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Prosodic Rephrasing and Violations of the Phase Impenetrability Condition

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Abstract: According to the Phase Impenetrability Condition (PIC), phasal domains are opaque to further syntactic operations. Some researchers claim that the PIC applies in the phonological component of grammar (i.e., at PF). Others, however, claim that there is no PIC at PF (see Newell 2017 and references therein). I use data from Turkish to provide new arguments against the PIC-at-PF view and conclude that the PIC can only possibly hold in syntax. I show that the PIC-at-PF view is too restrictive, as it makes incorrect predictions about variable prosodic domain formation and optional prosodic variation in Turkish.

Keywords: prosody; syntax–prosody correspondence; phase impenetrability condition; prosodic word; Turkish; optional variability; tunes; syntax–prosody mismatches

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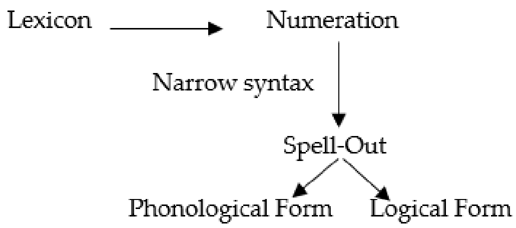
1. Introduction

The presence of boundary tones, pauses, and other acoustic cues informs us that continuous speech is parsed into prosodic chunks, and that these chunks often align with syntactic constituents. This fact provides uncontested evidence for the idea that a correspondence exists between syntactic and prosodic constituents (Chomsky and Halle 1968; Downing 1970; Kaisse 1985; Ladd 1986, 2008; Nespor and Vogel 1986; Odden 1987; Ghini 1993; Truckenbrodt 1995, 1999, 2012; Gussenhoven 2004; Newell 2005, 2008, 2015; Jun 2005; Ishihara 2007, 2014; Cheng and Downing 2007, 2016; Elordieta 2008; Samuels 2009; Féry 2010, 2017; Scheer 2011, 2012; Selkirk 1972, 1984, 1986, 1995b, 2011; Elfner 2012; Itō and Mester 2013, 2022; Wagner 2005, 2010, 2015; Güneş 2015; Bennett and Elfner 2019; Lee and Selkirk 2022; and in many others). According to 'syntax-first' modular theories of grammar (Chomsky 1995; see (1)), syntax shapes prosody. This situation exists because syntactic constituency is formed first, before being transferred (Spelled-Out) to the sound- (i.e., Phonological Form, PF) and meaning-related (i.e., Logical Form, LF) interfaces.

(1)



The prevailing contemporary view is that Spell-Out applies to designated clausal and subclausal phrasal nodes. Spell-Out therefore occurs multiple times during the syntactic construction of a standard clause-sized sentence (see Bresnan 1978; Uriagereka 1999; Chomsky 2000, 2001, among others). In the domain of phonology, some researchers have suggested that certain phonological phenomena, such as prosodic constituency formation and prosodic prominence assignment, show sensitivity to the domains created by Spell-Out (see, e.g., Dobashi 2003; Newell 2005, 2008; Richards 2006; Kratzer and Selkirk 2007; Ishihara 2007; Selkirk 2009; Samuels 2009, 2010, 2011, 2015; D'Alessandro and Scheer 2015;

Faust 2014). Following the accepted terminology, I henceforth refer to phonological analyses that adopt this view as *phase-based*.

Syntacticians have also claimed that, once a phrase has been Spelled-Out, neither that phrase nor anything inside it can be used as an input for a subsequent syntactic operation. Chomsky (2000, 2001, 2004) calls this *freezing effect* the "Phase Impenetrability Condition" (PIC) (see Section 2.3 for more details about this condition). Some scholars who adopt a phase-based approach to phonology have also claimed that similar opacity effects are observed in phonology, thus engendering the "PIC-at-PF" view (Samuels 2009, 2010, 2011, 2015; Marvin 2002, 2011, 2013; D'Alessandro and Scheer 2015; Richards 2006; Faust 2014).[1]

Because observations from Turkish have been used to motivate phase-based accounts of the syntax–phonology interface (Üntak-Tarhan 2006; Newell 2008, 2015; Kamali and Samuels 2008; Kamali 2011), Turkish phonology is a candidate for showing PIC effects and therefore a useful testing-ground for assessing the viability of PIC-at-PF approaches. In this paper, I discuss novel and/or overlooked data from Turkish syntax-based prosody. Specifically, I focus on configurations in which the syntax-based domains, e.g., the domain of prosodic prominence and the location of boundary tones, may vary, and that subclausal prosodic constituency may be completely absent, even if the clause being prosodified is composed of multiple syntactic phrases. I argue that PIC-at-PF approaches make incorrect predictions about the variability in Turkish and mismatches data. Furthermore, I show that the observed (optional) variability and mismatches in Turkish are straightforwardly captured by my own account of the Turkish syntax–prosody interface (following Güneş 2015), which is not phase-based in nature and does not assume that phase-based opacity effects may be observed at PF.

This paper is organized as follows. Section 2 provides a more detailed background on topics such as the predictions of phase-based syntax–phonology interface accounts that assume some related versions of PF^{PIC} accounts (Section 2.3), some facts on Turkish syntax-based prosodic constituency, and core properties of Turkish phonological structures (Section 2.2). I will then, in Section 3, illustrate over a sample declarative clause how each account successfully predicts the observed prosodic constituency. Section 3 will list instances of variable constituency in the vP domain (Section 3.1), as well as in the DP, AP, and CP domains (Section 3.2), and clause-size tunes, which concern all existing phasal domains in a clause (Section 3.3). Discussing the consequences of the data presented in Section 3, Section 4 summarizes the findings and concludes the paper.

2. Background

Because, to my knowledge, all research on Turkish phrasal prosody is couched in the Prosodic Structure Theory (PST) framework, I use the PST as the framing device for this paper's discussion. In other words, I will compare two theories that both adopt the tenets of the PST (specifically, as applied to Turkish) but differ with respect to the units mapped from syntax to prosody and whether reprosodification of the mapped units is permitted. For the PF^{PIC} approach, only phases are mapped and reprosodification of mapped phases is disallowed. For the PF^{NOPIC} approach, both phases and non-phases (as long as they are suitable for the prosodic parser) are mapped, and the reprosodification of mapped items is permitted. Readers who advocate a theory of syntax-based prosody other than the PST are welcome to translate either the PF^{PIC} or PF^{NOPIC} (or both) into their preferred framework. This will not affect the arguments made in this paper in any way.

Before sketching the PF^{PIC} and PF^{NOPIC} approaches in more detail, I first provide a general outline of the PST, as applied to Turkish.

2.1. Prosodic Structure Theory, as Applied to Turkish

PST organizes suprasegmental phonological chunks into a hierarchy of prosodic category types.[2] PST asserts that the prosodic constituent structure is subject to its own language-specific grammar rules. Syntax–phonology interface theories that adopt PST assume that each prosodic category type corresponds to a constituent type in syntax. The prosodic category types that correspond to syntactic domains (the so-called *interface categories*) are listed in their hierarchical order in (2).

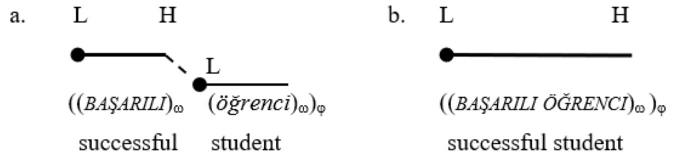
(2) intonation phrase (ι)
phonological phrase (φ)
prosodic word (ω)

The consensus position is that all three levels of the prosodic hierarchy in (2) are present in the Turkish prosodic grammar (see Güneş 2015, 2020a, Karlsson et al. 2020 and references therein). Acoustic and phonological evidence for these independently existing category types come from various experimental studies (Kabak and Vogel 2001; Levi 2005; Kan 2009; Özge and Bozşahin 2010; Kamali 2011; Güneş 2013; İpek and Jun 2014; İpek 2015). To summarize the findings: In Turkish, φs and ιs exhibit a right edge boundary tone (T- and T%, respectively). Non-final φs exhibit a high right edge tone, H-, and ιs may be marked with a high, H%, or a low right edge boundary tone, L%. The final syllable of the ι-final word exhibits a significantly longer vowel and syllable duration than φ-final words do. However, φs exhibit longer final syllables than ωs do. No significant durational difference is found between the final and the unstressed penultimate syllable in finally stressed words (Vogel et al. 2016; Athanasopoulou et al. 2021). Linguistic pauses are longer between two ιs than between two φs. Head directionality counts as phonological evidence that distinguishes ιs from φs: the most prominent part of an ι is contained in its final φ (i.e., Turkish ιs are *right-prominent*), whereas the most prominent part of a φ that contains more than one ω is its leftmost ω (i.e., Turkish φs are *left-prominent*). At the ω-level, the relevant acoustic property is its *pitch levelling* (also known as *register*), which refers to its overall F0 level (either overall high, or overall low). In both final and non-final φs that are composed of two ωs, the leftmost ω exhibits a high overall F0, which results in it being perceived as more prominent than what follows it. In contrast, the non-initial ω exhibits low overall F0 both in final and non-final φs, which results in it being perceived as non-prominent. Based on this contrast, we say that the leftmost ω in a φ is the *head*, and the non-prominent second ω is the *non-head*. A head ω exhibits a high right boundary tone (H) (İpek and Jun 2014; İpek 2015; Güneş 2015), whereas a non-head ω exhibits a low left boundary tone (L).

Turkish morphosyntactic words are traditionally categorized as finally or non-finally stressed. Within a single ω, the prominence is known to fall onto the last syllable of that ω in finally stressed words, which constitute the majority of the Turkish lexicon (see Kabak 2016 and the references therein). Following the previous literature, I assume that a significant acoustic correlate of stress is pitch, namely F0 (see Lewis 1967; Konrot 1981; van der Hulst and van de Weijer 1991; Levi 2002, 2005; Pycha 2006; Zora et al. 2016; and Kabak 2016 for a summary). From the perspective of pitch, the acoustic correlate of stress in finally stressed words is an F0 fall after the stressed word's final syllable, which may yield an F0 leveling difference between the final syllable of the stressed word and the initial syllable of the next word and gives the impression of prominence on the stressed word's final syllable (Kamali 2011; Özçelik 2012, 2014; Güneş 2015). In this regard, the correlates of final stress and prosodic word-hood are identical; see (3) (Kornfilt 1996; Newell 2008; Göksel 2010; Güneş 2015; Kabak 2016, among others). Although this situation could be viewed as evidence—alongside the evidence discussed by Athanasopoulou et al. (2017) and Vogel (2020)—that "final stress" is not lexically encoded and is therefore a redundant concept for Turkish, I remain non-committal on the issue of whether word-level stress plays an active role in Turkish prosodic grammar (see Kabak 2016 for a detailed discussion).[3]

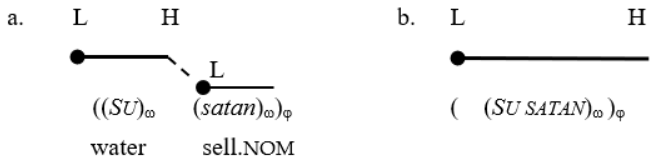
In Turkish, prosodic prominence arises via variation in pitch levelling rather than via pitch accentuation on words without a lexical accent (Levi 2005; Kamali 2011; Güneş 2013).[4] As mentioned already, the leftmost ω in a φ is produced with a higher overall levelling than the non-head (Levi 2005; Kan 2009; Kamali 2011; İpek 2011; Güneş 2013, 2015;

2020a, Karlsson et al. 2020). The stylized contour of a φ with two ωs is exemplified in (3) below, in which the levelling difference between the head (*başarılı*) and the non-head (*öğrenci*) is clearly visible (hereafter prominence is marked via small caps). If there is no levelling difference between two morphosyntactic words in a phonological phrase (as illustrated in (3b) below), then the entire syntactic phrase (regardless of the number of morpho-syntactic words that it contains) is parsed as a single prosodic word. The type of ω-formation that is illustrated in (3b) is a form of syntax–prosody mismatch from the point of view that each morphosyntactic word corresponds to an ω.[5]

(3)


The prosodic head of the final φ (i.e., the rightmost φ in a ι) is perceived as bearing the sentence-level prosodic prominence, which is also referred to as the *nucleus* in the literature on Turkish prosody. If an intonational phrase is composed of only one φ, then the leftmost ω of that φ is perceived as the nucleus of that ι. If a phonological phrase contains only one ω, then that ω is the prosodic head of that phonological phrase (as in 3b).

When multiple morphosyntactic/vowel-harmonic words (in this context the root + suffixes) are parsed as a single prosodic word (as in 3b), there is no audible intonational cue that separates these two morphosyntactic words. The individual lexical words may be distinguished via lexical association or other segmental phonetic and phonotactic properties such as onsets of vowel harmonic domains. In cases where such cues are not present to tell apart each individual lexical item within a ω, then ambiguity is expected to arise, in which the combined lexical items may have another meaning. This is because prosodic word-hood is completely destroyed in these areas and no stress-related or similar intonational cues are present to identify individual lexical words. This prediction is borne out. Consider the example in (4) below. The morphosyntactic words *su* 'water' and *satan* 'sell.nom' are combined into a single ω. We know this from the orthographic representation, in which the two words are written separately. In production, this string is ambiguous between the two-worded relative clause *su satan* 'water selling' and mono-worded relative clause *susatan* 'the one that gets someone thirsty'.

(4)


In the prosodic constituency that is schematized in (4a), a phonological phrase contains two prosodic words that, respectively, correspond to two distinct lexical items, which translates as 'water selling / the one who sells water' (a nominalized relative clause). The same string is parsed into a single prosodic word in (4b), in which the string is ambiguous, allowing two possible readings, (i) 'water selling', the bi-lexical reading that is also available in (4a), in which the leftmost syllable (*su* 'water') is perceived as a separate lexical item, and (ii) 'the one who makes thirsty', a mono-lexical reading, in which the verb *susat* 'to make thirsty' in *susa-t-an* (thirst-CAUS-REL.CL.) is taken as a single lexical item, not allowing any boundary between the leftmost syllable and the penultimate syllable. The availability of the ambiguity in the case of (4b) evidences the fact that in the cases in which a phonological phrase does not involve any levelling difference in pitch, the string that is contained in this phrase is parsed as a single prosodic word—i.e., what we see is what we get.

2.2. A PST Approach to Turkish Prosody That Is Not Phase-Based

MATCH (Selkirk 2009, 2011; Selkirk and Lee 2015) is the prevailing contemporary PST-oriented theory of how syntactic structure is mapped to prosodic structure. For the purposes of this paper, the MATCH rules for the PF^NOPIC approach are:

(5)	a.	MATCH-Clause:	Force$_{ILL}$P	intonational phrase (ι)
	b.	MATCH-Phrase:	syntactic phrase	phonological phrase (φ)
	c.	MATCH-Word:	M-word	prosodic word (ω)

In (5), Force$_{ILL}$P refers to the syntactic locus of illocutionary force. In other words, MATCH-Clause states that any unit—clausal or not—that is employed to commit a speech act is mapped to an ι (Downing 1970; Kan 2009; Truckenbrodt 2015; Güneş 2014, 2015; Ishihara 2022). In (5b), 'syntactic phrase' means any XP node, including any clause-size projection that is not Force$_{ILL}$P. In (5c), 'M-word' refers to a morphosyntactic word in the sense of Embick and Noyer (2001), i.e., a potentially complex head that is not immediately dominated by a further head projection (assuming the Distributed Morphology framework of morphosyntax).

I further assume that, in Turkish prosodic structure formation, a syntactic projection without an overtly exponed head is not MATCHed to a φ, and nor is the head of that projection matched to a ω (Güneş 2015). In cases where there are multiple maximal projections of syntactic head (due to the presence of specifiers or adjuncts), only one node is MATCHed to φ. The XP node chosen for mapping is the first relevant one up from the XP's exponed head. Here, "relevant node" means "the XP node that dominates an exponed head aside from X, **or** failing that, an XP node" (Güneş 2015). I assume that the mapping procedure in Turkish applies in a "one-fell swoop" manner (Selkirk and Lee 2015, p. 5, fn.7) over a complete syntactic representation (i.e., an entire utterance), after Vocabulary Insertion has taken place.

The current PF^NOPIC approach assumes that Turkish is restricted by (at least) two prosodic well-formedness constraints (Güneş 2015, 2020a, 2020b). The first is *non-recursivity* (NON-REC), which precludes recursive prosodic structures.[6] If recursive phonological structures arise from mapping from syntax, these structures are "repaired" so that NON-REC is satisfied (Güneş 2015, 2021). This repair effect is illustrated in (6). In this example, mapping from syntax creates a recursive-ι configuration (6b), as the parenthetical insertion and its host clause are both Force$_{ILL}$Ps (Güneş 2015). So that NON-REC is satisfied, this configuration is converted into a non-recursive string of ιs by adding two additional boundaries; see (6c) ((Güneş 2015, pp. 296–301; see Güneş 2015, pp. 250–52) for arguments against the existence of recursive ιs in Turkish).

(6) a. [$_{ForceILLP}$ Aynur [$_{ForceILLP}$ sınav-ı geç-ti] okul-u bırak-mış.]
Aynur exam-ACC pass-PST school-ACC drop.out-EVD
'Aynur, and she had passed the exam, has dropped out from the school.'
b. * [$_ι$ Aynur [$_ι$ exam-ACC pass+PST] school-ACC drop.out-EVD]
c. [$_ι$ Aynur] [$_ι$ exam-ACC pass+PST] [$_ι$ school-ACC drop.out-EVD]

Recursive φs are avoided by deleting φs (Güneş 2015, p. 38, 2020a). This is illustrated in (7) and (8), in which the inner φ in (7b) and (8b) is reduced into an ω; see (7c) and (8c).

(7) a. [$_{ForceILLP}$ ($_{vP}$($_{NP}$Kitap) oku-du-n$_v$)]
book read-PST-2SG
'You read a book.'
b. * [$_ι$ ($_φ$ ($_φ$ ($_ω$ book)) ($_ω$ read-PST-2SG))]
c. [$_ι$ ($_φ$ ($_ω$ book) ($_ω$ read-PST-2SG))]

(8) a. ($_{NP}$($_{AP}$ ıslak) saç$_{N}$) [from Güneş 2015, p. 38]
wet hair
b.* ($_{\varphi}$($_{\varphi}$ ($_{\omega}$ wet)) ($_{\omega}$ hair))
c. ($_{\varphi}$ ($_{\omega}$ wet) ($_{\omega}$ hair))

Prosodic operations that occur to ensure phonological well-formedness often result in syntax–phonology mismatches: nonclausal syntactic phrases are sometimes parsed as ιs (as in (6c)) or syntactic phrases may not have a corresponding φ (as in (7c) and (8c)). Such syntax–phonology mismatches are expected and naturally accommodated in a theory that rejects the "PIC-at-PF" view, as it allows further amendments on the MATCHed constituency.

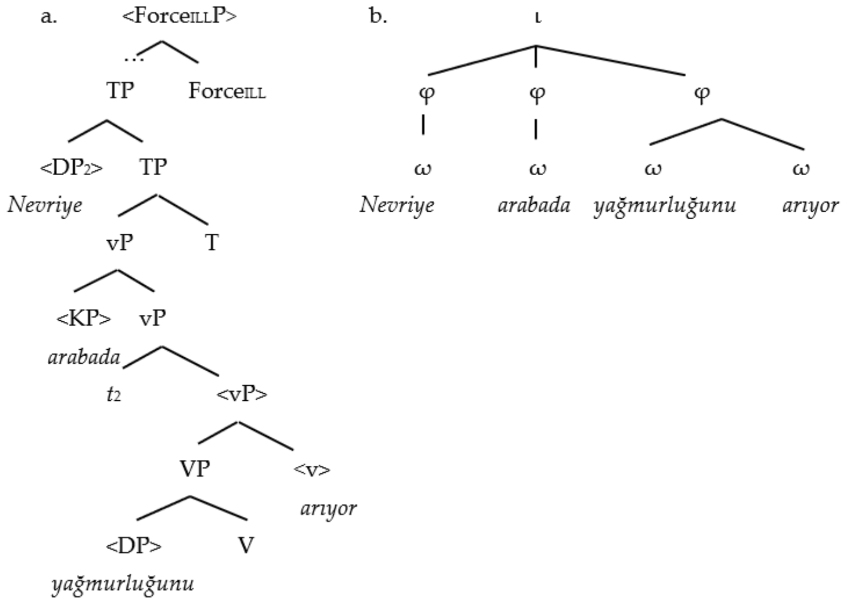
The second major phonological well-formedness constraint operative in Turkish (according to the current PF^{NOPIC} approach) is the rhythmic constraint *Maximal Binarity* (BIN-MAX) (Güneş 2015, 2020a, 2020b; see Itō and Mester [1992] 2003; Ghini 1993; Mester 1994; Hewitt 1994; Selkirk 2000; Bennett et al. 2016 among others for a family of binarity constraints in various languages). BIN-MAX dictates that phonological constituents can maximally contain two constituents. BIN-MAX applies only at the φ-level in Turkish, where it restricts the number of ωs in a φ to two (BIN-MAX(φ)) (Güneş 2015). In scenarios in which a φ contains three or more ωs, BIN-MAX(φ) can be satisfied varyingly (see (9b–d)), with no one solution being preferred over another, and with no difference in interpretation existing between the possible solutions (ceteris paribus).[7]

(9) a. * ($_{\varphi}$ ($_{\omega}$X) ($_{\omega}$Y)($_{\omega}$Z)) *BIN-MAX(φ) is violated*
b. ($_{\varphi}$ ($_{\omega}$X) ($_{\omega}$Y Z)) *BIN-MAX(φ) is satisfied*
c. ($_{\varphi}$ ($_{\omega}$X Y) ($_{\omega}$Z)) *BIN-MAX(φ) is satisfied*
d. ($_{\varphi}$ ($_{\omega}$X Y Z)) *BIN-MAX(φ) is satisfied*

To provide a concrete example: The PF^{NOPIC} approach predicts that a sentence such as (10), whose syntactic phrase marker is presented in (11a),[8] will display the prosodic constituency in (11b). In (11a), the relevant phrases targeted for mapping are enclosed in chevrons.

(10) Nevriye araba-da yağmurluğ-un-u arı-yor. (Güneş 2015, p. 110)
Nevriye car-LOC raincoat-3POSS-ACC search-PROG
'Nevriye is looking for her raincoat in the car.'

(11) The syntax phrase marker and predicted prosodic structure of (10):



In this example, the immediate mother of v is matched to φ, as this is the closest relevant vP node to v (this vP node dominates an exponed head aside from v, namely *yağmurluğunu* 'her raincoat'). This results in the locative PP *in the car* being parsed in a separate φ to the verb and the direct object. Note that V (and its maximal projection) and T (and its maximal projection) are not matched to prosodic categories because V and T are not phonologically exponed.

Güneş (2015) shows that the predicted prosodic constituency in (11b) is indeed attested. The observed constituency is given in (12) and the related visual of the F0 contour of this sentence is given in Figure 1 (from Güneş 2015, p. 110).

(12) [$_\iota$ ($_\varphi$($_\omega$ Nevriye)) ($_\varphi$ ($_\omega$ arabada)) ($_\varphi$($_\omega$ yağmurluğ-un-u) ($_\omega$ arı-yor))]

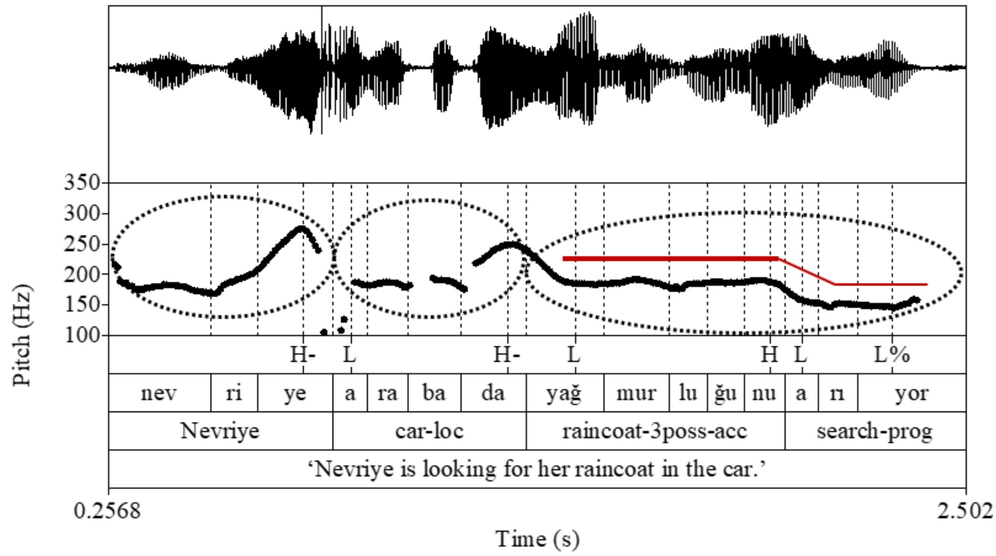


Figure 1. F0 of an ι with three φs (for (10)): declarative clause in all-new context.

About the utterance in Figure 1, Güneş (2015) reports the following: Each ω except for the verb is finally stressed and accentless. There are three φs in this figure, each enclosed in a dotted ellipse. The leftmost and the medial φs are *non-final* and the rightmost φ is the final φ. *Nevriye* and *arabada* 'in the car' are parsed as separate, non-final φs. The final φ ends the sentence and is composed of the direct object and the verb. The non-final φs bear a high right edge (H-). The final syllables of the non-final φs (both of which are open syllables) have a similar duration. The final syllable duration of the first non-final φ is 179 ms. The final syllable duration of the second non-final φ is 183 ms. The pitch levelling remains the same in the transition from the second non-final φ to the head of the final φ. The mean F0 of the first non-final φ is 202 Hertz (Hz). The mean F0 of the second non-final φ is 202 Hz, and the mean F0 of the first ω of the final φ is 188 Hz. The final φ begins with a low tone (L). The pitch level remains constant until the end of the first ω within the final φ, which is the head of the final φ and therefore the nucleus of the entire ι (marked with a subscripted N). The head ω of the final φ bears an H on its right edge. The second ω of the final φ (the verb *arıyor* 'is looking for') begins with a low tone (L)—the level of which is scaled relatively lower than the first ω in the final φ (the mean F0 of the nuclear ω is 188 Hz, and the mean F0 of the non-head ω is 153 Hz). The second ω in the final φ constitutes the post-nuclear area of the entire ι. It bears a low-levelled, flat F0, which is typical of post-nuclear ωs in Turkish (Özge and Bozşahin 2010), and a low right edge boundary tone, L%.

To provide one more concrete example, consider the boldfaced clause in (13), which is a declarative clause uttered discourse non-finally in an all-new context (i.e., as an answer to "What happened?"). A tonal annotation of the F0 contour of this clause (see Figure 2) reveals that it exhibits the prosodic structure in (14).

(13)	**Aynur**	**kapıyı**	**araladı**	kediler	dışarı	kaçtı
	Aynur	door.ACC	open.PST	cat.PL	outside	escape.PST
	'Aynur opened the door, (and at that moment) the cats escaped.'					

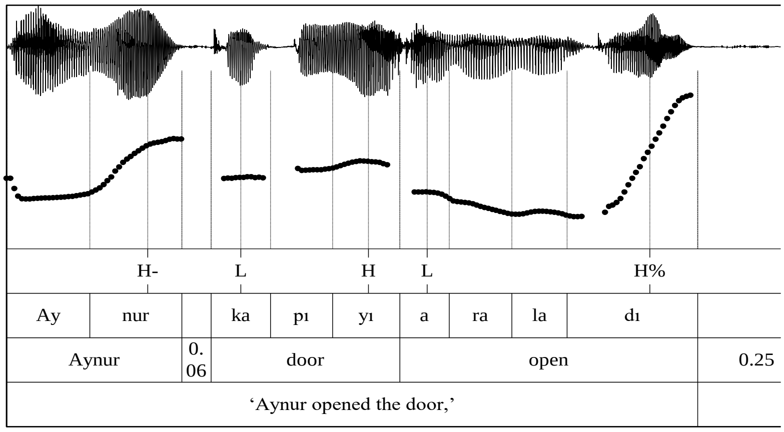


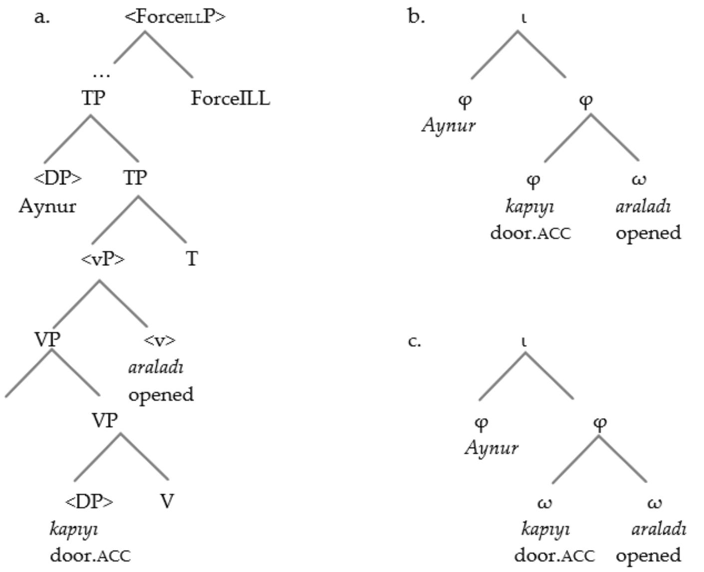
Figure 2. F0 of *Aynur kapıyı araladı* 'Aynur opened the door' in (13).

(14) H- L H L H%

$[_{\iota}$ $(_{\varphi}(_{\omega}$ Aynur)) $(_{\varphi}(_{\omega}$ kapıyı) $(_{\omega}$ araladı))]

The PF^{NOPIC} approach correctly predicts the prosodic structure in (14) for (13). By applying the MATCH rules from (5) to the syntactic phrase marker in (15) (and also by keeping in mind the supplementary conditions on how these rules apply), one yields the prosodic representation in (15b). To satisfy the well-formedness constraint NON-REC, the embedded φ mapped from the direct object *kapıyı* 'the door' is demoted to a ω; see (15c). The output of the mapping procedure thus aligns with the attested prosodic structure.

(15)



2.3. A PST Approach to Turkish Prosody That Assumes the "Modular" PIC

According to Chomsky's (2000, 2001) Phase Theory, the syntactic complements of the *phase heads* transitive v and C, which are VP and TP, respectively, are always Spelled-Out to the LF and PF. Chomsky additionally claims that Spell-Out phrases are "forgotten", i.e., not computationally active. He calls this claim the Phase Impenetrability Condition; see (16). Chomsky stipulates the PIC so that he can provide a conceptual motivation for phrasal Spell-Out: it occurs to reduce the cognitive load on the active memory use in sentence production and perception, thus yielding computational economy.

(16) Phase Impenetrability Condition (PIC) (Chomsky 2000, p. 108):
In a phase α with head H, the domain of H is not accessible to operations outside α; only H and its edge are accessible to such operations.

Chomsky (2001, pp. 12–13, 15; 2004, pp. 107–8) reasons that the computational benefits of phasal Spell-Out must also extend to phonology, meaning that the PIC should hold at phonology, too: "[the phonological component] is greatly simplified if it can 'forget about' what has been transferred to it at earlier phases; otherwise, the advantages of cyclic computation are lost" (Chomsky 2004, p. 107). According to this view, no phonological operation can take as its input two or more phonological units that correspond to syntactic items from different Spell-Out domains/phases (Samuels 2009, 2010, 2011, 2015; Richards 2006; and Faust 2014).[9] In phase-based prosodic research that adopts the "PIC-at-PF" view, the PIC is usually viewed as a condition banning reprosodification. Such analyses view phonological phrase (φ) boundaries as inserted at the edge of phases (this insertion operation occurs as an immediate reflex of the Spell-Out operation itself) and maintain that these φ-boundary events cannot be relocated to align with different syntactic nodes. Richards (2006) exemplifies this position. He claims that "the PF counterpart of the PIC is simply the PIC—same units, same effect (i.e., isomorphic phase boundaries at syntax and PF, yielding equivalent inaccessibility to syntactic and phonological operations alike)" and that "[the] phase boundaries defined by Chomsky's PIC do indeed delimit a phonological as well as a syntactic unit" (Richards 2006, p. 177). His view that the PIC precludes reprosodification is encapsulated in his *Maximal φ condition* (17). According to (17), φ boundaries are inserted at the edges of each phase, and certain phonological operations observe the presence of these boundaries (e.g., certain cliticization or contraction operations cannot take place across phase-induced φ boundaries).

(17) Maximal φ Condition
A phonological phrase φ (...ω, etc.) can be no larger than a phase.

Let us call the view that all phases are opaque at PF the *strong* version of the PIC-at-PF approach. D'Alessandro and Scheer (2015) argue for a weaker version (the so-called *Modular PIC*), according to which only a subset of phonological rules is governed by the PIC and only certain syntactic phases are treated as impenetrable phases at PF, and precisely which rules/domains (if any) depends on the language in question. This view is motivated by the observation that not all PF operations observe phase-related boundaries and not all phases within a single language exhibit the same PF opacity effect for the same PF operation (see Scheer 2011; and D'Alessandro and Scheer 2015).

It has been claimed in the phase-based literature on Turkish prosody that the vP and CP phases are phonologically active in Turkish: Üntak-Tarhan (2006) claims that final φs in Turkish are created as an automatic byproduct of vP phasal Spell-Out,[10] and Newell (2005, 2008, 2015) suggests that vP and CP phasal Spell-Outs trigger prosodic word formation and related prominence assignment in Turkish.[11] DP and AP influence the formation of prosodic domains in Turkish in precisely the same way that verb-sized and clause-sized phrases do (Kamali 2011; Güneş 2015). For advocates of phase-based prosody, this entails that (i) DP/NP and AP are syntactic phases (which aligns with Bošković's 2014 and Bošković and Şener's 2014 conclusions) and that (ii) the DP/NP and AP phases are phonologically active in Turkish. If the Modular PIC approach is correct, then each of these phasal domains should be opaque to (at least some) phonological operations. To be specific: when one considers that φ-level prosodic prominence and boundary phenomena have already been associated with the Spell-Out domains of the vP and CP phases in Turkish (Üntak-Tarhan 2006; Newell 2005, 2008, 2015; Kamali and Samuels 2008; Kamali 2011, 2015; Fenger 2020; Kouneli et al. 2022), the Modular PIC account predicts that the exponents of these phases will always be flanked by prosodic boundaries and that constituency-based prosodic prominence at the phrasal and sentential level will be calculated such that already-created prominence domains cannot undergo reprosodification to include the phonological exponents of other phases.[12] The idea that the PIC is active in the domain of Turkish prosodic prominence formation is taken for granted by Fenger (2020, pp. 76–77) and Kouneli et al. (2022, p. 3), who propose that a phase-based freezing effect applies to ωs that are formed after the first verbal Spell-Out cycle in Turkish. (Note that neither paper uses the term '(modular) PIC', however.)

I end this subsection with a concrete example of how the PF^{PIC} approach applies to Turkish. According to the PF^{PIC} approach, an immediate and automatic byproduct of the Spell-Out operation is that a prosodic boundary is associated with the right-edge of each phonologically active phase, which are AP, CP, DP/NP, and vP in Turkish (see the discussion above). The issue of how the Spell-Out operation knows which type of prosodic boundary (a ω-, φ- or ι-boundary) to associate with which phase is overlooked here: for convenience, I charitably assume that the correct association is made.[13] I henceforth make the minimal assumption that the right-edge of every phonological phase bears an acoustic sign associated with being some form of a prosodic constituent.

Consider again the boldfaced string in (18) (repeated from (13)). Because the PF^{PIC} account states that the two DPs, the vP, and the CP (where CP = Force$_{ILL}$P here, for simplicity's sake) will each be mapped to a prosodic domain, it correctly predicts the attested prosodic structure; see (14) and Figure 2.

(18)	**Aynur**	**kapıyı**	**araladı**	kediler	dışarı	kaçtı
	Aynur	door.ACC	open.PST	cat.PL	outside	escape.PST

'Aynur opened the door, (and at that moment) the cats escaped.'

3. PIC Violations in and across Prosodic Domains

Having outlined the basic characteristics of the two accounts that I wish to compare (namely, the PF^{PIC} and PF^{NOPIC} approaches), I now turn to undertake the comparison itself. Recall that this comparison will focus on Turkish data in which reprosodification occurs. For each datapoint, I will show that the PF^{PIC} makes incorrect predictions.

D'Alessandro and Scheer (2015), who originally developed the Modular PIC analysis, describe how the Modular PIC can be falsified. To falsify the Modular PIC, one must (i) demonstrate that a phase π in language L shows PIC effects for a specific phonological operation P and then (ii) demonstrate that PIC effects for π are not observed for every instance of π in L (D'Alessandro and Scheer 2015, p. 617). In other words, the Modular PIC is falsified if a purportedly phase-sensitive phonological operation applies optionally or variably for the same phase(s) in the same language.

Regarding task-(i), sufficient evidence has already been provided that, under a phase-based approach, the AP, CP, DP/NP, and vP phases are phonologically active in Turkish and that prosodic constituency formation is sensitive to them, in which a freezing effect is suggested especially for prominence-related constituency formation (Fenger 2020; Kouneli et al. 2022). By undertaking the comparisons in the following subsections of the current section, I complete task-(ii), and therefore falsify the Modular PIC (and by implication, falsify stronger versions of the "PIC-at-PF" theory).

3.1. Reprosodification in the Turkish vP Domain

The sentence in (19B) is a standard, broad-focus response to the "what happened?" question. The tonal annotation and prosodic constituency for (19B) is presented in (20). This annotation is based on the observations obtained from the audio recording of the utterance that is visualized in Figure 3.[14] As seen in the figure, the direct object *Aynuru* exhibits a high-level plateau, which is characteristic of the leftmost and hence the prominent prosodic word in the final φ. This is the nucleus of this sentence. In the post-nuclear area, we see the verbal domain, which exhibits a low-level flat F0 that extends across the entire verb.[15]

(19) A: Davet sırasında ne olmuştu?
'What happened during the reception?'

B: Ziyaretçi-ler Aynur-u gör-müş-∅-tü-ler
visitors-PL Aynur-ACC see-PERF-COP-PST-3PL
'The visitors had seen Aynur.'

(20) H- L H L L%
[ι(φ(ω ziyaretçiler)) (φ(ω Aynur-u) (ω gör-müş-∅-tü-ler))]
visitors Aynur-ACC see-PERF-COP-PST-3PL
'The visitors had seen Aynur.'

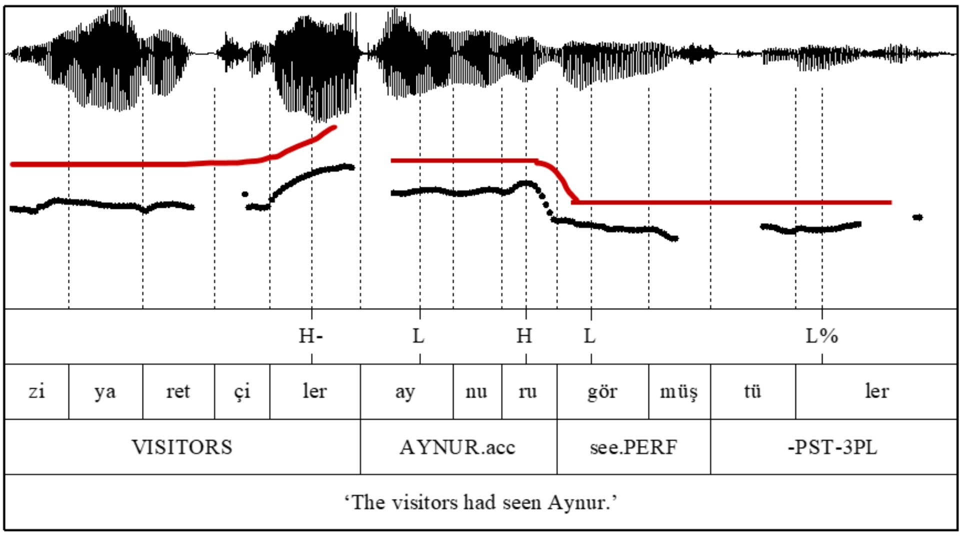


Figure 3. F0 for the broad-focus response in (19B).

If the information structure of (19) is altered such that the question asks about the verb, a response may involve narrow focus on the verb- and argument-drop of the subject and direct object; see the elliptic version of (19B) in (21), where the complex verb is used as a fragment answer. Notice that the verb in (19) and (21) contains two Tense/Aspect/Mood (TAM) markers, namely *-müş* (perfect) and *-tü* (past tense). If the Turkish inflected verb contains two or more Tense/Aspect/Mood (TAM) markers and is focused, then it is necessarily parsed into two prosodic chunks, with the leftmost chunk being perceived as bearing the sentence-level nuclear prominence (Sebüktekin 1984; Kornfilt 1996; Göksel 2010). In Turkish, each linearly non-initial TAM marker is hosted by a copular verb, which is often phonologically null, but which is nonetheless treated as the "trigger" or "cause" for the observed prosodic chunking when the verb is focused (Kornfilt 1996; Good and Yu 2000, 2005; Enç 2004; Kelepir 2001, 2003, 2007; Kahnemuyipour and Kornfilt 2010; Güneş 2020a, 2021, among others). In (21), the participle verb domain *görmüş* 'see-PERF' is the only domain that can be parsed as the nucleus; compare (22a) to (22b). (For a detailed discussion on the split prosodic behavior of various agreement paradigms in Turkish, see Güneş 2020a). The observed prosodic parse and the tonal annotation in (22a) is based on the recording of the visual F0 presented in Figure 4.

(21) A: Ziyaretçiler Aynur'u görmüş müydüler?
'Had the visitors seen Aynur?'
B: Gör-müş-Ø-tü-ler.
See-PERF-COP-PST-3PL
'(Yes, they) had seen (her).'

(22) a. H L L%
[$_\iota$($_\varphi$($_\omega$ gör-müş) ($_\omega$ -Ø-tü-ler))]
b. H-L%
* [$_\iota$($_\varphi$($_\omega$ gör-müş-Ø-tü-ler))]

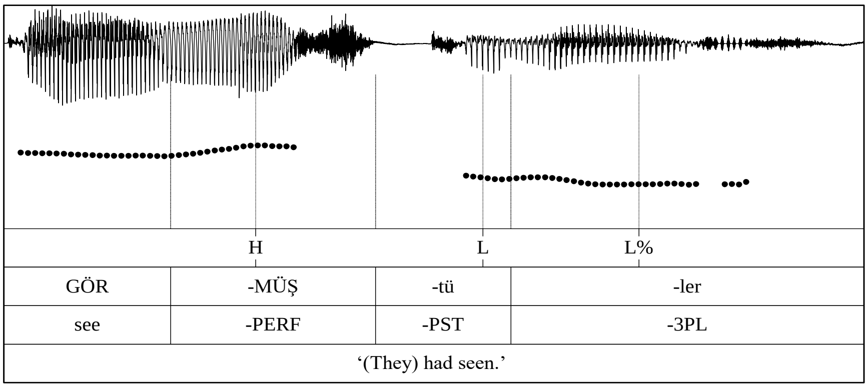


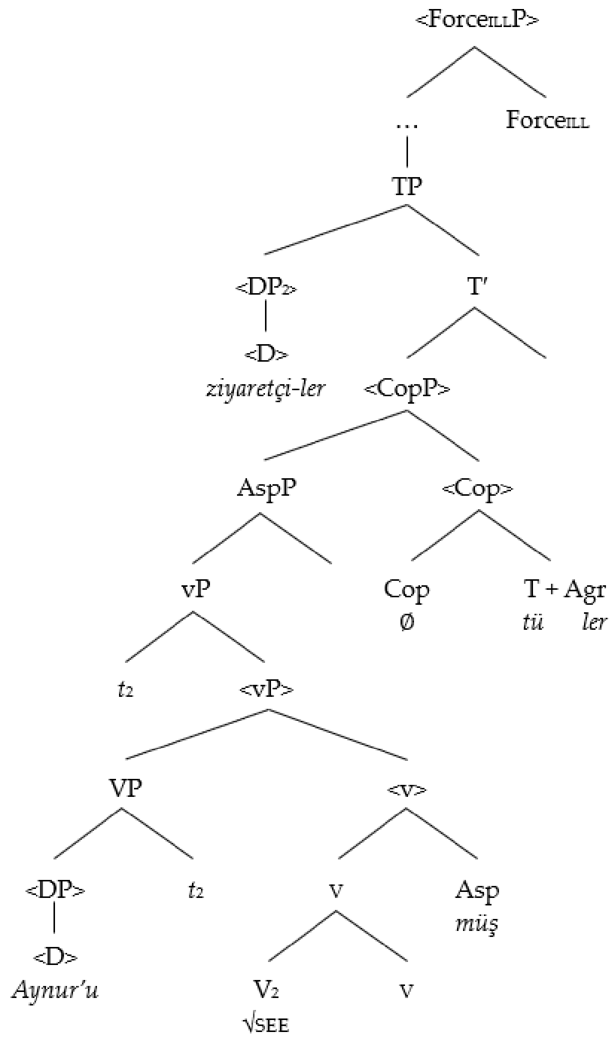
Figure 4. F0 contour for the verb-focused response in (21).

In Turkish narrow-focus sentences, the focused phrase remains in situ and the given argument and adjunct phrases undergo A′-movement to the clausal periphery (Şener 2010). Furthermore, this A′-movement is a prerequisite for the argument-drop (Şener and Takahashi 2010). Consequently, (19B) and (21B) are syntactically distinct. In (19B), the subject and object occupy their usual positions (SpecTP and SpecVP, respectively), whereas in (21B) they have A′-moved to the clausal periphery and undergone an argument drop, leaving phonologically null copies/traces in SpecTP and SpecVP:

(23) a. [$_{\text{ForceP}}$ [$_{\text{TP}}$ subject [$_{\text{vP}}$ object participle-verb] copular-verb]] *syntax for (19B)*
b. [$_{\text{ForceP}}$ (~~subject~~$_1$) (~~object~~$_2$) [$_{\text{TP}}$ t_1 [$_{\text{vP}}$ t_2 participle-verb] copular-verb]]
syntax for (21B)

From the perspective of syntax–prosody mapping, the crucial difference between (23a) and (23b) is that the vP node contains two exponed daughters in (23a) but only one exponed daughter in (23b). To capture the differing prosodic profiles of (19B) and (21B), a viable theory of syntax–prosody mapping for Turkish must accommodate the observed prosodic chunking triggered by the copula in (21B) and also be sensitive to the presence/absence of the direct object in VP. The PF$^{\text{NOPIC}}$ approach displays both characteristics. To see this, first consider the phrase marker for (19B) in (24). (This phrase marker follows Güneş (2020a) in assuming that TAM morphemes are post-syntactically lowered onto their verbal heads and that the lexical verb raises from V to v). In (24), the nodes which are mapped to prosody according to the PF$^{\text{NOPIC}}$ approach are enclosed in chevrons. The resulting parse in (25) is then repaired to satisfy NON-REC and BIN-MAX. Because BIN-MAX can be satisfied in two ways in this scenario, two possible parses are derived; see (26). The first parse in (26a) is unavailable for independent semantic reasons. To convey a broad-focus meaning in Turkish, the XP immediately preceding the verb must be aligned with the nucleus. If part of the verb is contained in the nucleus (as in (26a)), then the verb is understood as narrowly focused, and the broad-focus meaning is lost. Because (19B) must convey a broad-focus meaning (as it answers a "what's happening?" question), the parse in (26a) is therefore inappropriate. This leaves (26b) as the only predicted parse for (19B), which aligns with the observed parse in (20).

(24)



(25) [$_\iota$($_\varphi$($_\omega$ ziyaretçiler)) ($_\varphi$($_\varphi$($_\varphi$($_\omega$ Aynur-u)) ($_\omega$ gör-müş)) ($_\omega$ Ø-tü-ler))]

(26) a. [$_\iota$($_\varphi$($_\omega$ ziyaretçiler)) ($_\varphi$($_\omega$ Aynur-u gör-müş) ($_\omega$ Ø-tü-ler))]
b. [$_\iota$($_\varphi$($_\omega$ ziyaretçiler)) ($_\varphi$($_\omega$ Aynur-u) ($_\omega$ gör-müş Ø-tü-ler))]

The syntax for (21B) is the same as (24), except that, in (21B), the direct object and the subject undergo A′-movement to the clausal periphery, leaving VP and TP without any phonologically exponed items in them. Putting the DPs and Ds aside, each of the nodes targeted for creating the prosodic structure for (19B) are also targeted for creating the prosodic structure for (21B) (i.e., each of the non-nominal chevroned nodes in (24)). Mapping for (21B) yields the prosodic structure in (27a), whose innermost φ is removed to satisfy NON-REC. The final predicted parse in (27b) aligns with the observed parse in (22a).

(27) a. [$_\iota$($_\varphi$($_\varphi$($_\omega$ gör-müş)) ($_\omega$ tü-ler))]
b. [$_\iota$($_\varphi$($_\omega$ görmüş) ($_\omega$ tüler))]

Recall from Section 2.3 that phase-based approaches to Turkish phonology assume that vP and CP are phonologically active in Turkish, and automatically trigger prosodic domain formation when Spell-Out occurs. The observation that the verbal complex in (21B) exhibits the "split" prosodic realization in (22a) has been taken as evidence that vP is phonologically active in Turkish and the boundary associated with vP Spell-Out is responsible for creating the "split" prosodic pattern (Newell 2005, 2008), which is frozen after it is formed (Fenger 2020). The observation that this split pattern in not observed in non-focused complex verbs (recall (20)) falsifies the Modular PIC, as it represents a scenario in which the same phase type (the vP phase) shows sensitivity to a particular phonological phenomenon (prosodic domain formation) in one structural context but not another.

A phase-based approach that does not adopt the modular PIC could hypothetically account for the different prosodic realizations of the verb in (19B) and (21B) by appealing to reprosodification and postulating that that prosodic boundary associated with the vP phase is somehow erased during the generation of the prosodic structure for (19B). Because this hypothetical phase-based analysis must appeal to some extraneous factor to explain **why** reprosodification occurs in (19B) but not (21B), this analysis will be inferior to the PF^{NOPIC} analysis outlined above, in which reprosodification is expected based on the general rules of Turkish prosodic grammar.

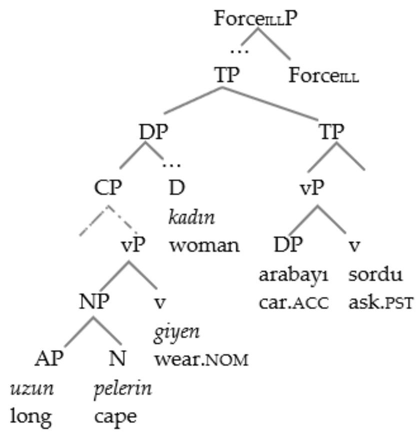
3.2. NP, AP, and CP Domains: Optional Variable Parse in Non-Final φs

Nominalized relative clauses in Turkish are adjuncts (Kornfilt 2001, 2003; Griffiths and Güneş 2014) that are contained in the same φ as their heads (Kan 2009; Güneş 2015; İpek 2015, p. 80). Importantly, in specific information-structural configurations, such clauses show semantically vacuous variability in ω-level parsing. (Güneş 2015; Güneş and Göksel 2017). To see this, consider (28), whose simplified phase marker is presented in (29).

(28)	***Uzun***	***pelerin***	***giy-en***	*kadın*	*araba-yı*	*sor-du*
	long	cape	wear-NOM	woman	car-ACC	ask-PST

‘The woman that is wearing a long cape asked about the car.’

(29)



If (28) answers a broad focus question such as “what’s happening?”, in which the relative clause and its head are all-new, or the narrow focus question “What did the woman that is wearing a long cape ask about?”, in which the relative clause and its head are all-given, then there are four variants available for the ω-level constituency of the relative clause, (30), none of which differ from the others in terms of syntactic, narrow semantic or information-structural import. The internal syntax of a phrase remains the same when that phrase is all-new or all-given.

(30)	a.	[ι(φ(ω UZUN)	(ω *pelerin*	*giyen*	*kadın*))	(φ(ω <u>*ARABAYI*</u>)	(ω *sordu*.))]
	b.	[ι(φ(ω*UZUN*	*PELERİN*)	(ω *giyen*	*kadın*))	(φ(ω *ARABAYI*)	(ω *sordu*.))]
	c.	[ι(φ(ω *UZUN*	*PELERİN*	*GİYEN*)	(ω *kadın*))	(φ(ω *ARABAYI*)	(ω *sordu*.))]
	d.	[ι(φ(ω *UZUN*	*PELERİN*	*GİYEN*	*KADIN*))	(φ(ω *ARABAYI*)	(ω *sordu*.))]
		long	cape	wear.NOM	woman	car.ACC	ask.PST

‘The woman who is wearing a long cape asked about the car.’

The F0 contour for (30a) is presented in Figure 5. In this figure, there are two φs. The final φ contains the object and the verb, whereas the non-final φ contains the subject DP and its relative clause modifier. The subject noun *kadın* ‘woman’ is separated from the string that follows it. This is evidenced by a pause that separates the subject and object (110 ms), pre-boundary lengthening (the final syllable duration of the noun *kadın* 'woman' is 270 ms), the H- boundary tone, and the φ-final F0 rise on the edge of the non-final φ (with a magnitude of 145 Hz). The sentence initial adjective *uzun* 'long' bears a rising contour and a ω-level H tone on its right edge, the final syllable duration of which is 252 ms. This ω constitutes the head-ω of the non-final φ. The following noun *pelerin* 'cape' exhibits an initial L tone and no other F0 event in the transition to the verb of the relative clause. This indicates that *pelerin* 'cape' is parsed together with the material that follows it. Similarly, no correlates of an ω- or φ- level boundary are observed in the transition from the verb of the relative clause (i.e., *giyen* 'wear.NOM') to the head of the relative clause (i.e., *kadın* 'woman'). This indicates that the relative clause and its head are parsed together in a single φ (see Kan 2009; Güneş 2015; and İpek 2015 for a similar observation), and in this case, they share the same ω (i.e., the non-head ω of the non-final φ).

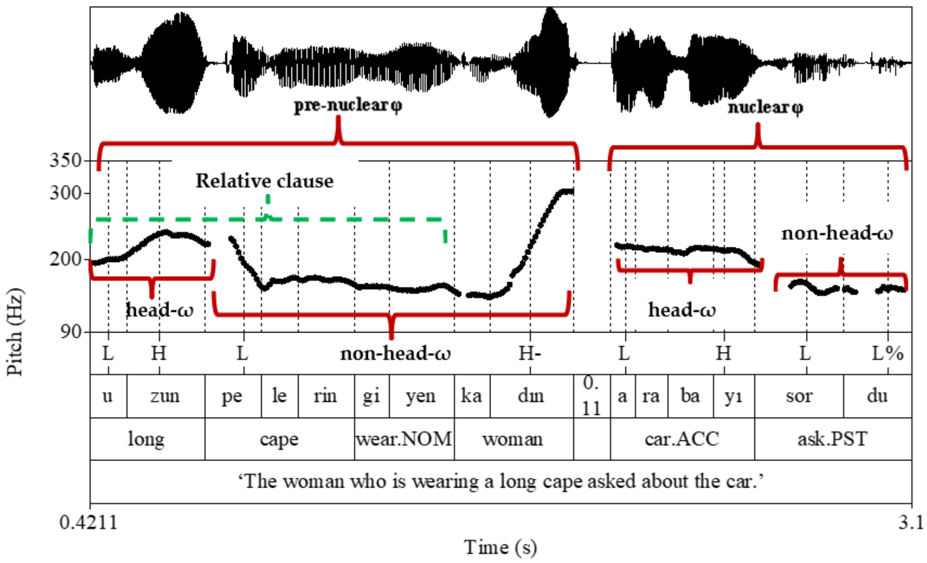


Figure 5. F0 contour of (30a).

Figure 6 presents the F0 contours for each of the parses in (30). The figure shows that each displays the same prosodic profile, *modulo* of the position of the first two tones.

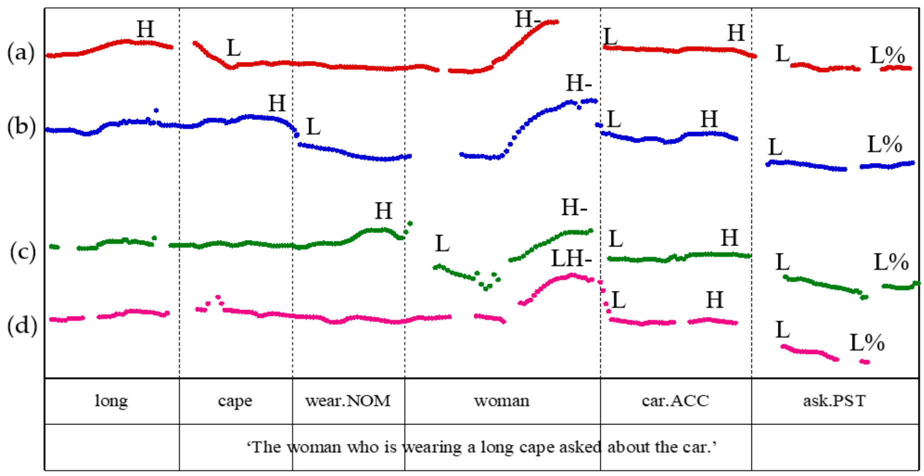
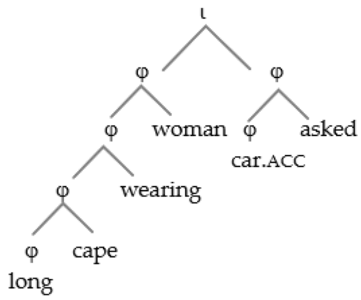


Figure 6. F0 collection and the tonal annotation of all possible prosodic realizations of a nominalized relative clause and its head that are schematized in (30a–d) (uttered by the same speaker).

Assuming that AP, CP, NP, and vP are phases (see Section 2.3), then the PF^{PIC} approach predicts the prosodic structure in (31) for (28).

(31) Prosodic realization of (28), according to PF^{PIC} accounts



In (31), there are five clause-internal prosodic boundaries and one prosodic boundary at the right edge of the entire utterance (on the matrix verb *sordu* 'asked'). This account predicts three prosodic boundaries inside the relative clause. The innermost boundary corresponding to the deepest AP is predicted on *uzun* 'long' and a boundary corresponding to the NP modified by *uzun*, *pelerin* 'cape', and the boundary corresponding to the vP/CP layers is predicted on the nominalized verb *giyen* 'wear.NOM'. Another boundary is also predicted on the head noun *kadın* 'woman'.

Because (31) contains more prosodic boundaries than any of the attested variants in (30), PF^{PIC} approaches fail to capture the data. Moreover, PF^{PIC} approaches fail to predict the presence of variable prosodic parsing, as the variants in (30) cannot come from the syntactic source, in which the number of phases and their positions remain constant, as does the information structure.

In contrast, the predictions of the PF^{NOPIC} account of Turkish prosodic grammar correctly predicts the attested variation. The analysis is presented in (32).

(32) Prosodic realization of the complex DP in (28), according to PF^{NOPIC} account

(i) Match (clause/XP/M-word with exponents) with ι/φ/ω:[16]

$(_{\varphi}(_{\varphi}(_{\varphi}(_{\varphi}(_{\omega}$ uzun)) $(_{\omega}$ pelerin)) $(_{\omega}$ giyen)) $(_{\omega}$ kadın))
long cape wear.NOM woman

'The woman who is wearing a long cape…'

(ii) Reduce to repair recursively embedded φs (to satisfy NON-REC(φ)):

$((_{\omega 1}$ uzun) $(_{\omega 2}$ pelerin) $(_{\omega 3}$ giyen) $(_{\omega 4}$ kadın$))_{\varphi\text{-non-final}}$

(iii) Repair BIN-MAX(φ) violations (combine ω):

a.	$(_{\varphi}(_{\omega}$ UZUN)	$(_{\omega}$ *pelerin*	*giyen*	*kadın*))	[combine ω_2, ω_3 and ω_4]
b.	$(_{\varphi}(_{\omega}$ *UZUN*	PELERİN)	$(_{\omega}$ *giyen*	*kadın*))	[combine ω_1 and ω_2 / ω_3 and ω_4]
c.	$(_{\varphi}($*UZUN*	*PELERİN*	*GİYEN*)	$(_{\omega}$ *kadın*))	[combine ω_1, ω_2 and ω_3]
d.	$(_{\varphi}(_{\omega}$ *UZUN*	*PELERİN*	*GİYEN*	*KADIN*))	[combine ω_1, ω_2, ω_3 and ω_4]
	long	cape	wear-NOM	woman	

'Long cape wearing woman …'

In (32i), multiple recursive φs layers are formed, which reflects the fact that the relative clause in (28) is syntactically complex. After the embedded phonological phrases from (32i) are type-shifted to prosodic words in (32ii), the complex DP is comprised one φ containing four independent ωs. Finally, to repair BINMAX(φ) violations, ω-combination occurs. ω-combination can licitly generate four outputs, each of which corresponds to one of the attested parses listed in (30). [18]

3.3. Clause-Size Tunes and Overriding Clause-Internal Prosodic Constituency

In this subsection, I discuss clause-size tunes (*nuclear tunes*) and their interaction with syntax-based prosodic constituency.

I start with a brief introduction to tunes, which are also known as *intonational contours*. These are fixed contours used to convey pragmatic meanings such as surprise, contradiction, insinuation, making an assertion, or posing a question (Gussenhoven 2004;

Hirschberg 2004; Truckenbrodt 2012 and the references therein). As illustrated with the English surprise-redundancy contour in (33), tunes can be borne by a single syllable (33B) or spread over a linearly contiguous sequence of words in (33B′) and (33B′′) (Ladd 2008). Crucial for theories of syntax–phonology correspondence is the question of whether syntax-based prosodic constituency is retained when an utterance is produced with a tune. It seems—at least from the simplified representation in (33B′′)—that when a tune spreads over an entire clause, the clause-internal prosodic constituency at the phrase level is destroyed by the prosodic template dictated by that tune.

(33) A: I hear Sue's taking a course to become a driving instructor.[19]

B: Sue!?

B′: A driving instructor!? [multiword surprise-redundancy contour]

B′′: Sue's taking a course to become a driving instructor!?

In this section, I focus on a Turkish tune that is employed to indicate the temporal proximity between two events, which I call the *temporal proximity tune*. The events in question are described in consecutive clauses, with the tune appearing on the first clause. A tonal annotation and stylized pitch representation for the temporal proximity tune is provided in (34). The F0 contour for (34) is presented in Figure 7. Both (34) and Figure 7 come from Güneş and Göksel 2013.[20]

(34)	%LH-L	LH%	
	↗↘baba-m-ı	arı-yacak-tı-m↗	– ama gitmiş.
	father-1POSS-ACC	call-FUT-PST-1SG	– but he has left
	'I was about to call my dad—but it turns out that he has left.'		

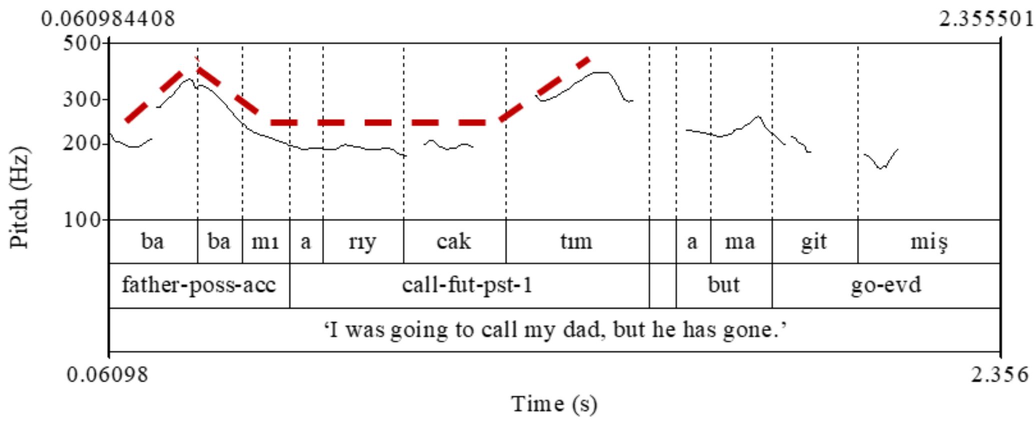


Figure 7. The Turkish temporal proximity contour (red dashed line).

The initial clause of (34) displays OV word order and an omitted pronominal subject. The initial rise is realized on the leftmost syllable of the entire ι, i.e., on the initial syllable of the object *babamı* 'father.POSS.ACC'. This initial rise is a rising left ι-level boundary tone, annotated as %LH. Immediately after the initial syllable, on the next syllable of the same lexical word, one observes a fall, which is annotated as L. Together, the initial rise and this subsequent fall create the *rise–fall* pattern. The area that follows the initial rise–fall pattern is completely flat until the final rise of the entire ι, which is annotated as LH%. The flat area in between the two peaks of the contour covers the final syllable of the object and the entire verb. Like the English tune in (30), the Turkish temporal proximity contour can be realized on a single verb[21] or on a longer clause. Whatever the size of the underpinning string, the template of the contour will remain unchanged: a rise–fall at the start, LH% at the end, and a low and flat contour in the middle.

The temporal proximity tune can also be applied to the boldfaced initial clause in example (13) from Section 2.2 (repeated below in (35)); see Figure 8 for the F0 contour and see (36) for the annotation derived therefrom. We can now compare Figure 8 to Figure 2 from Section 2.2 (repeated below), which presents the F0 for the boldfaced clause in (35) in the standard declarative condition.

(35) **Aynur kapıyı araladı** kediler dışarı kaçtı
Aynur door.ACC open.PST cat.PL outside escape.PST
'Aynur opened the door, (and at that moment) the cats escaped.'

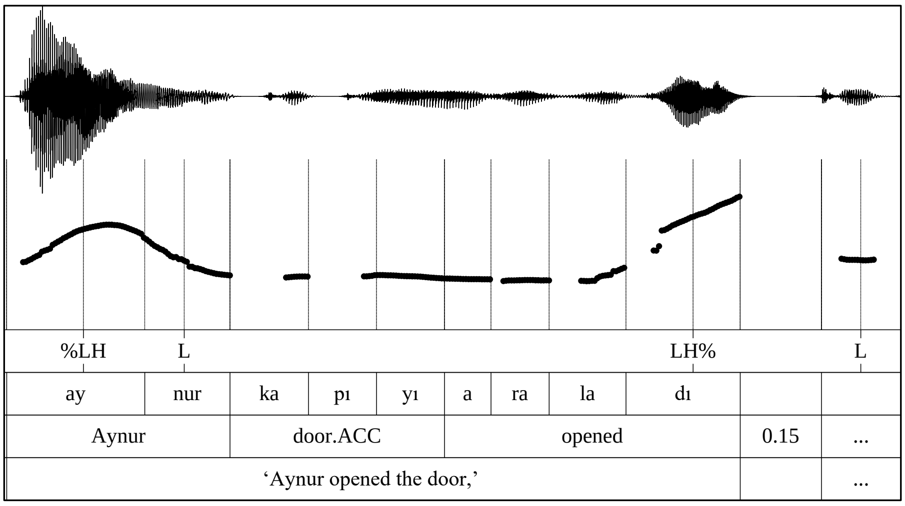


Figure 8. The F0 contour of the initial clause in (35), produced with the temporal proximity tune.

(36) %LH -L LH%
$[_{\iota}(_{\varphi}(_{\omega}$ Aynur kapıyı araladı))]

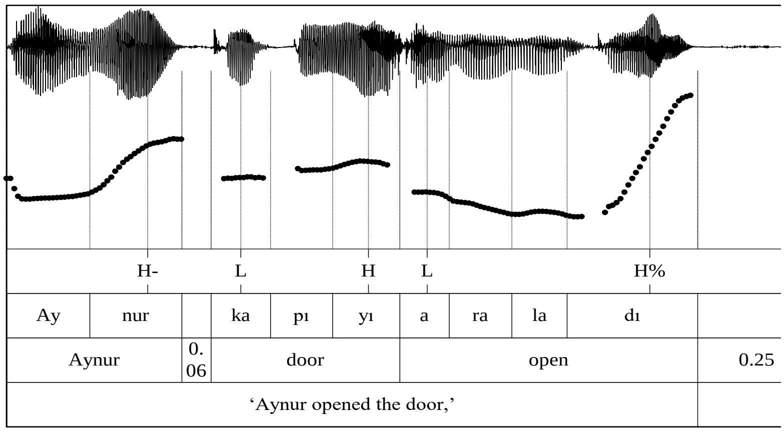


Figure 2. The F0 contour of the initial clause in (35), produced without a tune.

(37) H- L H L H%
$[_{\iota}(_{\varphi}(_{\omega}$ Aynur)) ($_{\varphi}$ ($_{\omega}$ kapıyı) (araladı))]

The prosodic realizations in Figures 8 and 2 display the following differences. In Figure 2, the first word *Aynur* is parsed as a single non-final φ. It exhibits the phrase final boundary lengthening (final syllable duration: 197 ms) and the φ-final right edge rise

(H-) that is typical of non-final φs in Turkish (Kamali 2011; Güneş 2015). Neither this H-edge tone nor the lengthening effect is observed in Figure 8. In Figure 8, *Aynur*'s final syllable is much shorter, lasting for only 148 ms. In Figure 8, *Aynur*'s initial syllable displays a lengthening effect (248 ms) and a multi-tonal left-edge ι boundary tone. This syllable is shorter in Figure 2 (178 ms), and no left edge tone is present. In Figure 2, a linguistic pause is observed after the initial φ (duration: 63 ms). The same pause is not present in Figure 8. The next word after the pause in Figure 2—namely, the direct object *kapıyı* 'door.ACC'—exhibits a high-level pitch levelling, which marks it as the head ω of the final φ and hence the nucleus of the entire ι. This high-level pitch levelling also functions to distinguish between the two ωs in the final φ: the high plateau represents one ω (namely, the head-ω) and the subsequent low-level flat area marks the other, non-head ω. This leveling distinction of the overall F0 is not present in Figure 8, which indicates the absence of the above-described ω-formation. The mean pitch of *kapıyı* 'door.ACC' in Figure 2 is 253 Hz, whereas the mean pitch of the same word in Figure 8 is 190 Hz. Finally, the duration of the final syllable of *kapıyı* 'door.ACC' is 148 ms in Figure 2 but 84 ms in Figure 8. This strongly suggests that the ω-boundary associated with *kapıyı* in Figure 2 is absent in Figure 8.

I conclude from a comparative acoustic analysis of Figures 2 and 8 that the syntax-based prosodic constituency that is present in Figure 2 is not present in Figure 8. This means that, in the presence of a tune that is spread over an entire clause C, no syntax-based constituency is present in C.

Before seeing how well the PF^{PIC} and PF^{NOPIC} approaches handle cases such as (36), it should be emphasized that the absence of syntax-based prosodic constituency in the presence of a tune is challenging for any analysis that aims to transparently relate syntactic and prosodic constituency. If syntax is the only input for deriving prosodic constituency (putting aside the well-formedness rules of prosodic grammar), then one must assume that the type of information that is exponed via tunes is syntactically encoded. Support for the idea that use-conditional meaning is syntactically encoded has increased dramatically in recent years; see Speas and Tenny 2003; Haegeman and Hill 2014; Tang 2015; Heim et al. 2016; Wiltschko and Heim 2016; Miyagawa 2022; Krifka 2023; and Miyagawa and Hill 2023 for direct attempts to associate intonational meanings with left-peripheral syntactic projections. Following this trend, I henceforth assume that the temporal proximity tune is mapped from a dedicated functional projection in the periphery (*TuneP*) of the Turkish clause.

So, could the PF^{PIC} approach ever explain (36)? If one assumes that syntax is generated from the bottom up in phases, then TuneP enters PF when the final phase of the clause is Spelled-Out. By this time, earlier/lower phases (e.g., vP and/or DPs) have already been Spelled-Out, and cyclic phonological operations have already taken place. If vP and DP phases are always associated with a prosodic boundary in Turkish, and if reprosodification is disallowed, then one expects tunes and standard syntax-based prosodic constituency to coincide, contrary to observation. In other words, the PF^{PIC} approach's refusal to allow reprosodification prevents it from ever explaining (36).

Clearly, a plausible explanation of (36) must involve a dramatic appeal to reprosodification, where all ω and φ boundaries mapped from syntax are somehow erased. Since the idiosyncratic properties of this particular clausal tune anchors to edges of the clause (i.e., anchoring %T … T%, precluding any prosodic constituency in between), the realization of this tune erases all ωs and φs.[22] This is possible in a model that allows the restructuring of already created phonological domains. If there is any peripheral clausal tune-inducing projection in the left periphery, previously mapped structures are overridden to fulfil the tune's tonal requirements, in which already created prosodic words and phonological phrases are destroyed. This leads to the absence of otherwise predicted ι-internal constituency.

4. Conclusions

This paper focused on the prosodic boundary and constituency related prominence phenomena observed in and across phases in Turkish. I showed that, for each phasal domain, one can observe the following prosodic variability and syntax–prosody mismatches: (i) prosodic prominence location and prosodic constituency (which are claimed to be phase-based and lead to freezing effects) can vary resulting in crossing phasal boundaries, and (ii) prosodic prominence and boundary tones may be completely absent on the edges of phasal domains, going against the predictions of those accounts that assume strict opacity and rigidity of already created phonological domains due to PIC at PF. The existence of such variability and mismatches is important because it helps adjudicate between competing theories of syntax–prosody mapping. In particular, the observed variability and mismatches severely undermine the PF^{PIC} accounts that have been discussed in the paper. Independently motivated ideas from the prevailing PST approaches can be combined to straightforwardly capture the observed variability and mismatches in Turkish under a PF^{NOPIC} approach, principally allowing rephrasing and overwriting at any stage. All one needs for Turkish is the following: MATCH rules, a ban on recursive prosodic constituents, and a binarity restriction on the maximum number of prosodic words within a phonological phrase.

Turning to PF^{PIC} approaches, a flexible "modular" version (D'Alessandro and Scheer 2015) of PF^{PIC} states that when a given syntactic node X is a syntactic phase in language L, X (or its Spell-Out domain) may be associated with a particular prosodic event Y in L. Seeing that DP, vP, and CP are phasal domains in Turkish, and given that phrasal prominence, and boundary phenomena have already been associated with the Spell-Out domains of these phases and freezing effects in Turkish (see Üntak-Tarhan 2006; Newell 2005, 2008; Kamali 2011; Bošković 2014 for phasal links and Fenger 2020; Kouneli et al. 2022 for freezing claims), the PF^{PIC} accounts predict that these nodes will always exhibit prosodic boundaries and constituency-based prosodic prominence in the phrasal and sentential level. Because this prediction runs contrary to observation, even the more flexible versions of the PF^{PIC} approaches are severely undermined. If D'Alessandro and Scheer (2015) are correct,

> "Note that the Modular PIC analysis may be falsified language-internally. If a particular phenomenon suggests that a phase head—say, v—lacks or is endowed with a PIC at PF, the PIC is expected to be lacking (or to be present) in all constructions involving the head and that phenomenon in this particular language." (D'Alessandro and Scheer 2015, p. 617)

then these Turkish data (showing the lack of freezing effect of these cycles in phonology) support those approaches that suggest abandoning the PF^{PIC} approach entirely (see Cheng and Downing 2007; 2016; Bonet et al. 2019; Guekguezian 2017; Newell 2017[23] and the references therein).

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Notes

1. Not all accounts that adopt a phase-based syntax–phonology interface also adopt the PIC-at-PF view. See Scheer (2011) and Newell (2017) for the separation of the two and the related literature. In a similar vein, most accounts that assume PIC-at-PF adopt a weakened version of PIC, in which only certain operations or certain phases (in certain languages) may show PIC-at-PF. For such weakened versions, e.g., for selective freezing effects of primary vs. secondary stress in English see Marvin (2002, 2011, 2013), for the Modular-PIC view see D'Alessandro and Scheer (2015), or for the PIC *à la carte* idea see Scheer (2011). We can list Samuels (2009, 2010, 2011, 2015), Richards (2006), and Faust (2014) as among the proponents of the stricter view of PIC-at-PF. Also see Section 2.3 of this paper for a more detailed presentation of the claims of some of these accounts.
2. For PST-based phonology literature see Nespor and Vogel (1986); Selkirk (1984, 1986, 1995b, 2011); McCawley (1968); Pierrehumbert and Beckman (1988); Selkirk and Tateishi (1988, 1991); Ghini (1993); Jun and Elordieta (1997); Féry (2010, 2017); Truckenbrodt (1995, 1999, 2012); Ishihara (2007, 2014); Itō and Mester (2013, 2022); and Cheng and Downing (2007, 2012, 2016). For a summary of syntax–prosody interface accounts that do and do not assume PST, see a recent overview by Bennett and Elfner (2019).
3. Importantly, however, I reject the view that final stress is somehow underlyingly present on a morphosyntactic word, M, even when there are no acoustic cues of stress on M. I reject this view because it tends towards unfalsifiability and is incompatible with the emerging view that "final stress" is merely post-lexical ω-boundary assignment (e.g., see Özçelik 2012). More generally, I reject any notion of 'abstract' prosodic structure, i.e., an underlying metrical structure for finally stressed words. If there is no acoustic evidence for the presence of a prosodic domain D, then D is simply not part of the prosodic structure of a given speech string.
4. See Türk (2020) for gesture-based evidence from the visual modality for the view that words with final stress are accentless.
5. See Sections 2.2. and 3 for some environments that trigger such mismatches, in which multiple morphosyntactic words are parsed as a single prosodic word.
6. Non-recursivity is a commonly observed property of some phonological grammars across different language groups (Selkirk 1995a; Truckenbrodt 1995, 1999; Hamlaoui and Szendrői 2017; i.o. but see Kabak and Revithiadou (2009) for a recursive phonological phrase analysis of a lexically specified group in Turkish).
7. There are different notions of word-hood (e.g., compound words, roots plus their affixes, phonologically defined words etc.— see (Haspelmath 2023) for a discussion on different types of words). In Turkish, at least two distinct types of words are shown to exist, first is the morphosyntactically defined word, i.e., root plus its affixes (in most cases this is also the domain of the vowel harmonic word). Second is the prosodic word in the way it is defined in Section 2.1 above (see Kornfilt 1996, Section 6 for a discussion of how the domain of root plus affixes (i.e., the domain of vowel harmony), differs from the domain of prominence). Both types of words show certain domain-related phenomena in the phonology of Turkish. It seems that most cases of segmental phonological events in Turkish are sensitive to the words that are the root plus affixes, e.g., vowel harmony, voicing alternation (Inkelas and Orgun 1995), or hiatus resolution (Kabak 2007). The prosodic word that is defined in this paper (but also in Güneş 2013, 2015, 2020a, 2021) to my knowledge does not trigger any segmental phonological phenomena within or across its boundaries. Similarly, the abovementioned segmental phenomena that are observed to apply within and/or across root plus affixes are not sensitive to whether or not that root plus its affixes overlaps with a prosodic word or not.
8. I assume that nominals are topped by a DP layer in Turkish (Kornfilt 2018a, 2018b).
9. As far as I can tell, most of the phase-based phonology literature uses the terms *phase* and *Spell-Out domain* interchangeably, even though these terms refer to syntactic phrases with different sizes in Chomsky's (2000, 2001) theory. For the purposes of this paper, I assume that phase-based approaches to prosody view the entire phase (e.g., vP and CP) as the syntactic chunk that has privileged status at PF, rather than the Spell-Out domains (e.g., TP and VP). Based on this assumption, I henceforth follow terminological convention and use the term *phase* rather than *Spell-Out domain*. Note that my arguments against phase-based approaches to phonology that assume the PIC-at-PF still holds when one switches from the idea that phases (e.g., vPs and CPs) are mapped to the idea that Spell-Out domains (e.g., VPs and TPs) are mapped.
10. Whenever v is not a phase head, i.e., in unaccusative and passive clauses, final φs in Turkish are viewed by Üntak-Tarhan (2006) as created as an automatic byproduct of CP phasal Spell-Out.
11. Neither Newell (2005, 2008, 2015) nor Üntak-Tarhan (2006) discussed the presence of PIC at the PF of Turkish, nor did they attribute any PF visible PIC effects to prosodic constituency formation in Turkish. However, these studies are essential in understanding what phasal domains have been claimed to have a PF imprint and what phonological operations are suggested to diagnose the presence of phasal domains at the PF of Turkish, especially to be able to discuss if the modular version of PF^{PIC} is present in Turkish.
12. Both Üntak-Tarhan (2006) and Newell (2005, 2008, 2015) discuss sentence-level prominence, which concerns vP and CP phases, not discussing other phasal domains of Turkish (i.e., DP/NP and AP). Consequent studies that investigate the prosodic properties of branching syntactic phrases (especially DPs/NPs and APs) in the area that precedes the final phonological phrases (see, e.g., Kamali 2011; Güneş 2013, 2015, 2020a; Féry 2017), observe that final and non-final phonological phrases are formed in the

same way. Additionally, citing Kornfilt (1996, p. 113) on how the prominence properties of complex verbs are sorted in the same way as phrases, Newell (2005, p. 46) derives the prominence properties of complex verbs via the standard derivational mechanisms of the interface system which is also responsible in parsing phrases (also see Güneş and Göksel 2013). If prosodically prominent domain generation (sentence-level or phrasal-level) is taken as a single phonological operation, then one can extend the analyses and claims made about sentence-level prominence domains to phrase-level prominence domains. In this uniformed account of prominence formation, the only difference between sentence-level prominence and phrase-level prominence would then be attributed to the linear position of the phonological phrase (see Güneş 2015 for such a uniformed analysis of prosodic prominence in Turkish). As for the PF^{PIC} view, for the sake of illustration of a phase-based account, I then conclude that both APs and DPs/NPs are phonologically relevant phases in Turkish.

13. Note that one cannot simply associate the distinction between ω-, φ- or ι-boundaries with increasing boundary strength in Turkish, as other phonological properties distinguish between prosodic categories, e.g., φs are head-initial whereas ιs are head-final. Nor can one stipulate that the instruction to Spell-Out a syntactic phase XP as a particular prosodic category is contained in the lexical entry for X, as ωs in Turkish correspond to a structurally defined notion in Turkish (an M-word, see Section 2.2). Thus, how to ensure that a phrase is associated with the correct prosodic category type without incurring a "look ahead" problem is not a simple matter.

14. The prosodic realizations discussed in this paper represent Standard Turkish and the PRAAT visualizations come from audio recordings of native speakers. Audio recordings of each of the possible prosodic realizations discussed in Section 3 of this paper were presented to 16 native speakers of Standard Turkish. Each speaker confirmed the naturalness of each realization in their given contexts, respectively. The observation that Turkish permits optional prosodic realizations in certain structural environments (e.g., see Section 3.2) is not new: most of the data presented in this paper comes from previous work (references are provided for each example). I thank Sun Ah Jun (pers. comm. in 2013) for making me aware of the possibility of variable prosodic realizations of relative clauses (see Figure 6). I also thank Aslı Göksel for confirming the judgments attributed to the data presented in Figure 6 and for bringing to my attention the tunes discussed in Figures 7 and 8.
Beyond adopting the view that the relevant variable prosodic realizations exist (which is incontestable, given the observations presented in this paper), I make no claims about the data. Particularly, I make no claims about the frequency with which a particular prosodic realization can be found in corpora, or about whether certain demographic groups use a particular realization more frequently than others. The methodology that I employed to confirm that variable prosodic realizations exist involved creating stimuli artificially (in other words, my stimuli were not naturally occurring data taken from corpora) and then collecting acceptability judgments. This is the standard practice in generative linguistics—(almost) all generative linguistic research on morphology and syntax adopts this methodology. This being the case, I reject as unreasonable an anonymous reviewer's view that my claim that variable prosodic realizations exist is undermined by not reporting naturally occurring examples of each prosodic variant and/or by not using naturally occurring examples as stimuli for obtaining acceptability judgments. This view holds phonology oriented generative linguistic research to higher empirical standards than any other form of generative linguistic research, and without providing a valid reason for doing so.

15. In Figure 3, the visible interruption of the F0 contour on the area where the final consonant of the participle verb and the initial consonant of the copular domain is due to the fact that both of these consonants are voiceless and do not lead to consistent repetition of the sound waves to be interpreted as pitch points. In short, this interruption is not a linguistic pause or a sign of a boundary, but a phonetic result of the fact that two consecutive voiceless sounds occur at this juncture.

16. Note that the embedded CP, i.e., that of the relative clause, does not Match with an intonational phrase as this clause is not employed as a speech act and there is no $Force_{ILL}P$ projection.

17. Note that ω-combination is only limited by adjacency, i.e., only adjacent ωs can be combined (Güneş 2015).
Additionally, the optional prosodic realization exemplified in (30) is not restricted to relative clauses. This is demonstrated by the example in (i), which contains a complex attributive adjective phrase (Güneş 2020b, ex. (29)). The PF^{NOPIC} analysis sketched in (32) extends without modification to this example, as (ii) demonstrates. PF^{PIC} approaches are equally as ineffective here as with the relative clause case described in the main text, and for the same reasons. A structure with a similar meaning but without a relative clause is observed to exhibit a similar optional variable prosodic realization, yet without the clausal phase-based boundaries of the relative clause, i.e., *uzun pelerinli kadın* 'the woman with a long cape'. The optionality is not predicted by PF^{PIC} accounts.

(i)	**Uzun**	**pelerin-li**	kadın	araba-yı	sor-du.
	Long	cape-ADJ	woman	car-ACC	ask-PST
	'The woman with a long cape asked about the car.'				

(ii)	*Match&Reduce*:	[$_\iota$ ($_\varphi$ ($_\omega$ *Uzun*)	($_\omega$ *pelerinli*)	($_\omega$ *kadın*))	($_\varphi$ ($_\omega$ *araba-yı*)	($_\omega$ *sor-du*.))]
	Combine-ω:	[$_\iota$ ($_\varphi$ ($_\omega$ *UZUN*)	($_\omega$ *pelerinli*	kadın))	($_\varphi$ ($_\omega$ *ARABA-YI*)	($_\omega$ *sor-du*.))]
	Combine -ω′:	[$_\iota$ ($_\varphi$ ($_\omega$ *UZUN*	*PELERINLI*)	($_\omega$ *kadın*))	($_\varphi$ ($_\omega$ *ARABA-YI*)	($_\omega$ *sor-du*.))]
	Combine -ω″:	[$_\iota$ ($_\varphi$ ($_\omega$ *UZUN*	*PELERINLI*	*KADIN*))	($_\varphi$ ($_\omega$ *ARABA-YI*)	($_\omega$ *sor-du*.))]

18. Here I use an example from English so that it is easier to understand the notion of tunes for the cross-linguistic reader. English and Turkish belong to different prosodic typological groups. Turkish is a phrase language without lexical stress (for most lexemes), whereas English is an intonation language with lexical stress. Therefore, no specific parallels between English and

Turkish prosodic properties can be made. This paper specifically discusses the prosodic grammar of Turkish and no cross-linguistic generalizations should be made, especially involving languages that belong to different typological groups.

19. Although this tune resembles the well-described Rise–Fall–Rise tune of English, it is by no means related in content. There is no indication of correction, insinuation, or contradiction in the Turkish one. The difference, above other things, may be sourced from the fact that the rise (or sometimes the fall) of the English contour is borne by a pitch accent, however in the Turkish contour, only boundary tones are used to create this seemingly similar rising falling rising pattern in the contour.
20. Due to its specific event-related intonational meaning, the temporal proximity contour can only occur minimally on predicates (verbal, nominal or adjectival).
21. The idea that larger domains with lexical prespecifications may *override* already created domains is not alien to derivational theories, e.g., see Starke's (2009) override idea for lexical insertion, which is also known as the "Biggest Wins Theorem".
22. In fact, Newell (2017, p. 21) states that there is no PIC even in syntax.

Abbreviations

ACC: Accusative case
EVD: Evidential
PST: Past
LOC: Locative
NOM: Nominalizer
POSS: Possesive agreement
PROG: Progressive
PL: Plural
PERF: Perfect
COP: Copula
FUT: Future
SG: Singular

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