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*Matching overtly headed syntactic phrases in Italian**

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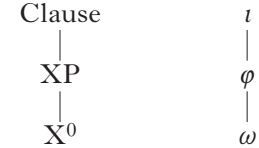
In this paper, I develop an analysis of the Italian syntax–prosody interface in Match Theory, revisiting three *φ*-diagnostics from previous work: word-final vowel deletion, stress retraction and final lengthening. I show that these processes sometimes diverge in their distribution, supporting the existence of two phrasal domains in Italian. These domains are analysed using prosodic recursion. I then develop a novel formulation of MATCHXP, according to which only syntactic XPs with phonologically overt heads, whether lexical or functional, are visible to the syntax–prosody mapping. This formulation is argued to be superior to versions of MATCHXP that only match lexical XPs or that attempt to match all XPs, at least in Italian, suggesting that implementation of syntax–prosody mapping constraints may be subject to cross-linguistic variation.

1 Introduction

A long-standing question in phonology concerns how the prosodic structure of an utterance both departs from and is constrained by syntax. Match Theory argues for a straightforward mapping from syntactic constituents to prosodic domains, carried out by Match constraints (Selkirk 2011). MATCHWORD maps heads (X^0) to prosodic words (*ω*), MATCHXP maps maximal projections (XP) to phonological phrases (*φ*) and MATCHCLAUSE maps clauses to intonational phrases (*ι*). This mapping is schematised in (1).

(1) *syntax* → *phonology*



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An ongoing debate concerns which syntactic constituents are visible to Match constraints (Elfner 2012, Guekguezian 2017, Ito & Mester 2019, Tyler 2019). A distinction is frequently drawn between lexical and functional elements, such that the syntax–prosody mapping only makes reference to lexical XPs (e.g. NP, AP, VP), while ignoring functional XPs (e.g. DP, PP, TP) (Nespor & Vogel 1986, Selkirk 1986, 1996, Truckenbrodt 1999). Truckenbrodt formalises this insight as the Lexical Category Condition, given in (2), which asserts that only XPs with phonologically overt lexical heads are visible to the syntax–prosody mapping.

(2) *Lexical Category Condition*

> Constraints relating syntactic and prosodic categories apply to lexical syntactic elements and their projections, but not to functional elements and their projections, or to empty syntactic elements and their projections.

One line of work has continued to assume a lexical/functional distinction (e.g. Selkirk 2011, Ishihara 2014). Selkirk & Lee (2017) propose MatchPhrase$_{Lex}$, which ports the Lexical Category Condition into Match Theory by requiring MatchXP to ignore functional XPs and XPs with silent heads. Another line of work has reached the opposite conclusion: Elfner (2012, 2015) provides evidence that all XPs, including functional phrases, are visible to MatchXP, and other researchers have adopted this view (Elordieta 2015, Bennett *et al*. 2016, Ito & Mester 2019). At the word level, Tyler (2019) argues that a strict lexical/functional distinction does not adequately account for the idiosyncratic behaviour of function words: some function words are prosodically dependent, while others form prosodic words. Tyler proposes that all heads are visible to MatchWord, and certain function words fail to map to prosodic words when MatchWord is overridden by prosodic subcategorisation frames (Inkelas 1990, Zec 2005). In light of this work, there is reason to rethink the lexical/functional distinction.

In this paper, I argue for a novel formulation of MatchXP, inspired by Truckenbrodt's Lexical Category Condition. I propose that any XP, whether lexical or functional, is visible to MatchXP as long as it has a phonologically overt head. Like the Lexical Category Condition, this definition of MatchXP gives the phonological status of the head a central role in delimiting the set of XPs relevant to the syntax–prosody mapping. Unlike the Lexical Category Condition, this version of MatchXP is indifferent to a head's lexical status, leveraging the fact that being lexical and having phonological content are separate properties. The redefined MatchXP is shown to have desirable consequences in Italian: functional phrases like DP, PP and QP must be matched, while phrases headed by silent elements must not be. The overt head condition makes MatchXP compatible with work arguing against the lexical/functional distinction, while preserving the Lexical Category Condition's insights.

The analysis is based on three Italian phenomena which have been argued to be sensitive to φ: *troncamento* (Meinschaefer 2005, 2006, 2009),

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stress retraction (Nespor & Vogel 1986, Ghini 1993) and final lengthening (Nespor & Vogel 1986, Ghini 1993). Based on novel data combined with descriptions from previous work, I argue that Italian has two phrasal domains: one diagnosed by *troncamento*, and the other diagnosed by stress retraction and final lengthening.

Following Match Theory, which argues for a restricted prosodic hierarchy in which the only suprafoot categories are ω, φ and ι, I analyse these two phrasal domains using recursive φ and prosodic subcategories (Ito & Mester 2007, 2012, 2013). Prosodic recursion has long been a subject of debate, however. Some researchers contend that recursive structures explain gradient phonetic phenomena and the application of domain-specific rules at the ω level (Booij 1996, Peperkamp 1997, Ito & Mester 2009, Bennett 2018), the φ level (Ito & Mester 2012, Elfner 2015, Elordieta 2015) and the ι level (Ladd 1986, Féry 2010, Myrberg 2013). However, many theories prohibit prosodic recursion. Early work in prosodic hierarchy theory banned recursion as a result of Strict Layering (Selkirk 1984, Nespor & Vogel 1986), a stance adopted in much subsequent work (Jackendoff & Pinker 2005, Vogel 2009, Schiering *et al.* 2010). Direct reference theories, which assume that phonological processes are conditioned by morphosyntactic structure without invoking the prosodic hierarchy, typically argue against recursion in phonology (Kaisse 1985, Seidl 2001, Pak 2008, Samuels 2009, Scheer 2012). This debate is difficult to settle empirically, in part because recursive approaches can often be reanalysed by introducing new categories in the prosodic hierarchy. Similarly, the data in this paper do not uniquely support recursion: a non-recursive account recognising two phrasal domains would be descriptively adequate. With this in mind, the paper addresses several theoretical reasons to pursue recursion, and asks what must hold true of Match Theory to account for Italian, while acknowledging that other frameworks would approach the data differently.

The paper is organised as follows. In §2, I introduce the three φ diagnostics described in previous work: *troncamento*, final lengthening and stress retraction. In §3, I show that the domain diagnosed by *troncamento* is distinct from that diagnosed by final lengthening and stress retraction, and that prosodic recursion provides one way of describing these domains. In §4, I propose a formulation of MATCHXP that is sensitive only to XPs with phonologically overt heads, and show how the structures proposed in §3 can be derived in Match Theory. In §5, I motivate the novel MATCHXP using data from quantifier phrases, ditransitives and Subject + Verb sequences. §6 concludes.

2 Italian φ phenomena

Several processes in Italian have been argued to be diagnostics of the right edge of φ-phrases: (non-application of) word-final vowel deletion (*troncamento*), (non-application of) stress retraction, and phrase-final vowel

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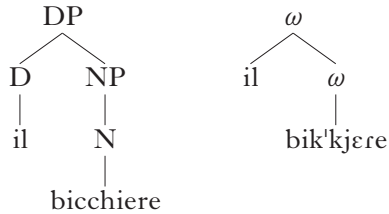
lengthening (Nespor & Vogel 1986, Ghini 1993, Meinschaefer 2005, 2006, 2009). In this section, I provide a brief overview of these processes, before presenting evidence in §3 that *troncamento* is a diagnostic of a different domain than final lengthening and stress retraction.

I assume that all lexical heads, such as nouns, verbs and adjectives, and some function words, such as quantifiers, are mapped to *ω*, while other function words, like prepositions and determiners, are proclitics (Ghini 1993). I assume that these proclitics form a recursive *ω* with their host, as in (3) (see Loporcaro 2000, Bennett 2018; Peperkamp 1996 has a contrasting view).[1]

(3)



'the glass'

2.1 *Troncamento*

Troncamento is a vowel-deletion process in Standard Italian; previous descriptions are based on *troncamento* in the Milanese (Nespor 1990) and Florentine (Meinschaefer 2005, 2006, 2009) varieties of Italian. In *troncamento*, unstressed word-final mid vowels (/e o/) are deleted after sonorants (/m n l r/) (Nespor 1990, Meinschaefer 2005). This restriction follows from Italian syllable structure, because only sonorants occur in codas (Itô 1986). This process is often optional, as in (4). When the adjective *migliore* is followed by the noun it modifies, its final vowel may either delete (4a) or surface (4b). (All examples are from Meinschaefer 2005, 2006, 2009, and the potential target of *troncamento* is in bold in the underlying form.)

(4) [la [[migliore]$_{AP}$ [scelta]$_{NP}$]$_{FP}$]$_{DP}$ è andare in centro
'the best choice is to go to the centre'

/la miʎˈʎoɾ**e** ˈʃelta .../ a. [la miʎˈʎoɾ ˈʃelta] b. [la miʎˈʎoɾe ˈʃelta]

Elsewhere, *troncamento* is prohibited. The same adjective, *migliore*, fails to undergo *troncamento* when located at the right edge of a DP, as in (5).[2]

[1] All IPA transcriptions are based on Krämer (2009). For an overview of my assumptions about the syntax of the examples in the paper, see §4.1.

[2] I assume an N-raising account of the noun–adjective order: APs are introduced in the specifier of a functional phrase FP, and N raises to the head of an agreement phrase AgrP dominating FP (Cinque 1994, Longobardi 2001, Dehé & Samek-Lodovici 2009).

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(5) [la [scelta [[migliore]$_{AP}$]$_{FP}$]$_{AgrP}$]$_{DP}$ è andare in centro
'the best choice is to go to the centre'
/la ˈʃelta miʎˈʎoɾe .../ a. *[la ˈʃelta miʎˈʎoɾ] b. [la ˈʃelta miʎˈʎoɾe]

In some constructions, *troncamento* is obligatory. For instance, it always applies to infinitives followed by a pronominal enclitic (6a) and to modal verbs followed by an infinitive (6b).[3]

(6) a. [trovare lo]$_{VP}$ 'find it'
/tɾovaɾe lo/ i. [tɾovaɾ lo] ii. *[tɾovaɾe lo]
b. [potere [fare]$_{VP}$]$_{TP}$ 'be able to do'
/poˈteɾe ˈfaɾe/ i. [ˈpoteɾ ˈfaɾe] ii. *[poˈteɾe ˈfaɾe]

Recent accounts argue that *troncamento* applies obligatorily within φ, and is blocked at φ boundaries (Meinschaefer 2005). This explains why *troncamento* applies obligatorily in (6a), since clitics phrase with their hosts, but is prohibited in cases like (5), in which the target word is phrase-final and therefore at a prosodic boundary. Under this analysis, non-application of *troncamento* is a diagnostic of φ boundaries. Optional application indicates the availability of multiple phrasings, as shown by the behaviour of the noun *colore* in (7). When the target word undergoes deletion, as in (7a), no φ boundary follows the target; when *troncamento* fails to apply and the vowel surfaces, as in (7b), a φ boundary follows.[4] (In all examples in this paper, a hyphen between proclitics and their hosts indicates that they belong to the same prosodic word.)

(7) [è [di [colore [[rosso]$_{AP}$]$_{FP}$]$_{AgrP}$]$_{PP}$]$_{TP}$ 'it is red'
/ɛ di koˈloɾe ˈɾosso/ a. (ɛ-di-koˈloɾ$_{\omega}$ ˈɾosso$_{\omega}$)$_{\varphi}$
b. (ɛ-di-koˈloɾe$_{\omega}$)$_{\varphi}$ (ˈɾosso$_{\omega}$)$_{\varphi}$

In addition to being sensitive to phrasing, *troncamento* is lexically restricted. Although the process appears to apply more commonly to verbs, Meinschaefer (2005) argues that the process treats all lexical categories equally, and that this apparent asymmetry is due to the fact that, while many verbs meet the segmental description for the process, few nouns and adjectives do. I adopt Meinschaefer's view. While *troncamento* is informally referred to as deletion, it can also be analysed as phonologically conditioned allomorphy, whereby only certain word forms have a

[3] See Cardinaletti & Shlonsky (2004) for a syntactic analysis of the lack of /e/ in modal + infinitive sequences. As noted by Meinschaefer (2006), their analysis does not extend to other instances of *troncamento*.

[4] *Troncamento* can create potential stress clashes, as in (7a). Meinschaefer (2005) cites two examples in which *troncamento* feeds retraction, as in (6b.i). She does not discuss retraction with respect to (4a) and (7a), and only gives her data in orthography. While retraction presumably applies in these examples, it is omitted from the transcriptions, for consistency with Meinschaefer.

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truncated alternant; for these forms, the truncated alternant is selected φ-medially (Meinschaefer 2009). This analysis captures the fact that the process is lexically restricted. For expository purposes, I follow the literature in describing the process as deletion.

2.2 Stress retraction

Stress retraction is another Italian φ process, typically found in northern varieties of the language. This process, also known as the rhythm rule, avoids stress clash between two words, ω_1 and ω_2, located within the same φ. When ω_1 bears final stress and ω_2 bears initial stress, the stress on ω_1 moves leftward (Nespor & Vogel 1986, Ghini 1993). Like *troncamento*, stress retraction is a diagnostic of φ boundaries: if retraction occurs, then no φ boundary exists after the target word; if retraction fails to apply, then a φ boundary separates the two potential stress-clashing words. All examples of the process are from Nespor & Vogel (1986) and Ghini (1993). In examples demonstrating (non-)application of retraction, stress is marked using the IPA symbol even in orthographic representations, to aid identification of potential clashes.

This process is illustrated in (8a), in which the clash between the words *pesche'rà* and *'granchi* is resolved by moving stress leftward to the first syllable of *'pescherà*, indicating that these two words belong to the same φ. In contrast, stress remains on the final syllable of *pesche'rà* in (8b), despite the potential clash between this word and the following word *'qualche*. The non-application of stress retraction indicates that the two words belong to separate φ's.

(8) a. [pesche'rà ['granchi]$_{DP}$]$_{TP}$ almeno, se non aragoste
'he will catch crabs at least, if not lobsters'
/peske'ɾa 'gɾaŋki/ ('peskeɾa$_{\omega}$ 'gɾaŋki$_{\omega}$)$_{\varphi}$

b. [pesche'rà ['qualche [granchio]$_{DP}$]$_{QP}$]$_{TP}$ almeno, se non aragoste
'he will catch some crab at least, if not lobsters'
/peske'ɾa 'kwalke 'gɾaŋkjo/ (peske'ɾa$_{\omega}$)$_{\varphi}$ ('kwalke$_{\omega}$ 'gɾaŋkjo$_{\omega}$)$_{\varphi}$

2.3 Final lengthening

The third φ phenomenon is final lengthening (Nespor & Vogel 1986, Ghini 1993). This process lengthens the stressed vowel of a φ-final word (typically the penultimate vowel), and, like the previous phenomena, has been argued to be a diagnostic of φ boundaries. A boundary occurs after all lengthened words, but no boundary occurs after words that fail to undergo lengthening, as in (9). In (9a), the stressed vowels of *mangiato* and *ripieni* are longer than in (b), indicating that they are φ-final in the former but not in the latter. The same holds for *pasticcini* in (b). All examples are from Nespor & Vogel (1986) and Ghini (1993). Potential targets of lengthening are underlined in the underlying forms, and lengthening is indicated by doubling of the vowel.

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(9) a. [Ho [mangiato [dei [pasticcini [[ripieni]$_{AP}$]$_{FP}$]$_{AgrP}$]$_{DP}$]$_{VP}$]$_{TP}$
'I ate some filled doughnuts.'
/o manˈʤa͡ato dei pastitˈʧi͡ini ɾiˈpj ɛ͡ni/
(o-manˈʤaato$_{\omega}$)$_{\varphi}$ (dei-pastitˈʧini$_{\omega}$ ɾiˈpjɛɛni$_{\omega}$)$_{\varphi}$

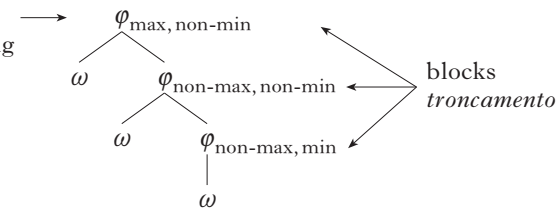
b. [Ho [mangiato [dei [pasticcini [[ripieni
[di [cioccolata]$_{NP}$]$_{PP}$]$_{AP}$]$_{FP}$]$_{AgrP}$]$_{DP}$]$_{VP}$]$_{TP}$
'I ate some doughnuts filled with chocolate.'
/o manˈʤa͡ato dei pastitˈʧi͡ini ɾiˈpj ɛ͡ni di ʧokkoˈla͡ata/
(o-manˈʤato$_{\omega}$ dei-pastitˈʧiini$_{\omega}$)$_{\varphi}$ (ɾiˈpjɛni$_{\omega}$ di-ʧokkoˈlaata$_{\omega}$)$_{\varphi}$

3 The proposal: recursive φ

Previous accounts have identified φ as the domain diagnosed by all three processes. If this hypothesis were correct, then we would expect all three processes to support the existence of boundaries in the same environments. I present novel data showing that this is not the case: a word can fail to undergo *troncamento*, indicating a boundary, without undergoing lengthening, indicating the *absence* of a boundary. This suggests that non-application of *troncamento* is a diagnostic of a different domain than lengthening. This conclusion is supported by the description of optional rule application in previous work: in the configuration [X [Y]$_{YP}$]$_{XP}$, the domain diagnosed by *troncamento* tends to contain a single prosodic word, while the domain diagnosed by retraction and lengthening tends to contain multiple prosodic words. This divergence requires a new analysis, in which *troncamento* is sensitive to a different domain. I propose that these two domains are different levels of recursive φ: φ and maximal φ (φ_{max}).

The proposal adopts Ito & Mester's (2012, 2013) prosodic subcategory theory. Under this approach, prosodic constituents can be recursive: a φ may dominate another φ, as in (10), and these φ's are organised into subcategories based on their dominance relations. The top φ in (10) is not dominated by any other φ, and is considered a maximal φ, while the φ at the bottom does not dominate any other φ, and is considered a minimal φ (φ_{min}). The intermediate φ is non-maximal and non-minimal, because it both dominates and is dominated by other φ's.

(10) blocks stress retraction
and
triggers final lengthening



The theory allows phonological processes to refer to subcategories of φ as their domain of application. I propose that *troncamento* is blocked by any φ:

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non-application of *troncamento* is a diagnostic of the right edge of a φ, and this φ may or may not be dominated by additional φ's. In contrast, non-application of stress retraction and application of final lengthening are diagnostics of the right edge of a φ_{max}. This proposal is summarised in Table I.

process	domain	diagnostic
troncamento: deletion of ω-final /e o/ after sonorants	φ	non-application: right φ edge after ω: $((\text{una-maggior}\mathbf{e}_{\omega})_{\varphi}\,(\text{sicureezza}_{\omega})_{\varphi})_{\varphi_{max}}$
stress retraction: retraction on ω_1 to resolve clash with ω_2	φ_{max}	non-application: right φ_{max} edge after ω: $(\text{vaccine'ròo}_{\omega})_{\varphi_{max}}\,(\text{'tutte}_{\omega}\ \text{le-sciimmie}_{\omega})_{\varphi_{max}}$
final lengthening: lengthening of stressed vowel of ω	φ_{max}	application: right φ_{max} edge after ω: $(\text{ho-mangiaato}_{\omega})_{\varphi_{max}}\,(\text{dei-pasticcini}_{\omega}$ $\text{ripieeni}_{\omega})_{\varphi_{max}}$

Table I
Boundary diagnostics.

In the following section, I compare the distribution of these processes, in order to motivate the existence of two domains. In line with the recursive analysis, boundaries diagnosed by application of final lengthening and non-application of stress retraction are labelled φ_{max}, while those diagnosed by non-application of *troncamento* are labelled φ.

3.1 Divergent diagnostics: evidence for different domains

Previous work on *troncamento* has not investigated the application of *troncamento* and final lengthening within the same examples. However, the claim that both non-application of *troncamento* and application of final lengthening are diagnostics of the same domain, φ, makes a testable prediction: any word that fails to undergo *troncamento* must always undergo lengthening, because lack of *troncamento* would indicate a φ boundary, and lengthening would apply at a φ boundary. Consider the N + PP sequence in (11). According to the single domain hypothesis, non-application of *troncamento* in the noun *bicchiere* would mean that *bicchiere* is at a right φ edge, and lengthening would obligatorily apply, due to the φ-final position of *bicchiere*. Stated differently, the single domain hypothesis predicts that lengthening is obligatory in the non-truncated form of words with a truncated alternant.

(11) [un [bicchiere [di [vino]$_{DP}$]$_{PP}$]$_{NP}$]$_{DP}$ 'a glass of wine'
/un bik'kiɛr**e** di 'vino/
a. $((\text{un-bik'kiɛre}_{\omega})_{\varphi}\,(\text{di-'viino}_{\omega})_{\varphi})_{\varphi_{max}}$
b. $(\text{un-bik'kiɛr}_{\omega}\,(\text{di-'viino}_{\omega})_{\varphi})_{\varphi_{max}}$
c. $^{?}(\text{un-bik'kiɛɛre}_{\omega})_{\varphi_{max}}\,(\text{di-'viino}_{\omega})_{\varphi_{max}}$

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This prediction is not borne out. Two native speakers of Italian from Milan report that three realisations are possible: in (11a), *troncamento* fails to apply to *bicchiere*, while lengthening only applies to *vino*, in (b), *troncamento* applies to *bicchiere*, and lengthening applies only to *vino*, and in (11c), *troncamento* fails to apply to *bicchiere*, while lengthening applies to both *bicchiere* and *vino*. Moreover, consultants indicated that the form in (11a) was the most natural, while (c), in which the non-truncated form undergoes lengthening, would be somewhat unusual, and reserved for a slow speech rate. The existence of (11a) poses problems for the single domain hypothesis, which predicts that lengthening should always apply to non-truncated forms, as in (c). The fact that lengthening does not obligatorily occur when *troncamento* is blocked suggests that the diagnostics are sensitive to different domains. Indeed, these structures can be accounted for under a recursive φ analysis, according to which *troncamento* is blocked by φ boundaries and lengthening applies at maximal φ boundaries. In (11a), *bicchiere* fails to undergo *troncamento*, because it is φ-final, but lengthening does not apply, because *bicchiere* is not at the edge of a φ_{max}. In (b), there is no right φ edge (maximal or otherwise) following *bicchiere*, so *troncamento* applies and final lengthening does not. In (c), *bicchiere* is φ_{max}-final, so *troncamento* is blocked and lengthening applies.

This pattern generalises beyond N + PP sequences: the same tripartite distinction is found in sequences of N + A (12a), A + N (12b) and V + DP (12c). The (a) forms, in which the non-truncated word does not undergo lengthening, are problematic for the single domain hypothesis, which predicts that only (b) and (c) should be possible. Clearly, non-application of *troncamento* does not entail application of final lengthening. The divergence of these diagnostics across various structures supports the existence of separate domains.

(12) a. [sul [mare [[azzurro]$_{AP}$]$_{FP}$]$_{AgrP}$]$_{PP}$ ‘on the blue sea’
/sul 'ma͟ɾ**e** ad'ʣu͟ro/ i. ((sul-'maɾe$_{\omega}$)$_{\varphi}$ (ad'ʣuuro$_{\omega}$)$_{\varphi}$)$_{\varphi_{max}}$
ii. (sul-'maɾ$_{\omega}$ (ad'ʣuuro$_{\omega}$)$_{\varphi}$)$_{\varphi_{max}}$
iii. ?(sul-'maare$_{\omega}$)$_{\varphi_{max}}$ (ad'ʣuuro$_{\omega}$)$_{\varphi_{max}}$

b. [una [[maggiore]$_{AP}$ [sicurezza]$_{NP}$]$_{FP}$]$_{DP}$ ‘better security’
/una mad'ʤo͟ɾ**e** siku'ɾe͟ttsa/
i. ((una-mad'ʤoɾe$_{\omega}$)$_{\varphi}$ (siku'ɾeettsa$_{\omega}$)$_{\varphi}$)$_{\varphi_{max}}$
ii. (una-mad'ʤoɾ$_{\omega}$ (siku'ɾeettsa$_{\omega}$)$_{\varphi}$)$_{\varphi_{max}}$
iii. ?(una-mad'ʤooɾe$_{\omega}$)$_{\varphi_{max}}$ (siku'ɾeettsa$_{\omega}$)$_{\varphi_{max}}$

c. [fare [delle [previsioni]$_{NP}$]$_{DP}$]$_{VP}$ ‘to make predictions’
/'fa͟ɾ**e** delle pɾevi'zjo͟ni/ i. (('faɾe$_{\omega}$)$_{\varphi}$ (delle-pɾevi'zjooni$_{\omega}$)$_{\varphi}$)$_{\varphi_{max}}$
ii. ('faɾ$_{\omega}$ (delle-pɾevi'zjooni$_{\omega}$)$_{\varphi}$)$_{\varphi_{max}}$
iii. ?('faaɾe$_{\omega}$)$_{\varphi_{max}}$ (delle-pɾevi'zjooni$_{\omega}$)$_{\varphi_{max}}$

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Additional evidence against the single domain hypothesis comes from the description of optional application of the three processes in the configuration $[X\ [Y]_{YP}]_{XP}$, in which X and Y are two prosodic words that optionally phrase together. Meinschaefer's (2006, 2009) corpus data suggest that the domain diagnosed by non-application of *troncamento* usually consists of a single prosodic word, with X and Y phrasing separately: $(X_\omega)_\varphi(Y_\omega)_\varphi$. In contrast, Ghini (1993) claims that the domain diagnosed by non-application of stress retraction and application of final lengthening tends to contain two prosodic words: $(X_\omega\ Y_\omega)_\varphi$. This divergence shows that the optionality of the processes is not comparable, supporting the claim that there are two different prosodic domains.

The clearest case of a difference between *troncamento* and the other processes comes from verb + complement sequences (V + Comp). In a corpus study of the Florentine dialect, Meinschaefer (2006, 2009) reported the rate of application of *troncamento* for infinitive verbs followed by a DP direct object or VP-internal PP. The sample was restricted to cases like (13), in which the target verb is followed by a single lexical word, e.g. $[X\ [Y]_{YP}]_{XP}$.

(13) è difficile [fare [delle distinzioni]$_{DP}$]$_{VP}$
'it is difficult to make distinctions'
/ˈfaɾ**e** delle distinˈtsjoni/ a. (ˈfaɾ$_\omega$ delle-distinˈtsjoni$_\omega$)$_\varphi$ (11%)
b. (ˈfaɾe$_\omega$)$_\varphi$ (delle-distinˈtsjoni$_\omega$)$_\varphi$ (89%)

This is exactly the environment in which *troncamento* is reported to be optional, so the rate of application in this configuration reveals whether the domain diagnosed by non-application of *troncamento* tends to include two words $(X_\omega\ Y_\omega)_\varphi$, i.e. no boundary follows X and deletion takes place, or just one word $(X_\omega)_\varphi(Y_\omega)_\varphi$, i.e. a boundary follows X and blocks deletion. Meinschaefer found that deletion, which involves the $(X_\omega\ Y_\omega)_\varphi$ structure, only occurs in 35 of 317 tokens (11%). She concludes that *troncamento* is relatively infrequent in this configuration. I interpret this finding as evidence that the $(X_\omega)_\varphi(Y_\omega)_\varphi$ phrasing, in which each word is parsed into its own phrase and *troncamento* is blocked, is more common.

Meinschaefer limited the corpus investigation to those words that undergo *troncamento*, meaning that the low rate of application cannot be ascribed to the fact that *troncamento* is lexically restricted. Instead, the rate reflects the fact that words with a truncated alternant typically surface in their full form. Thus *troncamento* is infrequent in this environment, even among words that can undergo the process.

In contrast, Ghini (1993) shows that V + Comp tend to phrase together in the domain diagnosed by stress retraction and final lengthening. Consider (14), in which a verb is followed by an unaccusative subject, a syntactic complement. Ghini notes that stress retraction applies 'without exception'. Further, he states that the phrasing in (14b), in which retraction fails to occur, is marked relative to the phrasing in (a). The domain

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diagnosed by non-application of stress retraction therefore shows the opposite tendency of the domain diagnosed by non-application of *troncamento*: here, the $(X_{\omega}\ Y_{\omega})_{\varphi}$ phrasing is more common.

(14) [arrive'rà ['Gianni]$_{DP}$]$_{TP}$ 'Gianni will arrive'
/arive'ra 'ʤanni/ a. (a'rivera$_{\omega}$ 'ʤanni$_{\omega}$)$_{\varphi_{max}}$
b. ?(arive'ra$_{\omega}$)$_{\varphi_{max}}$ ('ʤanni$_{\omega}$)$_{\varphi_{max}}$

These examples present a paradox under the single domain hypothesis, which states that non-application of *troncamento* and non-application of stress retraction are diagnostics of the same domain. If non-application of *troncamento* is our diagnostic, we expect $(X_{\omega})_{\varphi}(Y_{\omega})_{\varphi}$ to be the more common phrasing of $[X\ [Y]_{YP}]_{XP}$. If we use stress retraction as our diagnostic, we reach the opposite conclusion: $(X_{\omega}\ Y_{\omega})_{\varphi}$ is more common. This poses challenges for an account that holds all processes to be diagnostic of one and the same kind of φ.

This paradox generalises beyond the V + Comp cases. In Ghini's (1993) study of stress retraction and lengthening, he reports that the domain diagnosed by these processes tends to include two prosodic words whenever possible. Ghini claims that 'broader, i.e. 'average weight', phonological phrases', which are φ's that contain two prosodic words, are 'much more common' than φ's that contain a single prosodic word (1993: 77). Elsewhere, he describes Italian as having 'a strong tendency to avoid … phonological phrases formed by a single phonological word' (1993: 52).

Although phrasings in which each φ contains a single word are possible, they are 'highly marked' and require a slow speech rate or 'discourse factors such as focus' (1993: 57). Ghini concludes that 'restructured moderato φ's', containing two ω's, are 'the default phrasing', while phrasings with 'adagio 'non-restructured'' φ, which contain one ω, 'are by far more marked' (1993: 59). Thus the diagnostics show that $[X\ [Y]_{YP}]_{XP}$ most often maps to $(X_{\omega}\ Y_{\omega})_{\varphi}$.

As summarised in Table II, these facts would present a paradox if all three processes were sensitive to the same prosodic boundary: stress retraction and lengthening lead us to believe that $(X_{\omega}\ Y_{\omega})_{\varphi}$ is the more common

diagnostic	phrasing expected to be most common
stress retraction	$(X_{\omega}\ Y_{\omega})_{\varphi}$
final lengthening	$(X_{\omega}\ Y_{\omega})_{\varphi}$
troncamento	$(X_{\omega})_{\varphi}\ (Y_{\omega})_{\varphi}$

Table II
Divergent diagnostics for $[X\ [Y]_{YP}]_{XP}$.

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phrasing for $[X\ [Y]_{YP}]_{XP}$, while *troncamento* leads us to believe that $(X_{\omega})_{\varphi}(Y_{\omega})_{\varphi}$ is more common. The single domain analysis cannot handle this paradox, because diagnostics for the same domain should converge on the same conclusions.

This paradox disappears under a recursive analysis in which *troncamento* is sensitive to φ while stress retraction and lengthening are sensitive to φ_{max}. Under this analysis, the structure $[X\ [Y]_{YP}]_{XP}$ can map onto the three prosodic parses in Table III; note that parses (a)–(c) are parallel to the parses in (11) and (12). In parse (a), both words constitute separate φ's, but are phrased together in a single φ_{max}. *Troncamento* on X is blocked, due to the following φ boundary, but stress retraction applies and lengthening fails to apply to X, due to the lack of an immediately following φ_{max} boundary. This represents the most common phrasing: the domain diagnosed by non-application of *troncamento*, φ, contains one ω, while the domain diagnosed by retraction and lengthening, φ_{max}, contains two. Parse (b) does not place X into its own φ; *troncamento* applies due to the lack of a right φ boundary. This phrasing is less common, since *troncamento* is relatively infrequent in this environment. Finally, parse (c) places each word in a separate φ_{max}. In this case, stress retraction is blocked, and lengthening applies in X due to the φ_{max} boundary; *troncamento* is also blocked, because φ_{max} is a φ. This represents the exceptional case, where the domain diagnosed by retraction and lengthening consists of a single prosodic word at a slow rate or under focus. Together, these three phrasings allow for 'optional' application of all three processes, while capturing the tendency for the domain diagnosed by *troncamento* to contain one ω.

	parse	stress retraction blocked on X?	final lengthening applied to X?	*troncamento* blocked on X?	distribution
a.	$((X_{\omega})_{\varphi}\,(Y_{\omega})_{\varphi})_{\varphi_{max}}$	no	no	yes	most common
b.	$(X_{\omega}\,(Y_{\omega})_{\varphi})_{\varphi_{max}}$	no	no	no	less common
c.	$(X_{\omega})_{\varphi_{max}}\,(Y_{\omega})_{\varphi_{max}}$	yes	yes	yes	least common (slow rate; focus)

Table III
Prosodic parses of $[X\ [Y]_{YP}]_{XP}$.

Finally, this analysis accounts for the generalisation that non-application of stress retraction and application of final lengthening are diagnostics of the same domain (Nespor & Vogel 1986, Ghini 1993). As shown in

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(15a), these diagnostics converge: lengthening applies to the verb *vaccine'rò*, and stress retraction fails to apply, both of which indicate a boundary. In contrast, in (15b), lengthening fails to apply and retraction occurs, diagnosing the absence of a boundary.

(15) a. vaccine'rò 'tutte le scimmie 'I will vaccinate all the monkeys'
/vatʧine'ɾo̲ 'tu̲tte le 'ʃi̲mmje/
(vatʧine'ɾoo$_{\omega}$)$_{\varphi_{max}}$ ('tutte$_{\omega}$ le-'ʃiimmje$_{\omega}$)$_{\varphi_{max}}$

b. vaccine'rò 'tutte le scimmie del mondo
'I will vaccinate all the monkeys in the world'
/vatʧine'ɾo̲ 'tu̲tte le 'ʃi̲mmje del 'mo̲ndo/
(vat'ʧineɾo$_{\omega}$ 'tuutte$_{\omega}$)$_{\varphi_{max}}$ (le-'ʃimmje$_{\omega}$ del-'moondo$_{\omega}$)$_{\varphi_{max}}$

To summarise, I have provided new data showing that non-application of *troncamento* does not entail application of final lengthening, *contra* the predictions of the hypothesis that these diagnostics are sensitive to the same domain. I have also identified an apparent paradox for any account positing only one level of φ, to which all three processes should be sensitive: using non-application of *troncamento* as a φ diagnostic suggests that the phrasing $(X_{\omega})_{\varphi}(Y_{\omega})_{\varphi}$ is more common than $(X_{\omega}\ Y_{\omega})_{\varphi}$ in the configuration $[X\ [Y]_{YP}]_{XP}$, while non-application of stress retraction and application of final lengthening suggest the opposite. These findings render the position that all three processes diagnose the same domain untenable. To resolve this potential paradox, I have appealed to recursive φ: *troncamento* is sensitive to all φ boundaries, while stress retraction and final lengthening are sensitive to φ_{max} boundaries. In the next section, I sketch an alternative account, which captures the data by introducing a new category into the prosodic hierarchy.

3.2 Alternatives to recursion

Non-recursive approaches recognise that *troncamento* is sensitive to a smaller domain than stress retraction and final lengthening, but explain this divergence by appealing to separate categories on the prosodic hierarchy. One possibility is to assert that *troncamento* is sensitive to φ boundaries, while stress retraction and final lengthening are sensitive to ι boundaries, the next category on the prosodic hierarchy. However, stress retraction and lengthening cannot be ι diagnostics, because their distribution differs from that of *gorgia toscana*, a spirantisation process that is blocked at ι boundaries (Nespor & Vogel 1986). As shown in (16a), *gorgia toscana* applies between a subject and a verb: initial /k/ in the verb *costruiscono* surfaces as [h], diagnosing the absence of an ι boundary after the subject. If ι were also the domain of stress retraction and final lengthening, then retraction would apply between a subject and a verb, and lengthening would not occur in a preverbal subject, because there would be no ι boundary after the subject. In fact, the opposite is true: in (16b),

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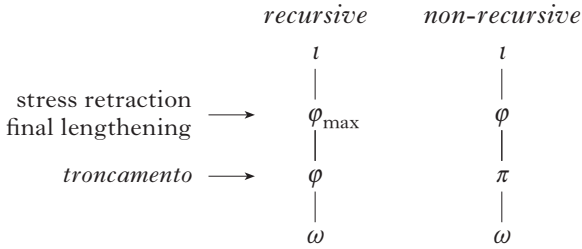
the subject *Pa'pà* undergoes lengthening and does not undergo retraction, despite a potential clash (Ghini 1993). Application of lengthening and non-application of retraction are diagnostics of the *presence* of a post-subject boundary; this divergence from *gorgia toscana* indicates that retraction and lengthening are not ι diagnostics. Moreover, the previous examples show that these two processes are sensitive to clause-internal boundaries, which would be unexpected if they were ι diagnostics.

(16) a. $[[\text{gli uccelli}]_{DP}\ [\text{costruiscono}\ [\text{i nidi}]_{DP}]_{TP}]_{FP}$
'birds construct nests'
/ʌi utˈʧɛlli kostɾuˈiskono i ˈnidi/
$\{$ʌi utˈʧɛlli hostɾuˈiskono i ˈnidi$\}_{\iota}$

b. $[[\text{Pa'pà}]_{DP}\ [\text{'mangia}]_{TP}]_{FP}$ 'Daddy is eating'
/paˈpa̲ ˈma̲nʤa/
$(\text{pa'paa}_{\omega})_{\varphi_{max}}(\text{'maanʤa}_{\omega})_{\varphi_{max}}$ *$(\text{'papa}_{\omega}\ \text{'maanʤa}_{\omega})_{\varphi_{max}}$

Another approach would avoid recursion by positing a new category in the prosodic hierarchy. This analysis would index stress retraction and final lengthening to φ and *troncamento* to a new category – call it π. These two approaches are schematised in (17).

(17) *Competing approaches to multiple phrasal domains*



The non-recursive alternative would be empirically adequate: the Italian data in the preceding section require two phrasal domains, but these domains need not be of the same category. However, I argue that there are theoretical reasons to prefer recursion. First, it is unclear what the domain π should be. One contender is the clitic group, which consists of ω and any dependent clitics (Nespor & Vogel 1986). Indeed, it has been argued that *troncamento* applies obligatorily within the clitic group (Nespor 1990). However, subsequent work has challenged the clitic group's existence (Zec & Inkelas 1991, Booij 1996, Peperkamp 1996). Zec & Inkelas (1991) provide cross-linguistic data showing that clitics attach not only to ω, but also to φ and ι, and Peperkamp (1996) uses variation in Italian dialects to argue that clitics can be prosodified in various ways: by adjunction to ω, incorporation into ω or attachment to φ. These authors contend that the non-uniform behaviour of clitics is evidence against the clitic group as a distinct constituent between ω and φ.

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Peperkamp also shows that analyses invoking the clitic group can be reanalysed without reference to this constituent. Finally, in the majority of the examples considered thus far, *troncamento* occurs between two independent ω's, which constitute a domain larger than the clitic group, and the process is sensitive to XP boundaries. As argued by Meinschaefer (2005, 2006), these facts suggest that *troncamento* is sensitive to a phrasal domain. Thus, identifying π with the clitic group is problematical.

One could still introduce a category π, provided that this category is larger than a clitic and its host. This analysis runs into a problem noted frequently in the literature: positing new domains leads to a proliferation of categories, without any principled limit on the number of categories we expect to find and no explanation of where they come from (Ito & Mester 2007, 2012, 2013, Selkirk 2009, among others). Ito & Mester (2012, 2013) provide an overview of this problem in Japanese, in which two phrasal domains have traditionally been recognised: the major phrase and the minor phrase. Ito & Mester point out that using multiple categories is problematic for the hypothesis that there is a straightforward correspondence between syntactic and prosodic constituents: while the major phrase corresponds to XPs, the minor phrase is defined in phonological terms, and lacks a clear syntactic correspondent. Abandoning the requirement that all suprafoot categories have a syntactic correspondent opens the door to more categories, with no clear limit on the number of categories. Indeed, Shinya *et al.* (2004) introduce a third level for Japanese, the superordinate minor phrase. This proliferation of categories makes cross-linguistic comparison difficult, because categories are often proposed on a language-specific basis. Ito & Mester argue that an analysis employing recursive φ can account for the data with a single category, while avoiding these issues.

Similar problems arise with π in Italian: it is unclear whether there are limits on the number of categories and whether the same categories should exist in other languages. Adding a domain also fails to explain why both π and φ are sensitive to XP boundaries; this fact remains a mere coincidence. In contrast, recursion provides an explanation: recursive φ are built on nested XPs. While particular levels of φ may exhibit unique properties, they are constructed on the same kind of syntactic object, so it is unsurprising that different levels coincide with XP boundaries. Moreover, the suprafoot prosodic hierarchy is restricted to the syntactically grounded categories ι, φ and ω: there is a principled limit on the number of categories, with a straightforward explanation of where they come from.

These arguments are admittedly theoretical, and proponents of other frameworks could counter that the present approach has its own theoretical issues. While recursion avoids category proliferation, the need to reference prosodic subcategories increases the complexity of the constraint set. I have also assumed that a restricted prosodic hierarchy is a desirable component of the theory; however, direct reference theorists eschew the idea of a prosodic hierarchy (Kaisse 1985, Pak 2008, Samuels 2009, Scheer 2012),

and are unlikely to be convinced by these arguments. Still, the arguments are worth reviewing as a reminder of what is at stake in the debate over recursion, and to motivate the use of Match Theory in this paper. The recursive treatment of Italian should be taken as a proof of concept, rather than the only way to approach these data, and alternative analyses would likely be descriptively adequate.

To summarise, a recursive analysis accounts for the fact that *troncamento* is diagnostic of a different domain than final lengthening and stress retraction. In the rest of the paper, I analyse Italian in Match Theory. Italian has previously been analysed in edge-based theories using Align and Wrap constraints (Samek-Lodovici 2005, Truckenbrodt 2007, Dehé & Samek-Lodovici 2009). These accounts have assumed that Italian lacks φ-recursion, but the framework is compatible with recursion, and could potentially account for the data presented here. Here, I pursue an account in Match Theory, which predicts the existence of prosodic recursion due to the tight correspondence between XPs and φ. I argue for a novel version of MATCHXP, according to which only XPs with phonologically overt heads are mapped to φ.

4 Italian φ-phrasing in Match Theory

In this section, I analyse Italian in Match Theory. I begin by reviewing the basic assumptions of Match Theory and by introducing a standardly assumed set of Match and markedness constraints. I then motivate a constraint ranking for Italian, showing that this framework straightforwardly derives the recursive structures proposed in §3.

4.1 Match constraints and syntactic preliminaries

Match Theory advocates a direct correspondence between syntactic and prosodic elements: syntactic words, X^0, are mapped onto prosodic words, ω, syntactic phrases, XP, are mapped onto phonological phrases, φ, and syntactic clauses are mapped onto intonational phrases, ι. This mapping is enforced through a family of Match constraints. One class of Match constraints, the syntax-to-prosody constraints, requires that a syntactic constituent α in the syntactic representation stand in a correspondence relationship (McCarthy & Prince 1995) with a prosodic constituent π in the phonological representation (Selkirk 2011); corresponding constituents must also dominate the same terminal nodes, as will be explained shortly (Elfner 2012, 2015). At the phrasal level, MATCHXP, defined in (18a), penalises a structure in which an XP in the syntax is not matched by a corresponding φ in the prosodic representation. Another class, the prosody-to-syntax constraints, penalises structures in which a prosodic constituent π has no correspondent α in the syntax. For phrases, MATCHφ, defined in (18b), assigns violations to structures containing φ

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that are not motivated by the syntax. In a departure from previous work, I propose that only XPs with phonologically overt heads are visible to MATCHXP and MATCHφ; this formulation will be developed below.

(18) a. MATCHXP$_{\text{OvertlyHeaded}}$-to-φ (MATCHXP$_{\text{OH}}$)
A phrase XP in syntactic constituent structure that has a phonologically overt head is matched by a corresponding phonological phrase φ in phonological representation. Assign one violation for each overtly headed XP not matched by a corresponding φ.

b. MATCHφ-to-XP$_{\text{OvertlyHeaded}}$ (MATCHφ_{OH})
A phonological phrase φ in phonological representation is matched by a corresponding phrase XP in syntactic constituent structure that has a phonologically overt head. Assign one violation for each φ not matched by a corresponding overtly headed XP.

As discussed in §1, there is an ongoing debate over whether Match constraints distinguish lexical and functional elements. Selkirk & Lee's (2017) MATCHPHRASE$_{\text{Lex}}$ incorporates Truckenbrodt's (1999) Lexical Category Condition, and only sees XPs with phonologically overt lexical heads. However, Elfner (2012, 2015) and Tyler (2019) argue that functional phrases like ΣP, TP and coordinated phrases are visible to MATCHXP, suggesting that the lexical/functional distinction is too strong, at least in some languages. At the word level, Tyler argues that the lexical/functional distinction should be abandoned, because function words have idiosyncratic behaviour and do not constitute a uniform class; for instance, he argues that the demonstrative determiner *that* and the preposition *via* are prosodic words, despite being functional. This work casts doubt on the strongest version of the lexical/functional distinction.

The proposed formulation of MATCHXP$_{\text{OH}}$ preserves the second part of the Lexical Category Condition, which requires XPs to have a phonologically overt head, while abandoning the lexical requirement. This definition attempts to reconcile two ideas: (i) not all XPs are mapped to φ's, and our theory should predict which XPs will be matched, and (ii) the lexical/functional distinction is a potentially problematic way to delimit this set of XPs, because it is too aggressive in ruling out all functional XPs. I assume that all syntactic terminals with phonological content, including functional heads that are clitics, are considered overt, and their maximal projection is therefore visible to MATCHXP$_{\text{OH}}$. Only syntactic terminals that have no phonological content, or that have undergone movement leaving behind a trace, are considered silent. This has important consequences for structures in which movement has taken place. In (19), the head of YP, *y*, has raised to W. According to Elfner's (2012, 2015) MATCHXP, which matches any XP dominating a unique set of terminal nodes, YP should be matched, because it dominates the unique set {*x*, *z*}. However, MATCHXP$_{\text{OH}}$ will ignore YP, because its head is a trace,

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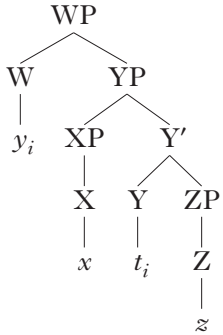
which is silent. Note that the same result would obtain under the copy theory of movement (Chomsky 1995), provided that lower copies are deleted before the syntactic structure is made available to the phonology. Under this view, the head of YP would be the deleted (and therefore silent) copy, and YP would be invisible to MATCHXP$_{OH}$. At present, I assume the newly proposed MATCHXP$_{OH}$, and I will explicitly argue in favour of this formulation in §5.

(19)



A reviewer notes a possible issue: MATCHXP$_{OH}$ requires the phonology to distinguish overtly headed phrases from those with silent heads. This might imply that syntactic labels are available to phonology, so that the phonology 'knows' whether, for example, a VP contains an overt head V. This is potentially problematic under the common assumption that syntactic labels are unavailable to phonology. One possibility, suggested by the reviewer, is that syntactic labels are replaced by arbitrary, syntactically neutral labels (e.g. A, B, C). For instance, VP and V could be replaced by the labels BP and B, allowing the phonology to check whether a phrase BP contains an overt head B without giving it access to syntactic labels. Under this view, (19) would be an example of the input to phonology: phrase structure is provided, labels are arbitrary and lower copies have been deleted. Other solutions are possible, including relaxing the assumption that syntactic labels are never available to phonology. The exact mechanism by which overtly headed XPs are identified is incidental to my main point: this is the set of XPs that must be matched.

Another question concerns what it means for an XP to 'match' a φ. I adopt Elfner's (2012, 2015) definition, which states that a φ matches an XP if the φ dominates all and only the phonological exponents of the terminal nodes of XP. This is demonstrated in (20). The syntactic structure in (20a) contains three phrases; each phrase dominates a unique set of terminal nodes: XP dominates $\{x, y, z\}$, YP dominates $\{y, z\}$ and ZP dominates $\{z\}$. The structure in (20b) is perfectly matched: each φ dominates the same terminal nodes as its syntactic correspondent. In contrast, (20c)

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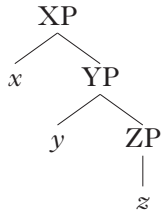
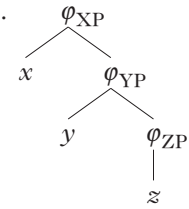
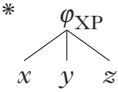
violates MATCHXP, because YP and ZP lack φ correspondents. Although φ_{XP} dominates all of the terminal nodes dominated by YP and ZP, this does not count as matching, because φ_{XP} does not contain *only* those terminal nodes dominated by YP and ZP. Note that MATCHXP is not equivalent to WRAPXP, which requires each XP to be contained in a φ (Truckenbrodt 1999). WRAPXP would be satisfied by (20c), because the terminal nodes dominated by YP and ZP are contained in φ_{XP}.

(20) a. 

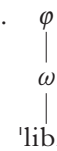
b. 

c. * 

Following much work in Match Theory (Ito & Mester 2013, 2019, Elfner 2015, Selkirk & Lee 2015, Cheng & Downing 2016), I assume that the syntax is available to phonology only after the entire derivation is complete. This differs from phase-based spell-out approaches, in which prosody is built cyclically throughout the derivation (Dobashi 2003, Wagner 2005, Ishihara 2007, Kratzer & Selkirk 2007, Newell & Piggott 2014). However, Match Theory and phase-based spell-out are not incompatible, and some analyses adopt both (Selkirk 2009, Elfner 2012).

I also adopt bare phrase structure (Chomsky 1995), which raises an interesting issue when a syntactic element is both maximal and minimal, such as an NP consisting of a single word, as in (21a) (Elfner 2015, Bennett *et al*. 2016). As a minimal projection, the noun *libri* should be mapped to ω by MATCHWORD. Yet, as a maximal projection, the NP *libri* should be mapped to φ by MATCHXP. I assume that elements like *libri* are visible to both MATCHWORD and MATCHXP and that the preferred configuration is (21b), with both ω and φ.

(21) a. 

b. 

'books'

With these assumptions in place, let us consider how MATCHXP_{OH} would parse an Italian SVO sentence, for which I assume the clause structure in (22).

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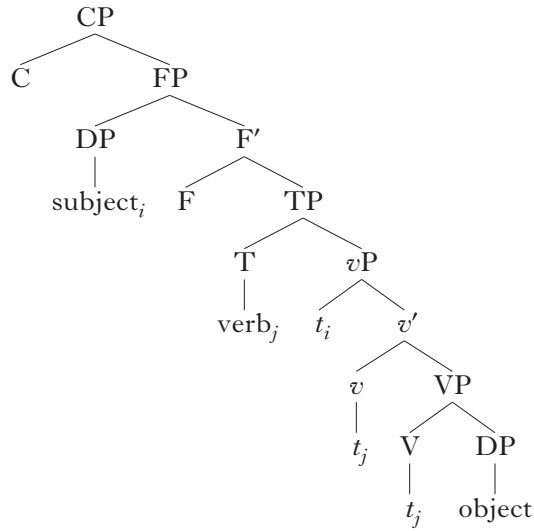
(22)



This clause structure is relatively minimal. Following previous work on Italian syntax, one could adopt a more articulated structure, by decomposing CP and TP into a series of functional projections such as ForceP, TopP and AgrP (e.g. Pollock 1989, Belletti 1990, 1994, Rizzi 1997, Cinque 1999). Most of these projections have silent heads, which will render them invisible to MATCHXP$_{OH}$, and irrelevant for the syntax-to-prosody mapping. I omit these projections from the syntactic representations for expository purposes, while noting that a more articulated structure is compatible with the analysis.

Second, I assume that the verb raises to T (Belletti 1990, 1994, Cardinaletti 1997, Samek-Lodovici 2005, Dehé & Samek-Lodovici 2009). This is supported by the appearance of the finite verb to the left of floated quantifiers and various adverbs (Belletti 1990, 1994).

Third, I assume that the subject raises to the specifier of a functional projection above TP (Cardinaletti 1997, 2004, Poletto 2000, Rizzi 2005, Frascarelli 2007, Dehé & Samek-Lodovici 2009). As observed by Dehé & Samek-Lodovici, previous analyses agree that the subject is in a higher functional projection than the verb; these analyses diverge primarily in whether the subject is in the inflectional domain (Cardinaletti 1997, 2004, Rizzi 2005) or the C-domain (Poletto 2000, Frascarelli 2007). This subject position is motivated by the finding that the subject and the verb can be separated by parentheticals, sentential adverbs and subordinate clauses; the reader is referred to the cited works for additional arguments. Because the precise location is unimportant for present purposes, I label this projection FP; candidates include Cardinaletti's (2004) SubjP and Frascarelli's (2007) ShiftP. The important point is that the subject is outside of TP, which will be crucial in explaining why the subject and verb phrase separately in §5.2.2.

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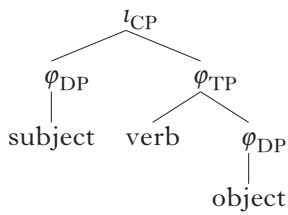
For the SVO syntactic input in (22), MATCHXP$_{OH}$ will prefer the prosodic output in (23). Assuming that the subject and object are DPs with overt heads, they will each be mapped to a φ, as will any overtly headed XPs within these DPs. TP is mapped to a φ because the verb has raised to T, making the head of TP overt. FP, *v*P and VP are invisible to MATCHXP$_{OH}$: FP has a silent head, while *v*P and VP are headed by a trace (or deleted copy), and MATCHXP$_{OH}$ does not build any φ's corresponding to these XPs. Since FP is phonologically invisible, there is no φ containing S, V and O. The invisibility of *v*P and VP prevents vacuous recursion: *v*P and VP each dominate only O, and, by ignoring these XPs, MATCHXP$_{OH}$ avoids having three φ's dominate O, e.g. $(((O)_{\varphi})_{\varphi})_{\varphi}$. Note that MATCHCLAUSE maps CP to ι (Ito & Mester 2013, Ishihara 2014, Bennett *et al*. 2016). A question that cannot be answered here is whether an overtly headed CP is visible to both MATCHCLAUSE and MATCHXP. We might expect CP to be visible to MATCHXP when it has an overt head, because CPs are maximal projections, but it may be the case that CPs are only visible to MATCHCLAUSE. I set this question aside, and refer the reader to Bennett *et al*. (2016) for further discussion.

(23)



4.2 Prosodic markedness constraints

While the structure in (23) illustrates the syntax–prosody mapping favoured by MATCHXP$_{OH}$, higher-ranked prosodic markedness constraints lead to syntax–prosody non-isomorphism. First, there is a cross-linguistic preference for prosodic constituents to be binary (e.g. Ghini 1993, Selkirk 2000, 2011, Ito & Mester 2007). Binarity constraints capture this tendency, but there are different ways to evaluate binarity. Adopting the terminology of Bellik & Kalivoda (2016), BRANCH-COUNTING BINARITY requires a prosodic constituent to have two daughters of any category, while LEAF-COUNTING BINARITY requires a constituent to dominate two nodes of a particular category, even if these nodes are not immediately dominated. In (24a), φ_1 is binary branching because it has two daughters, ω_1 and φ_2. However, φ_1 is ternary when counting leaves, because it dominates three ω's: ω_1, ω_2 and ω_3. Similarly, (24b) is binary branching, but is unary according to leaf-counting, because it only dominates one ω. Leaf-counting binarity is adopted here in order to penalise structures like (24a), which will be necessary in §4.3. (See Selkirk 2011, Ito & Mester 2013 and Ishihara 2014 for additional analyses employing leaf-counting.)

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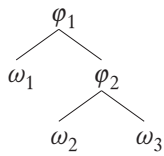
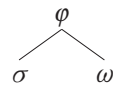
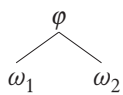
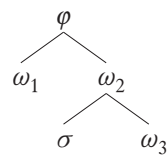
(24) a. 

b. 

Another issue arises when evaluating leaf-counting binarity in recursive structures. In (25a), φ is unambiguously binary: φ has two daughters, both of which are ω. The structure in (25b), in which a syllable has procliticised onto ω_3, creating a recursive ω, is less straightforward. Should ω_2 and ω_3 count once towards binarity, since they are segments of the same complex word, or twice, because there are two ω nodes?

(25) a. 

b. 

Intuitively, leaf-counting constraints evaluate the number of independent words, and creating a recursive ω with a clitic is not equivalent to having two separate prosodic words. Moreover, Ghini (1993) shows that, in Italian, a ω without clitics behaves in the same way as one containing clitics: both count as one ω. For this reason, leaf-counting must be defined such that the recursive ω in (25) is counted once, such that the φ is considered binary. This can be accomplished by counting the number of maximal ω's dominated by φ. This ensures that only *independent* ω's, e.g. ω_1 and ω_2, but not layers of a single recursive ω, e.g. ω_3, count toward binarity. The constraints $\text{BIN}_{\text{min}}(\varphi)$ and $\text{BIN}_{\text{max}}(\varphi)$ are defined in (26a) and (26b). The former penalises a φ that does not contain at least two ω's, while the latter penalises one that contains more than two ω's. $\text{BIN}_{\text{max}}(\iota)$, which penalises an ι dominating more than two φ's, will also be relevant, and is defined in (26c).

(26) a. $\text{BIN}_{\text{min}}(\varphi)$
Assign one violation for every φ that dominates fewer than two maximal (i.e. independent) ω's.

b. $\text{BIN}_{\text{max}}(\varphi)$
Assign one violation for every φ that dominates more than two maximal (i.e. independent) ω's.

c. $\text{BIN}_{\text{max}}(\iota)$
Assign one violation for every ι that dominates more than two maximal (i.e. independent) φ's.

d. StrongStart
Assign one violation for every prosodic constituent whose leftmost daughter is lower in the prosodic hierarchy than the sister to its immediate right.

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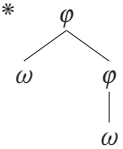
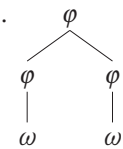
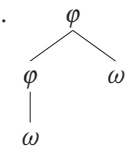
Another constraint, StrongStart, militates against weak elements at the beginning of prosodic constituents (Selkirk 2011, Elfner 2012, Bennett *et al*. 2016). As defined in (26d), StrongStart assigns violations to prosodic constituents whose leftmost daughter is lower on the prosodic hierarchy than the sister node to its immediate right (Elfner 2012). This constraint penalises structures like (27a), in which ω is the leftmost daughter of φ, and weaker than its sister φ, but allows structures like (27b), in which both sisters are φ, and (27c), in which the leftmost daughter φ is stronger than its sister ω.

(27) a. * 

b. 

c. 

This constraint set can capture many generalisations about Italian. The interplay of $\text{Bin}_{\text{min}}(\varphi)$ and StrongStart derives the optionality of *troncamento*, while $\text{Bin}_{\text{max}}(\varphi)$ limits the amount of recursion we find, allowing for departures from the syntax.

4.3 Upper limits on φ size

Various structures show that Italian φ's consist of at most two ω's, resulting in syntax–prosody non-isomorphism.[5] Consider the minimal pair in (28) (from Ghini 1993). In (28a), the noun *entrata* is followed by a PP consisting of a single ω, and only the last noun *fiera* undergoes final lengthening. This suggests that *entrata* and the PP are in the same φ_{max}. However, in (b), the PP contains two ω's. Here, the first and third nouns, *entrata* and *Milano*, undergo lengthening, while *fiera* does not. This suggests the phrasing in (28b), in which *entrata* is in its own φ_{max} and the PP phrases separately.[6]

(28) a. [l' [entrata [alla [fiera]$_{\text{NP}}$]$_{\text{PP}}$]$_{\text{NP}}$]$_{\text{DP}}$ 'admission to the fair'
/lenˈtr̲ata alla ˈfj̲ɛra/ (lenˈtrata$_{\omega}$ alla-ˈfjɛɛra$_{\omega}$)$_{\varphi_{\text{max}}}$

b. [l' [entrata [alla [fiera [di [Milano]$_{\text{NP}}$]$_{\text{PP}}$]$_{\text{NP}}$]$_{\text{PP}}$]$_{\text{NP}}$]$_{\text{DP}}$
'admission to the fair of Milan'
/lenˈtr̲ata alla ˈfj̲ɛra di miˈl̲ano/
(lenˈtraata$_{\omega}$)$_{\varphi_{\text{max}}}$ (alla-ˈfjɛra$_{\omega}$ di-miˈlaano$_{\omega}$)$_{\varphi_{\text{max}}}$

Following Ghini (1993), I assume that the DP in (28b) is broken up into two φ_{max}'s, because Italian φ cannot exceed two ω's; this is enforced by

[5] This binarity limit is enforced at average speech rates, but φ's containing three ω's are possible at a fast rate (Ghini 1993). I analyse the prosodic structures compatible with the average rate, which constitute the majority of Ghini's data.

[6] In subsequent examples of retraction and lengthening, I only show φ_{max} boundaries, because the internal φ structure is irrelevant when *troncamento* is not involved.

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$\textsc{Bin}_{max}(\varphi)$. As shown in (29), $\textsc{Bin}_{max}(\varphi)$ rules out candidate (c), which maps the entire DP to a φ. In fact, $\textsc{Bin}_{max}(\varphi)$ must be undominated, because the perfectly matched candidate (c) fares better than the winner on all other constraints. By respecting $\textsc{Bin}_{max}(\varphi)$, candidate (a) violates both $\textsc{Match}XP_{OH}$, because DP_1 is not matched, and $\textsc{Match}\varphi_{OH}$, because *entrata* occupies its own φ, despite not constituting an XP. This is a clear case where markedness constraints force non-isomorphism. Candidate (b) shows that $\textsc{Match}XP_{OH}$ must be ranked above $\textsc{Bin}_{min}(\varphi)$: it has one less unary φ than (a), but fails to match DP_1 and PP_1. Finally, there is no evidence for the relative ranking of $\textsc{Match}\varphi_{OH}$ and either $\textsc{Match}XP_{OH}$ or $\textsc{Bin}_{min}(\varphi)$.

(29)

[l' [entr̲ata [alla [fi̲era [di [Mil̲ano]$_{DP_2}$]$_{\mathbf{PP}_2}$]$_{NP}$]$_{\mathbf{PP}_1}$]$_{NP}$]$_{\mathbf{DP}_1}$	$\textsc{Bin}_{max}(\varphi)$	$\textsc{Match}$ XP_{OH}	$\textsc{Match}$ φ_{OH}	$\textsc{Bin}_{min}(\varphi)$
☞ a. (l-entraata) (alla-fiera (di-Milaano))		*$_{DP_1}$	*	**
b. (l-entrata alla-fieera) (di-Milaano)		*$_{DP_1, PP_1}$!	*	*
c. (l-entrata (alla-fiera (di-Milaano)))	*!			*

Note that certain XPs will never be matched, due to the assumption that function words procliticise onto their host. For instance, the preposition *alla* procliticises onto *fiera*, preventing the creation of a φ corresponding to NP that would exclude *alla*. This does not mean that NP is invisible to $\textsc{Match}XP_{OH}$; rather, $\textsc{Match}XP_{OH}$ would attempt to match NP by default, but higher-ranking constraints requiring the preposition to procliticise onto the noun prevent NP from being matched, violating $\textsc{Match}XP_{OH}$. These violations are omitted from the tableaux, because they are incurred by all candidates. For clarity, the label of every XP that could be matched (i.e. that has an overt head and is not prevented from matching due to proclitics) is in bold in the input. All examples are monoclausal and consist of a single *ι*; *ι* brackets are therefore omitted.

4.4 Optional phrasing and variable constraint ranking

Optional application of *troncamento* was demonstrated in §3.1 for N + A, A + N and V + N sequences, and is illustrated for an N + PP sequence in (30).

(30) [il [sapore [di [cioccolata]$_{DP}$]$_{PP}$]$_{NP}$]$_{DP}$ 'the taste of chocolate'
/il saˈpo̲ɾe di ʧokkoˈla̲ta/
a. (il-saˈpoɾ$_{\omega}$ (di-ʧokkoˈlaata$_{\omega}$)$_{\varphi}$)$_{\varphi}$
b. ((il-saˈpoɾe$_{\omega}$)$_{\varphi}$ (di-ʧokkoˈlaata$_{\omega}$)$_{\varphi}$)$_{\varphi}$

Again, I assume that different phrasings lead to optionality: *troncamento* applies to *sapore* when no right φ boundary follows, as in (30a), but is blocked when there is a φ boundary, as in (b). The current ranking does not accommodate optionality. In (31), candidate (a), without a boundary after *sapore*, harmonically bounds (b), in which *troncamento* is blocked.

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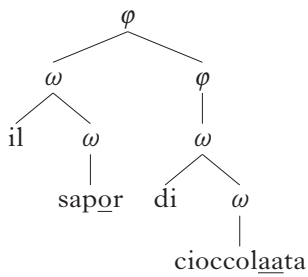
Candidate (b) loses because the φ *il sapore* incurs additional violations of MATCHφ_{OH} and BIN$_{min}(\varphi)$.

(31)

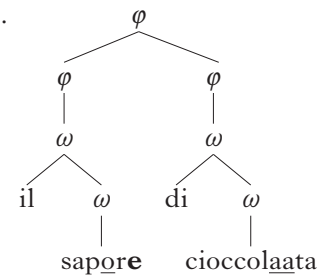
[il [sapore [di [cioccolata]$_{DP_2}$]$_{PP}$]$_{NP}$]$_{DP_1}$	BIN$_{max}$ (φ)	MATCH XP$_{OH}$	MATCH φ_{OH}	BIN$_{min}$ (φ)
☞ a. (il-sapor (di-cioccolaata))				*
b. ((il-sapore) (di-cioccolaata))			*!	**
c. (il-sapoore) (di-cioccolaata)		*DP$_1$!	*	**
d. (il sapor di-cioccolaata)		*PP!		

To select candidate (b), we need a constraint that prefers the structure in (32b) to that in (32a). Specifically, *il sapore* must map to φ, despite lacking an XP correspondent. I propose that this promotion of the ω *il sapore* to a φ is a consequence of STRONGSTART, which prefers (32b) because the alternative begins with a ω that is weaker than its φ sister.

(32) a.



b.



To allow both (32a) and (b) as possible outputs, I follow Myrberg (2013), who employs variably ranked constraints to capture variation in Swedish phrasing; see also Anttila (1997). When two constraints A and B are variably ranked, the grammar has two different rankings: one in which A is ranked above B, and another in which B is ranked above A. If constraints A and B favour different candidates, each ranking produces a different output. For Italian, STRONGSTART, MATCHφ_{OH} and BIN$_{min}(\varphi)$ are variably ranked (indicated by jagged lines in (33)). When either MATCHφ_{OH} or BIN$_{min}(\varphi)$ is ranked above STRONGSTART, candidate (a) is chosen, and *troncamento* applies. If STRONGSTART is ranked above both MATCHφ_{OH} and BIN$_{min}(\varphi)$, candidate (b) is chosen, and *troncamento* is blocked.

(33)

[il [sapore [di [cioccolata]$_{DP_2}$]$_{PP}$]$_{NP}$]$_{DP_1}$	BIN$_{max}$ (φ)	MATCH XP$_{OH}$	STR ST	MATCH φ_{OH}	BIN$_{min}$ (φ)
☞ a. (il-sapor (di-cioccolaata))			*		*
☞ b. ((il-sapore) (di-cioccolaata))				*	**
c. (il-sapoore) (di-cioccolaata)		*DP$_1$!		*	**
d. (il sapor di-cioccolaata)		*PP!			

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This analysis shows how mapping from XPs to φ's derives the nested φ structure argued for in §3, allowing optional *troncamento* on the first word of a two-word XP without affecting non-application of lengthening on that same noun. High-ranked MATCHXP$_{OH}$ ensures that the full DP is mapped to a φ_{max}, such that only the second ω is targeted by lengthening. Meanwhile, the variable ranking of STRONGSTART, BIN$_{min}$(φ) and MATCHφ$_{OH}$ ensures that the noun *sapore* is not always located at a φ edge, allowing for variability in *troncamento*.

5 Redefining MATCHXP: matching overtly headed XPs

So far, I have assumed that MATCHXP$_{OH}$ attempts to match only those XPs with an overt head. In this section, I explicitly argue in favour of MATCHXP$_{OH}$ over two alternatives: MATCHXP$_{Lex}$, which only matches lexical phrases (Selkirk 2011, Selkirk & Lee 2017), and general MATCHXP, which matches any phrase that dominates a unique terminal string, even if its head is silent (Elfner 2012, 2015). I first argue that functional phrases with overt heads must be visible to MATCHXP$_{OH}$; enforcing a lexical/functional distinction incorrectly excludes DPs, PPs and QPs. I then consider ditransitives and Subject + Verb sequences, both of which show that silently headed phrases must be ignored. I conclude that MATCHXP must be restricted. MATCHXP$_{OH}$ reconciles the claim that not all XPs are relevant to prosody with recent work which argues that the lexical/functional distinction is irrelevant for Match constraints (Elfner 2012, 2015, Tyler 2019).

5.1 Matching functional XPs with overt heads

I have shown that the correct phrasings can be derived even when we assume that functional phrases like PP and DP are visible to MATCHXP$_{OH}$. This suggests that the proposed MATCHXP$_{OH}$, which ignores the lexical/functional distinction, is on the right track. However, a reviewer suggests an alternative: that functional XPs like PP and DP are matched because they contain a lexical XP that cannot be matched once the clitics have procliticised onto the lexical head. For instance, one could argue that [D [N]$_{NP}$]$_{DP}$ is mapped to (D N)$_{φ}$ because the lexical NP needs to be matched, and D has procliticised onto N. This would preserve the lexical/functional distinction, but the approach encounters various issues. Without additional stipulation, this explanation is incompatible with the idea that MATCHXP is satisfied when a φ dominates all and only those terminal nodes that are dominated by its correspondent in the syntax: (D N)$_{φ}$ cannot be a match for NP, because NP does not dominate D in the syntax. One could adjust this definition of matching, perhaps by stipulating that proclitics are invisible when evaluating MATCHXP. Yet this amounts to saying that DP and D are invisible in order to create a φ containing exactly those terminal nodes dominated by

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DP: D and N. The stipulation is unnecessary: if we allow DP and D to be visible, the creation of $(\text{D N})_{\varphi}$ is an unremarkable consequence of MATCHXP$_{\text{OH}}$. Avoiding a stipulation that renders functional elements invisible also preserves the insights of work showing that certain functional phrases must be visible to MATCHXP (Elfner 2012, 2015).

More importantly, this alternative, which appeals to procliticisation, cannot account for cases in which a functional phrase headed by an independent ω must be matched. Consider (34), in which a verb takes a two-word QP as a complement (Ghini 1993). The φ diagnostics show that the verb *vaccine'rò* forms a separate phrase: the potential clash between the verb and the quantifier *'tutte* is permitted, and the verb undergoes lengthening.

(34) [vaccine'rò ['tutte [le [scimmie]$_{\text{NP}}$]$_{\text{DP}}$]$_{\text{QP}}$]$_{\text{TP}}$
'I will vaccinate all the monkeys'
/vattʃine'ɾo 'tutte le 'ʃimmje/
(vattʃine'ɾoo$_{\omega}$)$_{\varphi_{\max}}$ ('tutte$_{\omega}$ le-'ʃiimmje$_{\omega}$)$_{\varphi_{\max}}$

Under the analysis that a quantifier is the head of a functional projection QP taking a DP complement (Cardinaletti & Giusti 1991, Giusti 1991, Bianchi 1992, Cinque 1992), QP will be visible to MATCHXP$_{\text{OH}}$: although QP is functional, its head is overt. The tableau in (35) shows how MATCHXP$_{\text{OH}}$ derives the correct phrasing. Candidate (b), in which the verb phrases with the quantifier, is ruled out because QP is not matched.

(35)

[vaccine'rò ['tutte [le [scimmie]$_{\text{NP}}$]$_{\mathbf{DP}}$]$_{\mathbf{QP}}$]$_{\mathbf{TP}}$	BIN$_{\max}$ (φ)	MATCH XP$_{\text{OH}}$	STR ST	MATCH φ_{OH}	BIN$_{\min}$ (φ)
☞ a. (vaccine'ròo)('tutte (le-sciimmie))		*$_{\text{TP}}$	*	*	**
b. (vac'cinerò 'tuutte) (le-sciimmie)		*$_{\text{TP, QP}}$!		*	*
c. (vac'cinerò ('tutte le-sciimmie))	*!	*$_{\text{DP}}$	*		
d. (vac'cinerò '(tutte (le-sciimmie)))	*!		**		*

In contrast, QP would be invisible to MATCHXP$_{\text{Lex}}$, because of its functional status; this would predict the wrong phrasing, as shown in (36). Candidate (b), in which the verb phrases with the quantifier, is not ruled out by MATCHXP$_{\text{Lex}}$, because failure to match QP does not incur a violation. Even worse, the desired winner, (a), incurs an additional MATCHφ_{Lex} violation, because the φ corresponding to QP is not motivated by the syntax when functional XPs are invisible. The desired winner is harmonically bounded by candidate (b). Thus, making all functional phrases invisible to Match constraints has undesirable consequences. Moreover, the suggestion that functional phrases are matched only when a function word has procliticised into a lexical XP cannot be invoked to preserve the lexical/functional distinction, because the quantifier is not a clitic.

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(36)

[vaccine'rò ['tutte [le [sciimmie]$_{NP}$]$_{DP}$]$_{QP}$]$_{TP}$	BIN$_{max}$ (φ)	MATCH XP$_{Lex}$	STR ST	MATCH φ_{Lex}	BIN$_{min}$ (φ)
☜ a. (vaccine'rò)('tutte (le-sciimmie))		*$_{TP}$	*	**	**
🖝 b. (vac'cinerò 'tuutte) (le-sciimmie)		*$_{TP}$		*	*
c. (vac'cinerò ('tutte le-sciimmie))	*!	*$_{DP}$	*	*	
d. (vac'cinerò ('tutte (le-sciimmie)))	*!		**	*	*

5.2 Ignoring XPs with silent heads

While the lexical/functional distinction is undesirable, this does not mean that every XP is matched. MATCHXP$_{OH}$ retains the second part of Truckenbrodt's Lexical Category Condition, which renders XPs with a silent head invisible to the syntax–prosody mapping. Next, I show that this condition is necessary to account for the phrasing of ditransitives and Subject + Verb sequences: for each structure, Elfner's (2012, 2015) MATCHXP, which matches any XP dominating a unique terminal string, makes the wrong predictions. In contrast, MATCHXP$_{OH}$ can derive the right structures, provided that we also revise the definition of STRONGSTART.

5.2.1 *The ditransitive mismatch.* Consider the ditransitive sentence in (37) (from Ghini 1993). Ghini reports that the verb *da'rò* and the direct object *'libri* phrase together to the exclusion of the indirect object *a Gianni*, as in (37a); the alternative phrasing in (b) is ungrammatical. Ghini's phrasing is supported by stress retraction: retraction occurs to avoid a potential clash between the verb *da'rò* and the direct object *'libri*, showing that they are in a single φ_{max}.[7]

(37) [da'rò [['libri]$_{DP}$ [a Gianni]$_{PP}$]$_{VP}$]$_{TP}$ 'I will give books to Gianni'
/da'ɾo 'libɾi a 'ʤanni/ a. ('daɾo$_{\omega}$ 'libɾi$_{\omega}$)$_{\varphi_{max}}$ (a-'ʤanni$_{\omega}$)$_{\varphi_{max}}$
b. *(da'ɾo$_{\omega}$)$_{\varphi_{max}}$ ('libɾi$_{\omega}$ a-'ʤanni$_{\omega}$)$_{\varphi_{max}}$

Ditransitives constitute a syntax-to-prosody mismatch. In the analysis of ditransitives in (38a) (Larson 1988, Belletti 1999), the verb *darò* raises out of VP, leaving DP and PP behind. If VP were matched, we would expect a φ containing only DP and PP. Instead, DP and PP phrase separately. MATCHXP$_{OH}$ helps us understand why DP and PP are not phrased together (boxes are placed around XPs with overt heads). MATCHXP$_{OH}$ ignores the silently headed VP, eliminating the pressure to construct a φ containing only DP and PP. This analysis has precedent: MATCHXP$_{OH}$ is inspired by the second part of Truckenbrodt's (1999) Lexical Category Condition, which proposes that projections with silent heads are ignored in order to render an empty-headed VP invisible in Chichewa.

[7] The phrasing reported by Ghini implies that *libri* and *Gianni* also undergo lengthening, because both are φ-final. Lengthening is omitted from the transcriptions for consistency with Ghini, who only explicitly discusses retraction with respect to this example.

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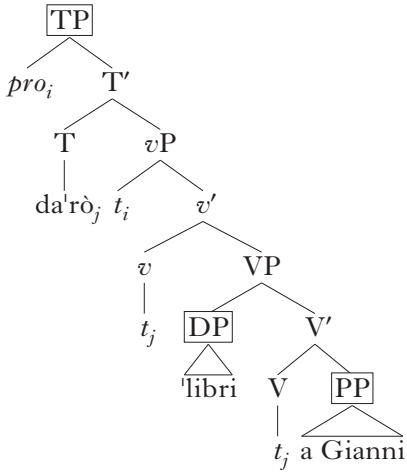
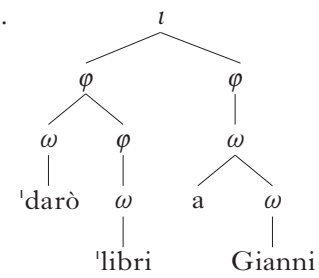
(38) a.



b.



While ignoring XPs with silent heads is necessary to avoid phrasing DP with PP, MATCHXP$_{OH}$ by itself is insufficient to derive (38b). This is because ditransitives also constitute a prosody-to-syntax mismatch: the verb phrases with DP in the prosody, as in (38b), but no corresponding XP exists in the syntax. MATCHXP$_{OH}$ cannot force the verb to phrase with DP, and (39) shows how the current grammar selects several winners: candidates (a) and (b) correctly phrase the verb with the direct object, while (c) incorrectly phrases the verb by itself. Due to the variable ranking of STRONGSTART, MATCHφ_{OH} and BIN$_{min}(\varphi)$ established in §4.4, we cannot rule out (c) with the current constraints. The desired winner, (a), performs better than the problematic (c) on MATCHφ_{OH} and BIN$_{min}(\varphi)$, yet fares worse on STRONGSTART. Thus, whenever STRONGSTART is ranked above these two constraints, (c) will win over (a). Moreover, (b), which also phrases the verb with DP, incurs the same violations as (c), so we have no way to choose (b) over (c). Note that BIN$_{max}(\iota)$ eliminates (d), in which each word is parsed into its own φ_{max}, creating a ternary ι. BIN$_{max}(\iota)$ is above the three variably ranked constraints, but we cannot establish where BIN$_{max}(\iota)$ ranks with respect to BIN$_{max}(\varphi)$ and MATCHXP$_{OH}$.

(39)

[da'rò [['libri]$_{\mathbf{DP}}$ [a Gianni]$_{\mathbf{PP}}$]$_{\mathbf{VP}}$]$_{\mathbf{TP}}$	BIN$_{max}$ (φ)	MATCH XP$_{OH}$	BIN$_{max}$ (ι)	STR ST	MATCH φ_{OH}	BIN$_{min}$ (φ)
☞ a. ('darò ('libri)) (a-Gianni)		*$_{TP}$		*	*	**
☞ b. (('darò) ('libri)) (a-Gianni)		*$_{TP}$			**	***
☜ c. (da'rò) (('libri) (a-Gianni))		*$_{TP}$			**	***
d. (da'rò) ('libri) (a-Gianni)		*$_{TP}$	*!		*	***
e. ('darò ('libri) (a-Gianni))	*!			*		**

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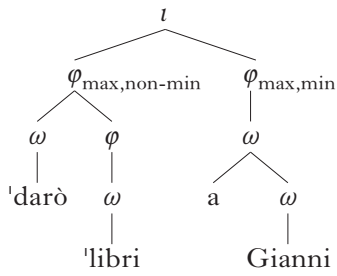
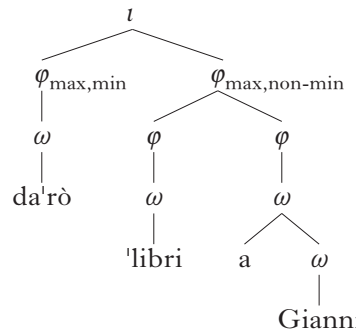
How do we eliminate candidate (c), to ensure that only candidates that phrase the verb with DP win? Compare the representations of candidates (b) and (c) in (40), which differ in constituent order: in the preferred winner, (b), a non-minimal φ precedes a minimal φ, while the reverse is true in (c). Since (b) must win over (c), this suggests that there is something marked about a minimal φ preceding a non-minimal φ. Intuitively, we might expect a minimal φ to be prosodically weaker than a non-minimal φ, since the latter contains additional φ structure by definition.

(40) *Candidate* (b)



Candidate (c)



Under this interpretation, the preference for (b) over (c) can be considered a StrongStart effect. However, StrongStart applies only to differences in category level, such as *ω vs.* φ, not to subcategories. I therefore redefine StrongStart in (41). This new constraint evaluates the relative strength of constituents of the same category and penalises structures like (c), in which the leftmost φ is minimal, and weaker than the non-minimal φ to its right. Note that this constraint is concerned with differences in minimal/non-minimal status: the maximal/non-maximal status of sister nodes is irrelevant. In fact, it is impossible for sister nodes to differ in their maximal status, because sister nodes have the same mother by definition, e.g. a non-maximal φ has a φ mother, so any φ sisters will also have a φ mother and be non-maximal.

(41) StrongStart

Assign one violation for every prosodic constituent whose leftmost daughter (i) is lower in the prosodic hierarchy than the sister to its immediate right, or (ii) is a minimal projection of a category and its sister constituent immediately to the right is a non-minimal projection of the same category.

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The tableau in (42) shows the output of our revised grammar. As desired, the two winners, (a) and (b), phrase V and DP together, and (c) is harmonically bounded, because it violates StrongStart.

(42)

[da'rò [['libri]$_{\mathbf{DP}}$ [a Gianni]$_{\mathbf{PP}}$]$_{\mathrm{VP}}$]$_{\mathbf{TP}}$	Bin$_{\max}$ (φ)	Match XP$_{\mathrm{OH}}$	Bin$_{\max}$ (ι)	Str St	Match φ_{OH}	Bin$_{\min}$ (φ)
☞ a. ('darò ('libri)) (a-Gianni)		*$_{\mathrm{TP}}$		*	*	**
☞ b. (('darò) ('libri)) (a-Gianni)		*$_{\mathrm{TP}}$			**	***
c. (da'rò) (('libri) (a-Gianni))		*$_{\mathrm{TP}}$		*!	**	***
d. (da'rò) ('libri) (a-Gianni)		*$_{\mathrm{TP}}$	*!		*	***
e. ('darò ('libri) (a-Gianni))	*!			*		**

This analysis makes predictions about the distribution of *troncamento* in ditransitives. First, the DP should never undergo *troncamento*, because it is followed by a φ boundary in both winning candidates. Meinschaefer (2006) shows that this is the case: in (43a), the noun *colore* never undergoes *troncamento*. The account also predicts that verbs optionally undergo *troncamento*, because a φ boundary appears after the verb in candidate (b), but not in (a). Two native speakers confirm that both forms in (43b) are possible: *troncamento* optionally applies to the verb *dare*.

(43) a. [ho [mostrato [il [colore]$_{\mathrm{NP}}$]$_{\mathrm{DP}}$ [a [Paolo]$_{\mathrm{DP}}$]$_{\mathrm{PP}}$]$_{v\mathrm{P}}$]$_{\mathrm{TP}}$
'I have shown the colour to Paolo'
/o mos'trato il ko'lore a 'paolo/
i. (o-mos'trato$_{\omega}$ (il-ko'lore$_{\omega}$)$_{\varphi}$)$_{\varphi}$ (a-'paolo$_{\omega}$)$_{\varphi}$
ii. ((o-mos'trato$_{\omega}$)$_{\varphi}$ (il-ko'lore$_{\omega}$)$_{\varphi}$)$_{\varphi}$ (a-'paolo$_{\omega}$)$_{\varphi}$
iii. *(o-mos'trato$_{\omega}$ il-ko'lor$_{\omega}$ a-'paolo$_{\omega}$)$_{\varphi}$

b. [dare [dei [libri]$_{\mathrm{NP}}$]$_{\mathrm{DP}}$ [a [Gianni]$_{\mathrm{DP}}$]$_{\mathrm{PP}}$]$_{\mathrm{VP}}$
'to give books to Gianni'
/'dare dei 'libri a 'ʤanni/
i. ('dar$_{\omega}$ (dei-'libri$_{\omega}$)$_{\varphi}$)$_{\varphi}$ (a-'ʤanni$_{\omega}$)$_{\varphi}$
ii. (('dare$_{\omega}$)$_{\varphi}$ (dei-'libri$_{\omega}$)$_{\varphi}$)$_{\varphi}$(a-'ʤanni$_{\omega}$)$_{\varphi}$

We have seen that an account of Italian ditransitives is possible with Match$_{\mathrm{OH}}$, provided that we use the revised version of StrongStart in (41). An analysis using Elfner's MatchXP, in which any XP dominating a unique terminal string is visible, would select the wrong output. The empty-headed VP would be visible because it dominates the unique string [DP PP]. As shown in (44), this causes (c) to win: the desired winners, (a) and (b), incur an extra MatchXP violation because they fail to match VP. It is therefore necessary for the empty-headed VP to be invisible to MatchXP$_{\mathrm{OH}}$.

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(44)

[da'rò [['libri]$_{\mathbf{DP}}$ [a Gianni]$_{\mathbf{PP}}$]$_{\mathbf{VP}}$]$_{\mathbf{TP}}$	BIN$_{max}$ (φ)	MATCH XP	BIN$_{max}$ (ι)	STR ST	MATCH φ	BIN$_{min}$ (φ)
☜ a. ('darò ('libri))(a-Gianni)		*$_{TP, VP}$!		*	*	**
☜ b. (('darò)('libri))(a-Gianni)		*$_{TP, VP}$!			**	***
🖝 c. (da'rò)(('libri)(a-Gianni))		*$_{TP}$		*	*	***
d. (da'rò)('libri)(a-Gianni)		*$_{TP, VP}$!	*		*	***
e. ('darò ('libri)(a-Gianni))	*!	*$_{VP}$		*		**

As noted earlier, the idea that XPs with silent heads are invisible is not unique to this analysis. In addition to Truckenbrodt's (1999) work on Chichewa, Selkirk & Lee (2017) identify a similar issue in the phrasing of the double object construction in Xitsonga, and Kalivoda (2018) shows that the ditransitive mismatch is ubiquitous cross-linguistically. Kalivoda's survey did not find a single language in which the two arguments phrase together to the exclusion of the verb, as would be predicted if the syntax were perfectly matched. To explain this mismatch, Selkirk & Lee (2017) propose MATCHPHRASE$_{Lex}$, which adopts Truckenbrodt's Lexical Category Condition by ignoring both functional phrases and empty-headed phrases; Kalivoda (2018) follows suit in his Match-theoretic analysis of the phrasing of ditransitives in various languages. Thus the idea that empty-headed projections like VP are ignored by mapping constraints is not new, and is in fact assumed by many accounts enforcing a lexical/functional distinction.

The innovation here is to divorce the invisibility of functional XPs from the invisibility of XPs with silent heads. Although Truckenbrodt's Lexical Category Condition ties the importance of an overt head to the lexical/functional distinction, these are actually two separate issues. As argued in §5.1, categorically ruling out functional projections makes incorrect predictions in Italian. We therefore require MATCHXP$_{OH}$, which only sees XPs with overt heads but does not discriminate between lexical and functional projections. In the next section, I show that Subject + Verb sequences provide additional support for MATCHXP$_{OH}$.

5.2.2 *Subject + Verb sequences.* Recall from §3.2 that a preverbal subject phrases separately from the verb. In (45), the subject has final stress while the verb has initial stress, creating a potential stress clash, yet retraction does not occur. Both words also undergo lengthening. These facts support the phrasing in (45a), in which each word occupies its own φ_{max}.

(45) [la [veri'tà]$_{NP}$]$_{DP}$ ['vince]$_{TP}$ 'the truth wins'
/la veri'ta 'vintʃe/ a. (la-veri'taa$_{\omega}$)$_{\varphi_{max}}$ ('viintʃe$_{\omega}$)$_{\varphi_{max}}$
b. *(la-'verita$_{\omega}$ 'viintʃe$_{\omega}$)$_{\varphi_{max}}$

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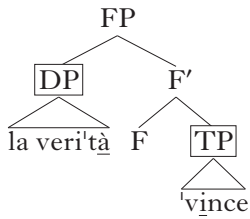
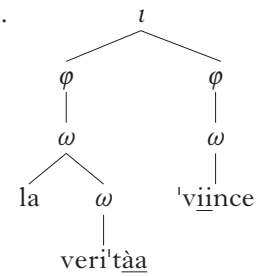
As explained in §4.1, I assume the subject has raised to a functional projection above TP, as in (46a) (Cardinaletti 2004, Frascarelli 2007). Following Dehé & Samek-Lodovici (2009), I relate the phrasing of the subject to its syntactic position. Crucially, MATCHXP$_{OH}$ derives this phrasing without the lexical/functional distinction; reference to overt heads is sufficient. Matching DP and TP will place each ω in a separate φ, as in (46b). However, FP has a silent head and therefore will not be matched.

(46) a.



b.



The tableau in (47) shows that the analysis generates this phrasing. Candidates (c)–(e) are eliminated because they fail to match DP, TP or both. Candidate (b) matches both DP and TP, but builds a φ corresponding to FP. This violates MATCHφ_{OH}, because FP is invisible to the syntax–prosody mapping, and (b) is eliminated. Thus MATCHXP$_{OH}$ is useful beyond ditransitives. (I omit BIN$_{max}$(φ) and BIN$_{max}$(ι) here, as none of the candidates violates these constraints.)

(47)

[[la [veri'tà]$_{NP}$]$_{\mathbf{DP}}$ ['vince]$_{\mathbf{TP}}$]$_{FP}$	MATCH XP$_{OH}$	STR ST	MATCH φ_{OH}	BIN$_{min}$ (φ)
☞ a. (la-veri'tàa)('viince)				**
b. ((la-'verità)('viince))			*!	**
c. (la-'verità ('viince))	*$_{DP}$!	*	*	*
d. ((la-'verità) 'viince)	*$_{TP}$!		*	*
e. (la-'verità 'viince)	*$_{DP, TP}$!		*	

Adopting Elfner's MATCHXP for Italian would again make the wrong predictions. MATCHXP would try to match FP, because FP dominates a unique terminal string. The tableau in (48) shows that the subject and verb are incorrectly predicted to phrase together. The desired winner, (a), violates MATCHXP by failing to match FP. Even worse, (b) harmonically bounds (a): (b) no longer violates MATCHφ, because the φ containing both subject and verb is now motivated by FP. MATCHXP$_{OH}$ is therefore necessary in Italian.

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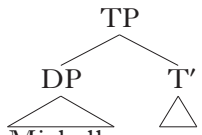
(48)

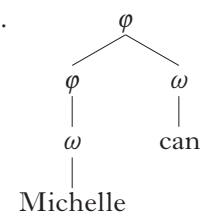
[[la [veri'tà]$_{NP}$]$_{\mathbf{DP}}$ ['vince]$_{\mathbf{TP}}$]$_{\mathbf{FP}}$	MATCH XP	STR ST	MATCH φ	BIN$_{min}$ (φ)
☜ a. (la-veri'tàa)('viince)	*$_{FP}$!			**
👎 b. ((la-'verità)('viince))				**
c. (la-'verità ('viince))	*$_{DP}$!	*		*
d. ((la-'verità) 'viince)	*$_{TP}$!			*
e. (la-'verità 'viince)	*$_{DP, TP}$!			

A reviewer asks if this analysis makes the undesirable prediction that the subject and the verb should always phrase together in languages in which the subject is in Spec,TP and the verb is in T, because verb raising renders TP visible to MATCHXP$_{OH}$, placing subject and verb in the same φ. The account does not make this prediction: there are several ways for a subject in Spec,TP to phrase separately from a verb in T while making TP visible. The first comes from Ito & Mester's (2019) discussion of Subject + Modal sequences in English, as in (49a). They propose that intermediate projections such as T′ are visible to MATCHXP, because they are considered TPs according to bare phrase structure (Chomsky 1995). Ito & Mester predict that MATCHXP prefers a structure like (c) over (b), such that the verb (and any complements) are mapped to a φ without the subject. It is therefore possible to match TP while phrasing the subject and verb separately.

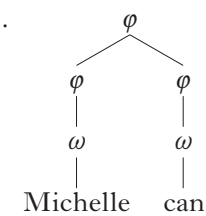
(49) a.



b.



c.



A potential objection is that this mapping creates a φ_{max} containing both subject and verb, and so they phrase together at some level. Ito & Mester anticipate this objection, using the rhythm rule as an example: non-application of the rhythm rule suggests that the subject and verb phrase separately in English, e.g. (Mi$_{\downarrow}$chelle)$_{\varphi}$ ('can)$_{\varphi}$ *vs.* *(Michelle 'can)$_{\varphi}$. They propose that the rhythm rule is a φ_{min} diagnostic: at the φ_{min} level the subject and the verb phrase separately, while at the φ_{max} level they phrase together. Thus, when TP is matched but diagnostics suggest that the subject is phrased separately, the analyst can posit that these diagnostics are sensitive to a different level of φ structure.

Eurhythmic constraints may also overrule MATCHXP$_{OH}$, preventing TP from being matched. For instance, BIN$_{max}$(φ) or BIN$_{min}$(ι) could prevent the matching of TP, while still mapping the subject and T′ to separate φ's, as shown for the SVO input in (50). The perfectly matched candidate (b)

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violates $\text{BIN}_{\text{max}}(\varphi)$, because $(\text{SVO})_{\varphi}$ dominates three ω's. Candidate (b) also violates $\text{BIN}_{\text{min}}(\iota)$, because ι is unary branching. In contrast, (a) avoids violating the binarity constraints by phrasing S separately. If either constraint is ranked above $\text{MATCHXP}_{\text{OH}}$, (b) will lose, and the subject will phrase by itself. Making TP visible to $\text{MATCHXP}_{\text{OH}}$ does not *require* the subject to phrase with the verb, and markedness constraints provide another way to phrase the subject separately.

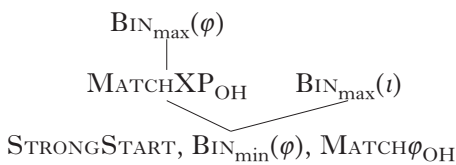
(50)

$[[\text{S}]_{\mathbf{DP}_1}$ [V $[[\text{O}]_{\mathbf{DP}_2}]_{\text{VP}}]_{\mathbf{T'}}]_{\mathbf{TP}}$	$\text{BIN}_{\text{max}}(\varphi)$	$\text{BIN}_{\text{min}}(\iota)$	$\text{MATCHXP}_{\text{OH}}$
☞ a. (S)(V(O))			*$_{\text{TP}}$
b. ((S)(V(O)))	*!	*!	

While explaining the range of SVO phrasings is outside the scope of this paper, I have shown that subjects in Spec,TP can phrase separately from verbs in T in the approach adopted here. Moreover, the ingredients of this analysis have precedent. Analyses adopting lexical-only mapping constraints often assume that movement of a lexical word to the head of a functional phrase results in that phrase inheriting lexical status and becoming visible to mapping constraints; these analyses would also predict TP to be visible in languages with V-to-T movement (Samek-Lodovici 2005, Dehé & Samek-Lodovici 2009, Göbbel 2013, Kalivoda 2018). Previous work has also appealed to the subject's position to explain cross-linguistic variation in phrasing: in Romance and Bantu, the subject is argued to phrase separately when located outside of TP (Elordieta *et al*. 2005, Cheng & Downing 2009, 2016). Rather than making incorrect predictions, the $\text{MATCHXP}_{\text{OH}}$ analysis retains the insights of previous work without invoking the lexical/functional distinction, which was shown to be problematic in §5.1.

The final ranking, presented in (51), was confirmed using SPOT (Bellik *et al*. 2015–21), a program that generates and evaluates all possible prosodic structures for a given syntactic input, and OTWorkplace (Prince *et al*. 2017), which calculates factorial typologies and constraint rankings. The analysis uses a core set of Match Theory constraints, with only two revisions: Match constraints only see XPs with overt heads, and STRONGSTART is sensitive to prosodic subcategories.

(51)



6 Discussion

This study has analysed Italian in Match Theory. Empirically, the analysis shows that apparent φ phenomena do not completely overlap in their

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domains of application, supporting the existence of multiple phrasal domains. Theoretically, the analysis proposed MATCHXP$_{OH}$, according to which only overtly headed XPs are matched.

The argument for two phrasal domains was based on three processes: *troncamento*, stress retraction and final lengthening. While studies have claimed that *troncamento* is sensitive to φ boundaries (Meinschaefer 2005), just as final lengthening and stress retraction are (Nespor & Vogel 1986, Ghini 1993), I provided evidence that *troncamento* is sensitive to a smaller domain, *contra* Meinschaefer. I appealed to recursion and prosodic subcategories: *troncamento* is sensitive to any φ, but final lengthening and stress retraction are only sensitive to maximal φ. This analysis preserves Meinschaefer's insight that *troncamento* is sensitive to domains that often correspond to XP boundaries, while explaining why the three processes sometimes diverge.

This analysis relies on the idea that phonological representations can be recursive, which is not without controversy. There exist both Indirect Reference and Direct Reference models of the syntax–prosody interface that argue against prosodic recursion (Seidl 2001, Samuels 2009, Vogel 2009, Schiering *et al*. 2010, Scheer 2012, among others). Although I analysed the two phrasal domains using recursion, an alternative account could posit another category in the prosodic hierarchy to explain why *troncamento* is sensitive to boundaries of a domain that is smaller than φ, but larger than ω. This approach could prove fruitful in frameworks that prohibit recursion, while acknowledging that Italian has multiple levels of embedding.

Although such an account would be descriptively adequate, I contend that there are theoretical reasons to prefer recursion. Adding a new category opens the door to a proliferation of language-specific categories, making cross-linguistic comparison difficult. Moreover, a recent line of work has argued for recursion at the level of ω, φ and ι (e.g. Ladd 1986, Wagner 2005, Ito & Mester 2009, 2012, Elfner 2015, Elordieta 2015, Bennett 2018). If these analyses are on the right track, and prosodic recursion is already necessary in the grammar, it is preferable to extend this approach to Italian, rather than stipulate a new category.

The recursive φ analysis was pursued in Match Theory, which states that prosodic domains are built from syntactic constituents. However, there are open questions about how to define Match constraints, which affects the theory's predictions. I argued that MATCHXP only sees XPs that are headed by a phonologically overt X^0, but does not distinguish lexical and functional XPs. While this was necessary for Italian, we should ask whether MATCHXP$_{OH}$ applies to all languages, or whether languages differ in which Match constraint they choose, as proposed by Selkirk & Lee (2017) for MATCHPHRASE$_{Lex}$. The claim that MATCHXP$_{OH}$ holds of all languages is appealing, as it results in a more restricted theory. Moreover, it could explain Kalivoda's (2018) finding that the ditransitive mismatch is common cross-linguistically. If MATCH ignores XPs with silent heads, and the XP containing the two ditransitive

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arguments is always headed by a trace, then it is no longer surprising that cross-linguistically we do not find these arguments phrasing together to the exclusion of the verb.

Cross-linguistic work is necessary to address this question, but recent work suggests that claims of universality are too strong. Elfner (2015) argues that phrases headed by traces, like TP and VP, are visible to MATCHXP in Irish. This suggests that the visibility of XPs with silent heads is parameterised across languages: these XPs are invisible in Italian but visible in Irish.

Another possibility is that the overt head condition could explain what has traditionally been identified as a lexical/functional distinction, whereby the syntax–prosody mapping ignores functional XPs (e.g. Truckenbrodt 1999, Selkirk 2011, Selkirk & Lee 2017). Perhaps those languages which have been argued to care only about lexical projections would show evidence of matching functional XPs, as long as these XPs have an overt head. This requires cross-linguistic investigation to see whether languages that make a lexical/functional distinction can be re-analysed in terms of (non-)overt heads.

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