nágeta
certain news-TOP Nomo-NOM who-DAT knuckleball-ACC pitched
to-**mo**] óokiku hoozi-nákat-ta
that-MO widely broadcasted
‘One news program did not broadcast widely for any *x*, *x* is a person,
that Nomo pitched a knuckleball to *x*.’

The second point worth mentioning, which is particularly relevant to the discussion here, is that unlike *wh*-questions, in which the end of *wh*-prosody always coincides with the end of a clause (where the question particle appears), an indeterminate construction can be formed at the level of the phrase as well the clause. This is because *mo* can attach not only to a CP, as in (17) above, but also to a phrase (DP or VP), as in (18) and (19).

- (18) Hánako-wa [DP **dare**-ga hometa hon]-**mo** yom-anai
H.-TOP anyone-NOM praise book MO read-NEG
‘Of anyone, Hanako does not read any book they praised.’
(adapted from Kuroda 2013:67)

- (19) Tároo-wa [VP **nani**-o tabe]-**mo** si-nákat-ta.
T.-TOP anything-ACC eat MO do-NEG-PST
‘Taro did not eat anything.’ (adapted from Kishimoto 2001:599)

In both (18) and (19), the *wh*-prosody is observed. And crucially, in both cases, the *wh*-prosody starts from the *wh*-phrase, and ends at particle *mo*, regardless of whether the particle attaches to a clause or a phrase.¹⁵ When the high-plateau-

¹⁵There are variations as to exactly where the plateau ends, because the domain of the *wh*-prosody seems to be affected by various factors, such as length of the domain, the presence of intervening pitch accents, and the type of boundary pitch movement (BPM, see Igarashi 2015 and references therein) at the end of the domain. A closer examination is necessary to make a precise description. The variability of the domain, however, does not undermine the

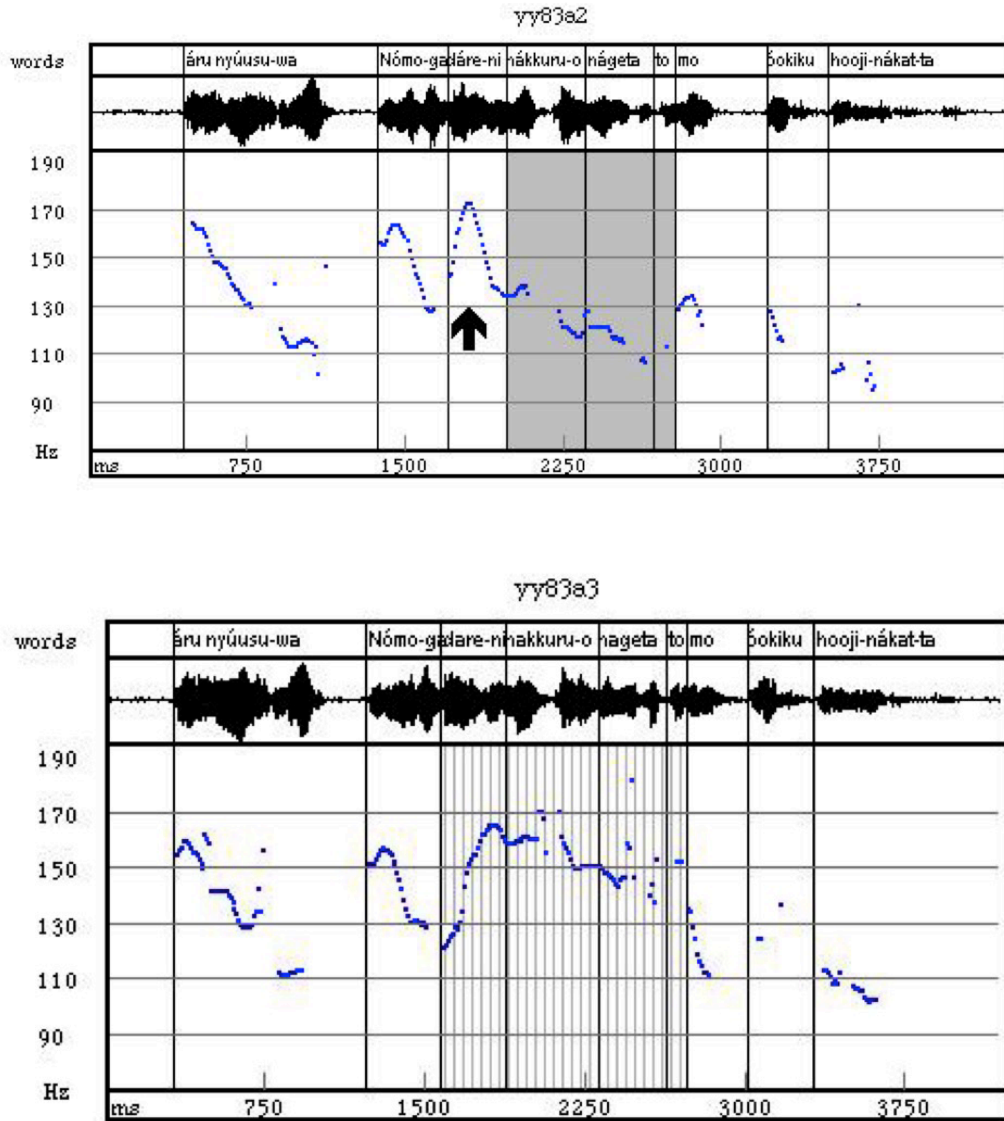


Figure 4: Two variants of the *wh*-prosody in an TJ indeterminate sentence, produced by the same speaker, taken from Ishihara (2003:75). One is parallel to the *wh*-prosody in TJ *wh*-questions (top), while the other is parallel to the *wh*-prosody in FJ *wh*-questions (bottom).

type *wh*-prosody (like the one in FJ *wh*-questions) appears, the lexical accent of the *wh*-phrase *dáre/náni* and the following words (e.g., the verb *tábe* in (19b)) will be deleted and a high plateau is formed between the *wh*-phrase and *mo*.

In the case of FJ, the data found in the literature seem to show that indeterminate constructions show the same *wh*-prosody as the *wh*-questions. The following examples are from Kubo (1989:77–78):

- (20) a. [CP **it̄u** **kyooto it̄te-mo**] i'i yo
 when Kyoto go-MO good PCL
 ‘Kyoto is wonderful whenever you visit there.’
 b. [DP **dono** **ziki-no** **kyooto-mo**] i'i tokoro'-ga aro'o ga
 which season-GEN Kyoto-MO good place-NOM exit PCL
 ‘In whichever season in Kyoto there is a wonderful place.’

This phenomenon, especially the cases of (20b), cannot be accounted for by Selkirk’s (2009) analysis of *wh*-prosody, because the domain of *wh*-prosody does not correspond to the domain predicted by MATCHCLAUSE. The domain of the *wh*-prosody is a DP in (20b), while MATCHCLAUSE predicts that there be an ι that contains the entire sentence. MATCHPHRASE does not predict the presence of ι -boundaries at the end of the DP, either, as it only predicts the presence of φ -boundaries.

The data from indeterminate constructions further strengthens the *wh*-scope marking analysis of *wh*-prosody in Japanese, for both TJ and FJ. The domain of *wh*-prosody is determined by the syntactic location of the relevant particle, which defines the scope of the question/quantification. Because the scope domain may be phrase or clause (in the case of indeterminate constructions), the analysis based on MATCHCLAUSE cannot account for the data.

In this section, we reviewed Selkirk’s (2009) claim that FJ *wh*-prosody can be explained as an effect of MATCHCLAUSE on embedded clauses. Additional data shows, however, that her observation is empirically not well grounded. The *wh*-prosody in FJ, be it the one in *wh*-questions or the one in indeterminate constructions here, as the domain can be extended up to *mo*, but never past *mo*.

structions, behaves like that of TJ in terms of how its domain is determined, and it is functioning as the *wh*-scope marker rather than as a result of MATCH-CLAUSE. We can conclude that the arguments for MATCHCLAUSE presented in Selkirk (2009) are not empirically not well-grounded.

4 Theoretical Questions Regarding MatchClause

In addition to the weakness of empirical support raised in the previous section, there are a few theoretical issues that challenge the validity and the necessity of MATCHCLAUSE. In particular, two issues will be taken up here. The first issue is about the status of syntactic clauses as a distinctive category. As will be shown below, this issue is also related to the nature of Layeredness, one of the principles that constitute the Strict Layer Hypothesis. The second issue concerns the incompleteness as well as the inexhaustiveness of the ι -mapping predicted by MATCHCLAUSE. This issue is closely related the question regarding the relevance of illocutionary force, or speech act, in the subcategorization of clauses mentioned in §2. The discussion here leads to the idea that it is not the clause (as a syntactic category), but rather the speech act associated with a syntactic constituent (clause or phrase), that shows systematic correspondence to ι .

4.1 Clauses as a distinct syntactic category?

The first question is whether syntactic clauses should be treated as a category distinct from phrases. In standard (generative) syntactic theories, clauses are treated as just a subtype of phrases, either as Complementizer Phrases (CPs) or some other phrases headed by a functional head (e.g., Tense Phrases, TPs). In that sense, clauses are not treated as a syntactic category inherently distinct from other phrases. If clauses are assumed to be a subtype of phrases in syntactic theories, a question immediately arises as to whether a theory of the syntax–prosody mapping should treat clauses categorically distinctive from phrases, as

in match theory and prosodic adjunction theory.

In relation to this, it may also be worth noting, as pointed out by Fabian Schubö (p.c.), that phrases that correspond to clauses (ForcePs, CPs, TPs, etc.) are usually considered functional projections rather than lexical projections such as VPs and NPs. This means that, unlike `MATCHWORD` and `MATCHPHRASE`, `MATCHCLAUSE` fails to comply with the Lexical Category Condition (Selkirk 1996; Truckenbrodt 1999), which states that “[c]onstraints relating syntactic and prosodic categories apply to lexical syntactic elements and their projections, but not to functional elements and their projections” (Truckenbrodt 1999:224). That is, by postulating `MATCHCLAUSE`, we would have to assume that the phonological component should be capable of identifying one particular type of functional projection (while ignoring all others) and mark its constituency in the prosodic realization. Such an analysis raises further theoretical questions, such as whether there is any other functional projections that are visible to the phonological component, and if not, why only CPs are visible, etc.

Furthermore, the status of clauses as a distinct category in the syntax–prosody mapping theories also raises another theoretical question. It concerns *Layeredness* (Selkirk 1996) (or, in Vogel’s (2020) term, *Constituent Sequencing*), one of the basic principles that constitute what has been called the Strict Layer Hypothesis (SLH, Selkirk 1984, 1986; Nespor and Vogel 1986). The SLH has been considered to characterize the core properties of prosodic structures. While some aspects of the SLH have been weakened in the development of the theory of prosody, such as Exhaustivity (no level-skipping) and Nonrecursivity (no level-repetition), other aspects have still been considered to hold steadily for prosodic hierarchy universally (See, among others, Selkirk 2011; Itô and Mester 2012, 2013; Vogel 2020 for discussion). Layeredness belongs to the latter group. It states that “[a] prosodic constituent of level C_n may only dominate constituents of level C_{n-1} or lower.” (Vogel 2020:37). In a prosodic structure that conforms to Layeredness, no ι would be dominated by a φ , for example.

When it comes to syntactic structures, by contrast, it has often been assumed

(and often tacitly) that Layeredness is not part of their intrinsic properties, and that the lack of Layeredness in syntax allows the recursion of syntactic structures (as seen in the transformational rules $S \rightarrow NP + VP$; $VP \rightarrow V + S$; $S \rightarrow NP + VP$; ...).

Despite the general assumption that Layeredness is a property unique to prosodic structures, it can, in fact, be said that Layeredness holds in syntax as well, to the extent that morphosyntactic categories, such as morphemes, words, and phrases, seem to be organized in such a way that no category is dominated by a lower category (i.e., morphemes < words < phrases).

There is one exception to this new generalization that Layeredness holds in both prosody and syntax: Layeredness does not hold between phrases and clauses, as a clause can be embedded inside a phrase (e.g., a VP can contain a clausal object, as in *John* [_{VP} *thinks* [_{CP} *that Mary is smart*]]). This exception, however, would be an exception only under the assumption that clauses constitute a distinct category in the syntactic hierarchy above phrases. By contrast, if we assume that clauses are a subtype of phrases, as in standard syntactic theories, the fact that clause may be dominated by a phrase would not be considered a violation of Layeredness. Put differently, if we give up the idea of the clause-level syntax–prosody mapping (clause $\rightarrow \iota$) and assumes that clauses are a subtype of phrases, Layeredness can be maintained as a property of both syntax and prosody alike.

While the theoretical issues regarding the Lexical Category Condition and Layeredness discussed here still await further empirical investigation, it seems evident that there is a fundamental question that still needs to be carefully considered, namely, whether it is appropriate to treat clauses as a distinct syntactic category in the theory of the syntax–prosody interface. As long as this fundamental question remains unanswered, the validity of MATCHCLAUSE remains uncertain.

4.2 Incompleteness and inexhaustiveness of ι -mapping

The second question regarding the mapping principle expressed by MATCH-CLAUSE is whether it is really syntax that is related to ι -phrasing, or the ι -mapping should rather be attributed to something else (that, in turn, may be associated with a syntactic constituent). Upon discussing this question, it is important to note that, in comparison to the well-established phrase-level correspondence (syntactic phrases $\rightarrow \varphi$'s), the clause-level correspondence seems to be far less consistent (in the sense that not all clauses map to ι) and far less exhaustive (in the sense that non-clauses also map to ι).

In fact, finding a consistent mapping relation between syntactic constituents and ι has long been a challenge. Match theory is not the only generalization that has been proposed in the literature. Selkirk (1984)'s *Sense Unit Condition* is one of such attempts. Selkirk (2005) also attempts to characterize the mapping between syntactic "Comma Phrase" and ι , before shifting her theory toward match theory. The major reason for the difficulty seems to be the incompleteness and inexhaustiveness of the ι -mapping mentioned just above.

As for incompleteness, it has already been acknowledged by Selkirk (2011:452) that not all types of clauses show consistent correspondence to ι , as explained in §2.1. While what Selkirk (2011) calls illocutionary clauses seem to show a strong tendency to be mapped to ι in their prosodic representations, so-called standard clauses (mostly embedded clauses that do not have an illocutionary force of their own) do not show systematic correspondence. As already shown in §2.1, this itself can be explained under match theory, by assuming that some prosodic wellformedness conditions may suppress the effect of MATCHCLAUSE.

As for inexhaustiveness, there are cases where certain phrases show a strong tendency to be mapped to an ι . In such contexts, clauses and phrases map to ι alike. Two major areas can be mentioned in which ι -mapping is often discussed. The first area is parenthetical expressions, such as adverbial clauses/phrases, non-restrictive relative clauses, appositive phrases, sentence adverbs, etc. (See Dehé 2014:ch. 1, for an extensive overview of various types of parenthetical

expressions). According to Dehé (2014), many of these parenthetical expressions have been claimed to form a prosodic constituent that is separated from the main (root) clause. These expressions, however, do not seem to distinguish between phrases and clauses.

Another area in which ι has often been claimed to be involved is information-structural phenomena, most prominently, topicalization. It has often been claimed that (certain types of) discourse topics tend to be prosodically separated from the rest of the sentences by a strong prosodic boundary, presumably an ι -boundary (among others, Frascarelli 2000; Feldhausen 2010). Just like parenthetical expressions, topics may be a clause or a phrase. The syntactic difference between clauses and phrases does not seem to be playing any important role in mapping of these elements to an ι .

4.3 Connection between clauses and illocutionary force

As mentioned in §2, Selkirk (2011) proposes two types of MATCHCLAUSE constraints. In this analysis, MATCHCLAUSE (unlike MATCHWORD and MATCH-PHRASE) is sensitive to the type of clauses (standard vs. illocutionary clause). What distinguishes between the two clause types is the presence or absence of illocutionary force. A clause that carries an illocutionary force of its own is categorized as an illocutionary clause. Due to the (universally high-ranked) MATCH(illocutionary clause, ι), it is (obligatorily) mapped to an ι . In contrast, a clause that does not carry an illocutionary force is categorized as a standard clause, and it may or may not be mapped to an ι , depending on the relative ranking of (the general version of) MATCHCLAUSE and other prosodic well-formedness constraints.

Here, one may ask why clauses, but not phrases, need to be distinguished depending on whether they carry an illocutionary force or not. This question is highly relevant, because it seems that a parallel pattern can be found for phrases. As mentioned above, parenthetical expressions, which may be a clause or a phrase, are consistently mapped to an ι (See Dehé 2014 and references

therein). Similarly, certain types of topics tend to be phrased as an ι , be it a clause or a phrase. What matters in these cases, then, seems to be the special status as parenthetical expressions or as topics, rather than whether the expression is a clause or a phrase.

There seems one common trait among parenthetical expressions and topics: they constitute a speech act that is independent of that of the main (root) clause. It has often been claimed that parenthetical expressions express a separate speech act that is independent of that of the main clause. It has also been observed that the illocutionary force of a parenthetical expression may be independent of that of the main clause (see Dehé 2014 and references therein). Potts (2005) claims that parentheticals (what he calls supplemental expressions) are syntactically marked as Comma Phrase and carry a conventional implicature, which, Selkirk (2005, 2009, 2011) assumes, is equivalent to say that a phrase associated with a [+comma] phrase performs a separate speech act.

Interestingly, there have also been claims and suggestions that certain types of topic phrases perform a separate speech act. Ebert (2009), following Jacobs (1984), suggests that establishing a(n aboutness) topic is a separate illocutionary act. Bianchi and Frascarelli (2010) propose, adopting Krifka (2001) analysis of quantified NPs, that aboutness-shift topics perform speech acts of their own.

Coming back to the formulation of MATCHCLAUSE, if the presence or the absence of illocutionary force is the only difference between the two clause types (illocutionary and standard clauses), and their difference in terms of ι -mapping is explained solely based on this difference, it seems more reasonable to connect illocutionary force itself (or the speech act associated with it) and ι directly, rather than to attribute the ι -mapping to the clause type. It makes even more sense once we consider the fact that the phrasal expressions that tend to map to ι (such as parenthetical expressions and aboutness topics) are also claimed to perform separate speech acts.

In relation to this, Selkirk (2011:452) assumes that ForceP, the projection that dominates illocutionary clauses, is an instance of Potts's (2005) Comma

Phrase. One problem is that, while it seems quite plausible to assume that ForceP and CommaP share the property of performing a speech act, their syntactic categories cannot be entirely equivalent. While ForceP is unambiguously a subtype of clauses, Comma Phrases subsume both clauses and phrases, as different types of parenthetical expressions are analyzed as instances of Comma Phrase.

Given that, instead of hypothesizing that there are two types of clauses, it seems more reasonable to hypothesize that the illocutionary force (or the speech act) is relevant for ι -mapping. Once it is hypothesized that each speech act maps to ι , it is no longer necessary to assume that there are two types of clauses, or that syntactic clauses generally map to ι . In other words, the syntax-prosody mapping can be explained without MATCHCLAUSE. In the following section, I would like to explore this possibility and its implications to the theory of syntax-prosody interface.

5 An Alternative Model

5.1 Mapping of speech act to ι

Although it is beyond the scope of this paper to develop the full-fledged analysis of the new possibility introduced in the previous section, I propose the following principle, for the sake of concreteness:

- (21) A speech act is realized as an ι in the prosodic representation.

We may be able to formulate it as a MATCH constraint, MATCH(speech act, ι) (or MATCHSA for short). This constraint covers all the cases of root clauses and parenthetical expressions (both phrasal and clause ones), as well as discourse topics, in a uniform fashion. All root clauses are commonly assumed to have illocutionary force, which is realized via speech acts. Parenthetical expressions and discourse topics, as discussed in §4.3, can also be analyzed as separate speech acts that are not part of the proposition expressed by the root clause.

All these speech acts form separate ι 's, according to MATCHSA.¹⁶

This MATCH constraint, unlike MATCHCLAUSE, is completely irrelevant for the cases where embedded clauses without illocutionary force (standard clauses) form an ι . These cases need to be derived by other constraints. As a concrete example, we can consider German object clauses. If we assume a model that lacks MATCHCLAUSE, a German sentence with an (extraposed) object clause is predicted to be mapped to the following prosodic structure:

$$(22) \quad \begin{array}{l} \text{Syntax: } [\text{ForceP } [\text{CP main clause}] [\text{CP embedded clause}]] \\ \text{Prosody: } \{ \iota \quad (\varphi \quad \quad \quad) (\varphi \quad \quad \quad) \} \end{array}$$

Depending on the prosodic structure of the clause-internal part, one of the clauses may be realized as an ι , due to some effect(s) of prosodic wellformedness (e.g., length, binarity). Once one of the clauses is promoted to an ι , the other clause is likely to be promoted to ι as well, due to EQUALSISTERS (Myrberg 2013), another prosodic wellformedness constraint. Alternatively, the promotion of two φ 's to ι 's may be the result of what Selkirk (2005) calls *stylistic promotion*. In any case, the resulting prosodic structure will be like (23) below:

$$(23) \quad \begin{array}{l} \text{Syntax: } [\text{ForceP } [\text{CP main clause}] [\text{CP embedded clause}]] \\ \text{Prosody: } \{ \iota \quad \{ \iota \quad \quad \quad \} \{ \iota \quad \quad \quad \} \} \end{array}$$

Although details of the analyses suggested above still need to be elaborated, it seems quite possible to derive desired prosodic structures without resorting to MATCHCLAUSE.

5.2 Prosodic hierarchy and division of labor

It should be noted that MATCHSA is *not* a syntax–prosody mapping constraint, because speech acts are not a syntactic category like words and phrases. (The proposal does not exclude, however, a possibility to assume that speech acts

¹⁶In essence, this proposal is quite similar to that of Selkirk (2005), in which edges of Comma Phrases are aligned to edges of ι . It is interesting to note that Selkirk (2005:12–13) also suggests that topic-like expressions, such as *as for*-phrases and left dislocated phrases, may count as expressions marked by [+comma].

are realized as a certain syntactic feature, such as [+comma] feature of Potts (2005).) If we assume that ι -mapping is regulated according to (21) (together with other prosodic wellformedness constraints), and that there is no MATCH-CLAUSE constraints, it follows that the prosodic category ι is outside the domain of the syntax-prosody mapping.

In the standard theories of the syntax-prosody interface, match theory and prosodic adjunction theory to be more precise, the prosodic hierarchy is divided into two categories, *rhythmic categories* and *interface categories*. Moras (μ), syllables (σ) and feet (f) belong to the former, and prosodic words (ω), phonological phrase (φ), and intonational phrase (ι) belong to the latter. What the current proposal implies is that the latter group, *interface categories*, can further be divided into two (sub)categories. While the lower two prosodic categories, ω and φ , are responsible for the interface with syntax, the higher category, ι , is responsible for the interface with discourse/pragmatics. If this is the architecture of the interface between prosody and other modules of grammar, it seems natural that it has long been a challenge to come up with a convincing theory of the syntax-prosody mapping in relation to ι .

6 Concluding remarks

In this paper, various kinds of empirical and theoretical issues have been discussed. Empirically, it was shown that Japanese data from previous studies do not provide support for MATCHCLAUSE. It was also argued that Selkirk's (2009) proposal based on FJ *wh*-question data is untenable. The theoretical questions discussed in §4 also challenge the validity and the necessity of the clause-level mapping. Instead of the clause-level syntax-prosody mapping, an alternative model was suggested in which ι is related to the pragmatics-prosody mapping. Through the discussion, I have attempted to show that there are still unanswered empirical and theoretical questions regarding MATCHCLAUSE, and that there may be other ways of viewing the grammatical architecture in the

interfaces between prosody and other modules of grammar.

Even though a new model of the interfaces between prosody and other modules of grammar was suggested, many questions, both empirical and theoretical, still remain to be further investigated. For example, empirical investigation on the prosody of embedded clauses needs to be continued further, possibly with more elaborated control of other prosodic factors. The theoretical question regarding the notion of clause, discussed in §4 need to be discussed further. If speech acts turn out to be relevant for the ι -mapping, integration of speech act theories might be a key to better understanding of the pragmatics–prosody interface.

References

- Beckman, Mary, and Janet Pierrehumbert. 1986. Intonational structure in Japanese and English. *Phonology Yearbook* 3:255–309.
- Bianchi, Valentina, and Mara Frascarelli. 2010. Is topic a root phenomenon? *Iberia* 2:43–88.
- Chen, Matthew Y. 1987. The syntax of Xiamen tone sandhi. *Phonology Yearbook* 2:109–149.
- Deguchi, Masanori, and Yoshihisa Kitagawa. 2002. Prosody and wh-questions. In *NELS 32: Proceedings of the North Eastern Linguistics Society*, ed. Masako Hirotani, volume 1, 73–92. Amherst, Mass.: GLSA, University of Massachusetts, Amherst.
- Dehé, Nicole. 2014. *Parentheticals in spoken English*. Cambridge, UK: Cambridge University Press.
- Ebert, Cornelia. 2009. *Quantificational topics: A scopal treatment of exceptional wide scope phenomena*. Springer.

- Feldhausen, Ingo. 2010. *Sentential form and prosodic structure of Catalan*. Amsterdam/Philadelphia: John Benjamins.
- Frascarelli, Mara. 2000. *The syntax-phonology interface in focus and topic constructions in Italian*. Dordrecht: Kluwer.
- Fujisaki, Hiroya, and Keikichi Hirose. 1984. Analysis of voice fundamental frequency contours for declarative sentences of Japanese. *Journal of the Acoustical Society of Japan* 5:233–242.
- Fujisaki, Hiroya, and Hiroshi Sudo. 1971. A model for the generation of fundamental frequency contours of Japanese word accent. *Journal of Acoustic Society of Japan* 27:445–453.
- Grijzenhout, Janet, and Baris Kabak, ed. 2009. *Phonological domains: Universals and deviations*. Berlin and New York: Mouton de Gruyter.
- Hayata, Teruhiro. 1985. *Hakata hōgen no akusento / keitairon [the accent and morphology of the Hakata dialect]*. Fukuoka: Kyushu University Press.
- Hirayama, Manami, and Hyun Kyung Hwang. 2016. Not all XPs affect prosody in Japanese. In *NELS 46: Proceedings of the North Eastern Linguistics Society*, ed. Christopher Hammerly and Brandon Prickett, 95–104.
- Hirayama, Manami, and Hyun Kyung Hwang. 2019. Relative clause and downstep in Japanese. In *Supplemental Proceedings of the 2018 Annual Meeting on Phonology*, ed. Katherine Hout, Anna Mai, Adam McCollum, Sharon Rose, and Matt Zaslansky. Washington, DC: Linguistic Society of America.
- Hirose, Yuki, and Yoshihisa Kitagawa. 2011. Production–perception asymmetry in wh-scope marking. In *Processing and producing head-final structures*, ed. Hiroko Yamashita, Yuki Hirose, and Jerome L. Packard, chapter 5, 93–110. Dordrecht: Springer.
- Hirotsu, Masako. 2005. Prosody and LF: Processing Japanese wh-questions. Doctoral Dissertation, University of Massachusetts, Amherst.

- Hwang, Hyun Kyung. 2011. Scope, prosody, and pitch accent: The prosodic marking of wh-scope in two varieties of Japanese and South Kyeongsang Korean. Doctoral Dissertation, Cornell University.
- Igarashi, Yosuke. 2015. Intonation. In Kubozono (2015), chapter 13, 525–568.
- Inkelas, Sharon, and Draga Zec. 1995. Syntax-phonology interface. In *The handbook of phonological theory*, ed. John A. Goldsmith, 535–549. Oxford, UK: Blackwell.
- Ishihara, Shinichiro. 2002. Invisible but audible wh-scope marking: Wh-constructions and deaccenting in Japanese. In *Proceedings of the 21st West Coast Conference on Formal Linguistics (WCCFL 21)*, ed. Line Mikkelsen and Chris Potts, 180–193. Somerville, Mass.: Cascadia Press.
- Ishihara, Shinichiro. 2003. Intonation and interface conditions. Doctoral Dissertation, Massachusetts Institute of Technology. URL <http://hdl.handle.net/1721.1/17020>.
- Ishihara, Shinichiro. 2015. Syntax-phonology interface. In Kubozono (2015), chapter 14, 569–618.
- Ishihara, Shinichiro. 2016. Japanese downstep revisited. *Natural Language & Linguistic Theory* 34:1389–1443. URL <http://dx.doi.org/10.1007/s11049-015-9322-8>.
- Ishihara, Shinichiro. to appear. Testing MATCHCLAUSE: The prosody of embedded clauses in Japanese. Paper to be presented at the 28th Japanese/Korean Linguistics.
- Itô, Junko, and Armin Mester. 2007. Prosodic adjunction in Japanese compounds. In *Formal Approaches to Japanese Linguistics 4 (FAJL4)*, 97–111.
- Itô, Junko, and Armin Mester. 2012. Recursive prosodic phrasing in Japanese. In *Prosody matters: Essays in honor of Elisabeth Selkirk*, ed. Toni Browsey,

- Shigeto Kawahara, Takahito Shinya, and Mariko Sugahara, 280–303. London: Equinox Publishing.
- Itô, Junko, and Armin Mester. 2013. Prosodic subcategories in Japanese. *Lingua* 124:20–40.
- Jacobs, Joachim. 1984. Funktionale Satzperspektive und Illokutionssemantik. *Linguistische Berichte* 91:25–58.
- Kawahara, Shigeto, and Takahito Shinya. 2008. The intonation of gapping and coordination in Japanese: Evidence for intonational phrase and utterance. *Phonetica* 65:62–105.
- Kentner, Gerrit, and Caroline Féry. 2013. A new approach to prosodic grouping. *The Linguistic Review* 30:277–311.
- Kishimoto, Hideki. 2001. Binding of indeterminate pronouns and clause structure in Japanese. *Linguistic Inquiry* 32:597–663.
- Kitagawa, Yoshihisa, and Janet Dean Fodor. 2003. Default prosody explains neglected syntactic analysis in Japanese. In *Japanese/Korean Linguistics*, ed. William McClure, volume 12, 267–279. Stanford: CSLI Publications.
- Kitagawa, Yoshihisa, and Janet Dean Fodor. 2006. Prosodic influence on syntactic judgements. In *Gradience in grammar: Generative perspective*, ed. Gisbert Fanselow, Caroline Féry, Matthias Schlesewsky, and Ralf Vogel, chapter 17. Oxford University Press.
- Kitagawa, Yoshihisa, and Yuki Hirose. 2012. Appeals to prosody in wh-interrogatives: Speakers’ versus listeners’ strategies. *Lingua* 122:608–641.
- Krifka, Manfred. 2001. Quantifying into question act. *Natural Language Semantics* 9:1–40.
- Kubo, Tomoyuki. 1989. Fukuoka-shi hōgen no dare, nani tō no gimon-shi o fukumu bun no pitchi patān [The pitch pattern of the sentences containing

- interrogative markers such as *dare*, *nani*, etc. in Fukuoka dialect]. *Kokugogaku* 156:71–82.
- Kubo, Tomoyuki. 2001. Fukuoka hōgen ni okeru tōgoron to on'inron no kyōkai ryōiki. [syntax–phonology interface in the fukuoka dialect.]. *Journal of the Phonetic Society of Japan* 5:27–32.
- Kubo, Tomoyuki. 2005. Phonology–syntax interfaces in Busan Korean and Fukuoka Japanese. In *Proceedings from the Symposium Cross-linguistic Studies of Tonal Phenomena: Historical Development, Tone-Syntax Interface, and Descriptive Studies*, ed. Shigeki Kaji, 195–219. Research Institute for Languages and Cultures of Asia and Africa (ILCAA), Tokyo University of Foreign Studies.
- Kubozono, Haruo. 1993. *The organization of Japanese prosody*. Tokyo: Kurosio Publishers.
- Kubozono, Haruo, ed. 2015. *Handbook of Japanese phonetics and phonology*, volume 2 of *Handbooks of Japanese Language and Linguistics*. Berlin / Boston: Mouton de Gruyter.
- Kuroda, S.-Y. 1965. Generative grammatical studies in the Japanese language. Doctoral Dissertation, Massachusetts Institute of Technology.
- Kuroda, S.-Y. 2013. Prosody and the syntax of indeterminates. *Lingua* 124:64–95.
- Ladd, D. Robert. 1986. Intonational phrasing: the case for recursive prosodic structure. *Phonology Yearbook* 3:311–340.
- Ladd, D. Robert. 1988. Declination ‘reset’ and the hierarchical organization of utterance. *Journal of the Acoustic Society of America* 84:530–544.
- Maekawa, Kikuo. 1991. Tōkyō hōgen gimon-bun no intonēsyon [The intonation of question sentences in Tokyo dialect]. In *Proceedings of the 1991 PSJ Annual Convention*, 42–47. The Phonetic Society of Japan.

- Maekawa, Kikuo. 1997. Nihongo gimonsi gimon-bun no intonēsyon [The intonation of the Japanese wh-question]. In *Bunpō to onsei [Grammar and sound]*, ed. Onsei Bunpō Kenkyū-kai, chapter 3, 45–53. Tokyo: Kurosio Publishers.
- Maekawa, Kikuo, Hideaki Kikuchi, Yosuke Igarashi, and Jennifer Venditti. 2002. X-JToBI: An extended J_ToBI for spontaneous speech. In *Proceedings of The 7th International Conference on Spoken Language Processing (ICSLP)*, 1545–1548. Denver, Colorado.
- McCawley, James D. 1965. The accentual system of standard Japanese. Doctoral Dissertation, Massachusetts Institute of Technology.
- Myrberg, Sara. 2013. EQUALSYSTEMS and prosodic branching. *Phonology* 30:73–124.
- Nespor, Marina, and Irene Vogel. 1986. *Prosodic phonology*. Dordrecht: Foris Publications.
- Nishigauchi, Taisuke. 1990. *Quantification in the theory of grammar*. Dordrecht: Kluwer Academic Publishers.
- Pierrehumbert, Janet, and Mary Beckman. 1988. *Japanese tone structure*. Cambridge, Mass.: MIT Press.
- Poser, William J. 1984. The phonetics and phonology of tone and intonation in Japanese. Doctoral Dissertation, Massachusetts Institute of Technology.
- Potts, Christopher. 2005. *The logic of conversational implicature*. Oxford University Press.
- Richards, Norvin. 2010. *Uttering trees*. Cambridge, MA: MIT Press.
- Rizzi, Luigi. 1997. The fine structure of the left periphery. In *Elements of grammar: Handbook in generative syntax*, ed. Liliana Haegeman, 281–337. Dordrecht: Kluwer Academic Publishers.

- Schubö, Fabian. accepted. Intonation Phrase formation in sentences with clausal embedding. *Journal of Comparative Germanic Linguistics* .
- Selkirk, Elisabeth. 1984. *Phonology and syntax: The relation between sound and structure*. Cambridge, Mass.: MIT Press.
- Selkirk, Elisabeth. 1986. On derived domains in sentence prosody. *Phonology Yearbook* 3:371–405.
- Selkirk, Elisabeth. 1996. The prosodic structure of function words. In *Signal to syntax: Bootstrapping from speech to grammar in early acquisition*, ed. James L. Morgan and Katherine Demuth, 187–213. Mahwah, N.J.: Lawrence Erlbaum Associates.
- Selkirk, Elisabeth. 2005. Comments on intontional phrasing in English. In *Prosodies: With special reference to Iberian languages*, ed. Sónia Frota, Mariana Vigário, and Maria Jo ao Freitas, 11–59. Berlin/New York: Mouton de Gruyter.
- Selkirk, Elisabeth. 2009. On clause and intonational phrase in Japanese: The syntactic grounding of prosodic constituent structure. *Gengo Kenkyu* 136:35–74.
- Selkirk, Elisabeth. 2011. The syntax-phonology interface. In *The handbook of phonological theory*, ed. John Goldsmith, Jason Riggle, and Alan Yu, 435–484. Oxford, UK: Blackwell, 2nd edition.
- Shimoyama, Junko. 2001. Wh-constructions in Japanese. Doctoral Dissertation, University of Massachusetts, Amherst.
- Smith, Jennifer L. 2005. On the WH-question intonational domain in Fukuoka Japanese: Some implications for the syntax-prosody interface. In *Papers on prosody*, ed. Shigeto Kawahara, volume 30 of *UMOP*, 219–237. Amherst, Mass.: GLSA.

- Smith, Jennifer L. 2013. Fukuoka Japanese wh prosody in production and perception. *Lingua* 124:96–130.
- Smith, Jennifer L. 2014. Wh prosody is not focus prosody in Fukuoka Japanese. In *Japanese/Korean Linguistics 23*, ed. Michael Kenstowicz, Ted Levin, and Ryo Masuda, 23–37. Standord: CSLI Publications.
- Truckenbrodt, Hubert. 1999. On the relation between syntactic phrases and phonological phrases. *Linguistic Inquiry* 30:219–255.
- Truckenbrodt, Hubert. 2005. A short report on intonation phrase boundaries in German. *Linguistische Berichte* 203:273–296.
- Truckenbrodt, Hubert, and Isabelle Darcy. 2010. Object clauses, movement, and phrasal stress. In *The sound patterns of syntax*, ed. Nomi Erteshik-Shir and Lisa Rochman, 189–216. Oxford/New York: Oxford University Press.
- Truckenbrodt, Hubert, and Caroline Féry. 2015. Hierarchical organisation and tonal scaling. *Phonology* 32:19–47.
- Uyeno, Tazuko, Hideo Hayashibe, and Kunihiko Imai. 1979. On pitch contours of declarative, complex sentences in Japanese. *Annual Bulletin of Research Institute of Logopedics and Phoniatics* 13:175–187.
- Uyeno, Tazuko, Hideo Hayashibe, Kunihiko Imai, Hiroshi Imagawa, and Shigeru Kiritani. 1981. Syntactic structure and prosody in Japanese: A study on pitch contours and the pauses at phrase boundaries. *Annual Bulletin of Research Institute of Logopedics and Phoniatics* 15:91–108.
- Venditti, Jennifer J. 2005. The J_ToBI model of Japanese intonation. In *Prosodic typology: The phonology and intonation of phrasing*, ed. Sun-Ah Jun, 172–200. Oxford, UK: Oxford University Press.
- Venditti, Jennifer J., Kikuo Maekawa, and Mary E. Beckman. 2008. Prominence marking in the Japanese intonation system. In *The oxford handbook*

- of Japanese linguistics*, ed. Shigeru Miyagawa and Mamoru Saito, 456–512. Oxford/New York: Oxford University Press.
- Vogel, Irene. 2009. The status of the Clitic Group. In *Phonological domains: Universals and deviations*, ed. Janet Grijzenhout and Baris Kabak, 15–46. Berlin and New York: Mouton de Gruyter.
- Vogel, Irene. 2020. Life after the Strict Layer Hypothesis: Prosodic structure geometry. In *Prosodic studies: Challenges and prospects*, ed. Hongming Zhang and Youyong Qian, chapter 1, 10–60. Routledge.
- Wagner, Michael. 2005. Prosody and recursion. Doctoral Dissertation, Massachusetts Institute of Technology, Cambridge, Mass.
- Zec, Draga, and Sharon Inkelas. 1990. Prosodically constrained syntax. In *The phonology-syntax connection*, ed. Sharon Inkelas and Draga Zec, 365–378. Stanford, California: CSLI Publications.