(In)Direct reference in the phonology-syntax interface under phase theory:

a response to Modular PIC[*]

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Abstract

While the domains of phrasal phonological processes are, in many interface theories, defined in terms of prosodic constituents, D'Alessandro and Scheer (2015) argue that their proposed modification of phase theory, *Modular PIC*, renders prosodic constituents superfluous. Phrasal phonological domains can instead be defined directly in the syntax. In this response, we argue that Modular PIC does not provide a convincing new approach to the syntax-phonology interface, as it is both too powerful and too restrictive. We show that the analysis offered of *Raddoppiamento fonosintattico* in Eastern Abruzzese does not justify the loss of restrictiveness Modular PIC brings to phase theory. Modular PIC is also shown to be too restrictive to account for phenomena, from Bantu languages and others, which have received satisfactory analyses within interface theories that appeal to prosodic constituents. We conclude that Modular PIC does not successfully replace prosodic constituent approaches to the interface.

Keywords: phase theory, PIC, prosodic constituents, raddoppiamento fonosintattico, Bantu languages, penult lengthening, pitch accent

1   Introduction

Since the late 1980s (see, e. g., Chen 1987, Hayes 1989, Nespor & Vogel 1986, Selkirk 1986), many theories of the syntax-phonology interface have argued for an indirect reference approach to defining the domains of phrasal phonological processes. The central argument

for this approach is that there is often a mismatch between domains of phonological processes and domains defined by the syntax. To account for these mismatches, it is proposed that phonology accesses syntax only indirectly. A mapping procedure allows restricted aspects of syntactic structure (as well as prosodic principles) to define constituents of the Prosodic Hierarchy, like the phonological phrase (φ), the intonational phrase (ι), and the utterance. Only those prosodic constituents, and not any specific syntactic information (constituents, categories or features), can be referred to in the context of application of any given phonological process. However, also since the late 1980s (see e.g., Kaisse 1985, Odden 1995), there has been a countervailing tradition of work on the interface arguing that phonology must have direct access to specific kinds of syntactic information and that the prosodic constituents in the Prosodic Hierarchy are insufficient and even superfluous in accounting for phrasal domains. Instead, in a direct reference approach, the constituents, features and relations provided by the syntax are all that are needed to define the domains for phonological processes. (See Elordieta 2007b, 2008 and Selkirk 2011 for recent critical overviews of work on the interface.)

As Elordieta (2007b, 2008) observes, phase-based syntax (Chomsky 2001) has brought renewed interest to exploring the limits of the direct reference approach. In phase theory, phonological constituents are derived through the operation Spell-Out (Transfer), the idea being that once a relevant syntactic chunk has been computed, it is sent to the interfaces to be interpreted. A reasonable hypothesis, as defended by Cheng and Downing (2012b, 2016), Dobashi (2004, 2009), Ishihara (2003, 2007), Kratzer and Selkirk (2007), and Selkirk (2011), among others, is that phases are necessarily *relevant* for phonological constituency and play a crucial role in the determination of prosodic domains. A more radical hypothesis – put forward in work like Adger (2007), Kahnemuyipour (2009), Pak (2008), and Seidl (2001) – is that the domains the phonology must refer to are directly delimited by phases alone, and that

therefore both the Prosodic Hierarchy and reference to prosodic constituents are superfluous. This is the hypothesis adopted by D'Alessandro and Scheer (2015), henceforth D&S.

A number of recent papers (e.g., Cheng & Downing 2007, 2009, 2012a,b, 2016; Dobashi 2010; Selkirk 2011) have, however, demonstrated mismatches between Spell-Out domains and phonological domains, arguing that it is necessary to parse the string into prosodic constituents, such as intonational phrase or phonological phrase, to account for the attested mismatches. D&S's paper has the goal of motivating an approach within phase theory that can account for the same range of data without appealing to prosodic constituents. In order to achieve this goal, D&S propose that the Spell-Out operation should be separated from the Phase Impenetrability Condition (PIC). They call their approach *Modular PIC*. This response provides a critique of Modular PIC.

The response is organized as follows. In section 2, we first lay out the alternations concerning *Raddoppiamento fonosintattico* in Eastern Abruzzese (ARF) that form the only well-developed argument D&S provides for Modular PIC and then summarize the key innovative aspects of Modular PIC, showing how they allow phase theory to account for the ARF data. The remainder of the response takes up a critique of Modular PIC. In section 3, we argue that Modular PIC is unnecessarily powerful. It introduces an excessive lack of restrictiveness into phase theory, while not improving on existing alternative analyses of ARF. In section 4 we argue that, at the same time, Modular PIC is too restrictive because it cannot actually account for the Bantu language data D&S cites in support of their proposal. Furthermore, it ignores the role of well-documented non-syntactic factors in determining the domains for phrasal phonological processes. The main points of the papers are summed up in section 5.

2 Modular PIC and its empirical motivation

2.1 *Raddoppiamento Fonosintattico* in Eastern Abruzzese

The only empirical argument for Modular PIC that D&S works out in detail comes from *Raddoppiamento Fonosintattico* (RF) in Eastern Abruzzese, an Italo-Romance variety spoken in Central Italy. Unlike the better-known case of *raddoppiamento* in Tuscan, in which gemination (*raddoppiamento*) is both stress-conditioned and lexically conditioned, in Eastern Abruzzese and other central-southern varieties, it is conditioned only lexically. This means that RF only affects the initial consonant of a word that appears after a closed set of lexical items, like *llà, so, ni, che*. This is illustrated in (1), where the affected consonant appears in boldface:

(1) llà **vv**icinə   so **vv**istə   ni **vv**e
    there around   am seen   not come
    'around there'   'I am seen'   's/he doesn't/they don't come'

In the formulation of the phonological process, D&S assumes a more or less standard approach, according to which these lexical items (*llà*, *so*, *ni*, etc.) have an extra timing slot at the end of the word in their underlying representation. This extra slot associates phonologically to the initial consonant of the following word when both trigger and target are within the appropriate domain. For convenience, we represent this lexical specification with a capital 'X', as in (2a); compare these examples with the examples in (2b), which lack the timing slot. All relevant items are underlined.

(2)   a. Examples of lexical triggers for RF
        <u>llà</u> **vv**icinə   /llàX/   (D&S: (16a))
        'around there'
        Jè mmeje <u>chə</u> **vv**e   /chəX/   (D&S: (8))
        is better that come.3SG
        'It's better that he/she comes.'

  b. Examples of non-triggers
   <u>la</u> vicina   /la/   (D&S: (16b))
   'the neighbor'
   Penza <u>ca</u> ve   /ca/   (D&S: (11))
   think that come(s)
   'I think that he/she comes/they come.'

Furthermore, D&S suggests that RF in Arielli Abruzzese (henceforth, ARF) occurs with these lexical triggers only when they are in a specific syntactic, phase-related relationship with the following word. While the participle following a passive auxiliary shows gemination (3a), the same participle following the perfect auxiliary does not, for either transitives or unaccusatives (3b,c). Some complementizers also trigger ARF, as shown in (3d); see also the second example in (2a). In these examples, relevant potential triggers of ARF are shown with the associated extra 'X' slot assumed in the analysis of D&S, while actual occurrences of gemination are boldfaced:

(3) a. SoX   **rr**əspəttatə
     am.1SG respected.SG
     'I am respected'
   b. SoX   rəspəttatə   la   leggə
     am.1SG respected.SG the.F .SG law.F.SG
     'I have respected the law'
   c. SoX   rəmastə
     am.1SG stayed.SG
     'I have stayed'
   d. Jè mmeje chəX **vv**e
     is better that   come.3SG
     'It's better that he/she comes'

Raddoppiamento (gemination) can take place only if the X-slot and the initial consonant in the following word are both within the same domain. In a direct reference approach that relies on phases as the only "chunk-defining device" (D&S: 594), that means that the trigger and target of gemination (i.e., the final X-slot of a word and the initial consonant of the following word) must be within the same Spell-Out domain. This is because Chomsky's (2001) Phase Impenetrability Condition (PIC) renders designated domains that start with the complement of phase heads, the Spell-Out domain, impenetrable to subsequent operations

involving both higher domains and the Spell-out domain. Thus, in [$_{ZP}$ Z . . . [$_{HP}$ α [H YP]]], if H is a phase head with YP its complement, "The domain of H [i.e., YP] is not accessible to operations outside of HP; only H and its edge [α] are accessible to such operations" (Chomsky 2001:13).[1]

The relevant syntactic structures corresponding to (3) are shown in (4), below, with the Spell-Out domains expected in a standard phase-based system (Chomsky 2001, see also Chomsky 2008) shown in boldface.[2] The PF domains that would be derived in this standard view of phases and Spell-Out are also shown in (4). The last two columns in (4) compare the presence or absence of gemination expected in this standard phase-based system with the actual output.

As we can see in (4a), because the VP complement would be subject to Spell-Out in the case of transitives, the v, with the preceding material, and its complement are in two separate domains at PF: [... soX] [rəspəttatə]. Gemination would therefore not be expected because the initial r of the participle, [rəspəttatə], is not accessible to the X of [soX]. As shown in (4b,c), in the case of passives and unaccusatives, which have a defective v,[3] the auxiliary and the participle do belong to the same Spell-Out domain: [... soX rəspəttatə] and [... soX rəmastə], respectively. Therefore gemination is expected. Finally, in (4d), the complementizer *chə* would also trigger Spell-Out of its complement, TP. Hence the following verb would not be expected to show gemination, as it is in a separate Spell-Out domain.

(4)   *Narrow syntax*   *Spell-Out*   *PF*   *Expected*   *Actual*

		Narrow syntax	Spell-Out	PF	Expected	Actual
a.	TRAN.	[$_{TP}$...so [$_{vP}$ v [$_{VP}$ **rəspəttatə**]]] $\rightarrow$	[... soX] [rəspəttatə]		r	r
b.	PASS.	**[$_{TP}$...so [$_{vP}$ v [$_{VP}$ rəspəttatə]]]** $\rightarrow$	[... soX rəspəttatə]		rr	rr
c.	UNAC.	**[$_{TP}$...so [$_{vP}$ v [$_{VP}$ rəmastə]]]** $\rightarrow$	[... soX rəmastə]		rr	r
d.	COMP.	[$_{CP}$ chə [$_{TP}$ **ve**]] $\rightarrow$	[chəX] [ve]		v	vv

The view of Spell-Out domains assumed in (4) correctly predicts lack of gemination in (4a) and presence of gemination in (4b), but incorrectly predicts presence of gemination with unaccusatives like (4c) ([... soX rəmastə] $\rightarrow$ **so rrəmastə*), and absence of gemination after

complementizers like (4d) ([chəX] [ve] → *chə ve). This is exactly the opposite of the pattern found in the data (cf. (3c,d)).

To solve the type of problems exemplified in (4c,d), D&S proposes a substantial modification of phase theory and the Phase Impenetrability Condition (PIC), Modular PIC. In the following section we summarize the theory, showing how it accounts for the cases in (4).

2.2 Modular PIC and its application to Eastern Abruzzese

As mentioned above, D&S's goal, in the spirit of direct approaches to the interface, is to motivate a single domain-defining mechanism for both syntax and phonology, in order to dispense with appealing to prosodic constituents, like phonological phrase or intonation phrase, distinct from syntactic ones. In order to account for challenges like those posed by ARF to standard phase-based interface analyses, D&S modify phase theory in three crucial ways: (a) there is no restriction on phase heads; (b) the PIC is parameterized to apply in the syntax, in the phonology, or in both; and (c) this parameterization can make reference to specific syntactic features. We elaborate on these points in turn.

Beginning with the question of restrictions on phase heads, since Chomsky's original proposal that only C and *v* are phase heads, subsequent work has expanded the number of phase heads (see Den Dikken 2007, Grohmann 2007, as well as the discussion in D&S). D&S takes this expansion to its logical conclusion, proposing that any head can be a phase head, the choice depending on the language.

With respect to the parameterization of the PIC, phases in the sense that D&S uses the term can have not only syntactic effects (and motivation) but also purely phonological ones. This is achieved through a new kind of lexical marking on heads (diacritic features) which determines whether a given phase head in this new sense is endowed with a syntactic PIC effect or not, and whether the same given phase head is endowed with a phonological PIC effect or not.[4] We will use the notation [±PIC$_{syn}$] for the former and [±PIC$_{pho}$] for the latter. In

(5) we show the four possibilities that these features define. The set of heads, with values for these features, is what D&S call the *phase skeleton*.

(5) Possibilities for any given phase head H
   a. [+PIC$_{syn}$]: the domain of H is impenetrable to syntax
   b. [−PIC$_{syn}$]: the domain of H is accessible to syntax
   c. [+PIC$_{pho}$]: the domain of H is impenetrable to PF
   d. [−PIC$_{pho}$]: the domain of H is accessible to PF

Note that (5a) corresponds to the standard notion of phase heads in syntax, and (5b) to any head that is not a syntactic phase head, also a possibility within the standard view. In contrast, (5c,d) formalize D&S's expansion of phase theory to include "phonological phases." According to D&S all possible combinations of these four parameters are attested: [+PIC$_{syn}$, +PIC$_{pho}$], [+PIC$_{syn}$, −PIC$_{pho}$], [−PIC$_{syn}$, +PIC$_{pho}$], [−PIC$_{syn}$, −PIC$_{pho}$].[5] The combinations [+PIC$_{syn}$, +PIC$_{pho}$] and [−PIC$_{syn}$, −PIC$_{pho}$] would be the expected options in other direct reference approaches, with coinciding syntactic and phonological chunks. However, the combinations [−PIC$_{syn}$, +PIC$_{pho}$] and [+PIC$_{syn}$, −PIC$_{pho}$] for a given head can give rise to non-matching syntactic and phonological domains because the chunking that we see in the syntax can be ignored in the phonology, and vice versa.[6] Recall from section 1 that a mismatch between prosodic and syntactic constituents has been a central motivation in indirect approaches for mapping syntactic structure to prosodic constituents. (More on this in section 4, below.) With the settings [−PIC$_{syn}$, +PIC$_{pho}$] and [+PIC$_{syn}$, −PIC$_{pho}$], Modular PIC provides a way of formalizing (some types of) non-matching that does not require recourse to prosodic constituents. Contrary to most indirect approaches, Modular PIC can refer to specific syntactic categories (and even specific features; see below).

Though introduced only in a footnote (footnote 5), a third element of the theoretical architecture turns out to be crucial for Modular PIC: for any given language, any given phase head, in addition to its specification as [±PIC$_{syn}$] and [±PIC$_{pho}$], must specify which phonological process this information is relevant for. Therefore the typology in (5) is actually

much more complex, especially on the phonological side. This is shown in (6), where different phase heads (H_i, H_j) are specified for different sets of phonological processes (P1, P2, ...).[7]

(6) Specifications for different phase heads with [+PIC$_{pho}$]
    H_i: [+PIC$_{pho}$] for P1, P3, P4, ...
    H_j: [+PIC$_{pho}$] for P1, P5, P6, ...

As illustrated in (6), a given phase head can not only be specified for different phonological processes, but also a given phonological process can be encoded in more than one phase head.

To summarize Modular PIC, we list in (7) the options, in the form of questions (Q), that are relevant for each functional head (H).

(7) Options for each functional head:
    Q1 Is H a phase head or not?
        If it is a phase head,
    Q2 Does H induce PIC in syntax?
    Q3 Does H induce PIC in phonology?
        If H does induce PIC in phonology,
    Q4 For which phonological processes P_1, P_2, ..., P_n does H induce PIC in phonology?
    Q5 For every process P_1, P_2, ..., P_n, which syntactic features does H need to carry in order for H to have a prosodic effect?

Let us see how Modular PIC deals with the ARF cases exemplified in (4), repeated below as (8). Recall that the last column reflects the actual realization, while the penultimate column shows the expected results for a direct reference approach based on a more standard theory of phases, like Chomsky (2008).

	Narrow syntax		*Spell-Out*		*PF*	*Expected*	*Actual*
a. TRAN.	[$_{TP}$...so [$_{vP}$ v [$_{VP}$ **rəspətatə**]]]	$\rightarrow$	[... soX] [rəspətatə]			r	r
b. PASS.	**[$_{TP}$...so [$_{vP}$ v [$_{VP}$ rəspətatə]]]**	$\rightarrow$	[... soX rəspətatə]			rr	rr
c. UNAC.	[$_{TP}$...**so [$_{vP}$ v [$_{VP}$ rəmastə]]]**	$\rightarrow$	[... soX rəmastə]			rr	r
d. COMP.	[$_{CP}$ chə [$_{TP}$ **ve**]]	$\rightarrow$	[chəX] [ve]			v	vv

D&S proposes to account for all the cases in (8) by assigning the features shown in the table in (9), where the values for [±PIC$_{syn}$] coincide with those widely assumed in other syntactic approaches. The notation v_{def} is used for passives and unaccusatives, which are weak phase heads in Chomsky (2001).

(9) Values for the PIC, Arielli Abruzzese (ARF)

		$[\pm PIC_{syn}]$	$[\pm PIC_{pho}]$
a.	v [active]	+	+
b.	v_{def} [passive]	−	−
c.	v_{def} (unaccusatives)	−	+
d.	C	+	−

For (9a,b), the values for $[\pm PIC_{syn}]$ and $[\pm PIC_{pho}]$ coincide, and hence the domain of gemination coincides with the one predicted by a more standard theory of phases, as reflected in (8a,b). The mismatches between phonology and syntax are defined in (9c,d) and exemplified in (8c,d). In (8c) the vP head, v, has a $[+PIC_{pho}]$ feature (see (9c)), in spite of it being $[-PIC_{syn}]$. Therefore, even though there is no PIC effect in syntax, phonologically the VP is impenetrable, and lack of gemination is expected: *so* and *rəmastə* belong to two different domains and hence the participle cannot geminate (*rrəmastə). In the case of (8d), while the TP is syntactically a phase complement and the PIC should block ARF, the presence of a $[-PIC_{pho}]$ feature on C (see (9d)) makes it a phonologically transparent domain and gemination is correctly obtained (*vve*). Recall that the inaccessibility effect created by a $[+PIC_{pho}]$ head is also process-specific in Modular PIC: phase heads must be marked with this feature with respect to the ARF process, but they could have different values for other phonological processes. In addition, ARF is conditioned by the syntactic features of the head: v heads with "an active value for the [voice] feature on v" (D&S:614), like (9a,c), are specified as $[+PIC_{pho}]$ for ARF, while v heads with the opposite value, like (9b), are specified as $[-PIC_{pho}]$ for ARF.

In section 3 we argue that Modular PIC is too unrestricted – and unnecessarily so, since the Eastern Abruzzese raddoppiamento data can be reanalyzed without having to modify phase theory.

3 Modular PIC is unnecessarily powerful

3.1 Excessive power illustrated

Even though Modular PIC provides a coherent account of the ARF data, an immediate concern is its excessive power, given that for any phonological process, any head (with some specific feature) can have any of the four combinations provided by the features [±PIC$_{syn}$] and [±PIC$_{pho}$]. The loss of restrictiveness can be seen by considering the typological consequences of variation in feature specifications for a phase head like *v*. In a standard phasal analysis, non-defective *v* induces a PIC effect in the phonology and defective *v* does not. In Modular PIC, *v* [active], *v$_{def}$* (unaccusatives), and *v$_{def}$* [passive] can induce or not induce, on a language-particular basis, a phonological PIC effect, as shown in (10). In addition to the ARF system, seven other typological possibilities are predicted:

(10)   Values for [±PIC$_{pho}$]

	ARF	Other typological possibilities						
v [active]	+	+	+	+	–	–	–	–
v$_{def}$ [passive]	–	+	+	–	+	–	+	–
v$_{def}$ (unaccusative)	+	+	–	–	+	+	–	–

Thus, in addition to the ARF outcomes *so rəspəttatə, so rrəspəttatə, so rəmastə*, we predict a variety with *so rəspəttatə, so rəspəttatə, so rəmastə*; another one with *so rəspəttatə, so rəspəttatə, so rrəmastə*; another one with *so rəspəttatə, so rrəspəttatə, so rrəmastə*; and so on. At the same time, ARF could be linked to other syntactic features, possibly feature combinations, expanding further the factorial typological possibilities. In effect, Modular PIC allows a phonological process like ARF to be made specific to individual syntactic constructions.

The concern raised in (10) for *raddoppiamento* generalizes to any type of phenomenon. To illustrate the unrestricted power of Modular PIC, let us take a language L with the phase skeleton [C, *v*, D, P] and a phonological process Ph, and let the domain of application of Ph vary as predicted by Modular PIC. For example, *v* can be specified either as [–PIC$_{pho}$] or as

[+PIC$_{pho}$], and in this case it can be restricted to *v*'s with specific syntactic featural specifications like [active], possibly combined with other features. Hence, the number of variations in the contexts in language L of process Ph with respect to *v* is N$_v$+2 (N$_v$, i.e. the number of features on *v*, plus N with no feature, plus, the lack of *v* in the skeleton), and the total number of options for L will be (N$_C$+2) × (N$_v$+2) × (N$_D$+2) × (N$_P$+2). This vast number of possible variations is excluded in theories based on the Prosodic Hierarchy, where phrasal processes apply within a restricted set of prosodic constituents, which are defined with reference to a restricted set of general syntactic constituent types. (See, e.g., Selkirk 2011 for discussion.)

Due to this lack of restrictiveness, Modular PIC predicts patterns that are unattested, as far as we know, in human language. To give some examples, for a given external sandhi process sP, we would expect to find a language in which all (phase) heads are [–PIC$_{pho}$] except for *v*, which is [+PIC$_{pho}$]. Assuming that the verb moves to *v*, in that language sP would apply across the board except between a verb and its complement, where it would be blocked. Similarly, we would expect a language with the same situation but with only D as [+PIC$_{pho}$]. Here the process would apply again across the board except between a determiner and its complement. In a language where, instead, all heads were [+PIC$_{pho}$] except for *v*, the process sP would only apply between a verb and the first word of its complement (assuming again that the verb moves to *v*). We would also expect languages in which both D and *v* are [–PIC$_{pho}$] while the remaining heads are [+PIC$_{pho}$]. In such a language sP would apply across D and across *v* but not across other heads. In addition, a language could have a phonological process applying across the board except across passive *v*; that is, a head with a specific feature. Many other examples can be constructed with similar specifications based on other heads or on any combination of heads, and the patterns that most of them predict do not seem to exist. Many external sandhi processes, like flapping in English (mentioned in D&S) or

spirantization in Spanish (see, among others, Mascaró 1984, Piñeros 2002), or several types of assimilation, apply essentially across the board. While other processes, like *Raddoppiamento* or French liaison, have a more restricted and complex distribution, it is not of the kinds described above.

3.2 Alternative analyses and empirical problems

Perhaps this loss of restrictiveness would have to be considered an acceptable price to pay, if there were no alternative account available for patterns like ARF. But ARF can, in fact, be reanalyzed in at least two ways without having to resort to the drastic modification of phase theory that Modular PIC embodies.

D&S's argument depends crucially on the assumption that *so* and *si* in passives and in the present perfect (transitives or unaccusatives) are instances of the same lexical verb, which in turn depends on the existence of auxiliary selection by person. According to D&S, in passive constructions the auxiliary is always the verb BE. However, as shown in (11), in the present perfect, the 1SG/PL and 2SG/PL select BE while the 3SG/PL selects HAVE.

(11) The passive and perfect auxiliaries in D&S

	BE		HAVE
	passive aux		
		perfect aux	
1SG		soX	
2SG		siX	
3SG	jèX		a
1PL		semə	
2PL		setə	
3PL	jèX		a

We can safely assume that in Eastern Abruzzese both passive constructions and copular constructions contain the same verb BE, as is generally the case in Romance: *so rrəspəttatə* 'I am respected', *so vvikkjə* 'I am old'.[8] But in the present perfect, it is not clear that synchronically the auxiliaries should be considered members of two different verb paradigms, syntactically selected by person, even though diachronically the auxiliaries derive from both

BE and HAVE.[9] The verb HAVE indicating possession (Italian *avere*) is a different verb in Eastern Abruzzese, namely *tenə*, so the auxiliary HAVE seems to consist of the single form *a* of the 3SG/PL.[10] Furthermore, serious doubts have been cast in the literature about the syntactic character of the selection of auxiliary by person: see Bentley and Eythórsson (2001), Bentley (2006:55-59, 61.64), and the detailed studies of Loporcaro (2001, 2007) for arguments against a syntactic analysis.[11]

Instead of assuming that synchronically Ariellese, and Abruzzese in general, uses two different auxiliaries for the perfect, with selection by person, one could plausibly assume that, as in English and other Romance languages, there is a single perfect auxiliary different from the one used in passives and in copular constructions, as shown in (12). This option is considered, but rejected, by Biberauer and D'Alessandro (2006) on grounds of complexity that are not very convincing.[12]

(12) Alternative analysis of the passive and perfect auxiliaries

	BE	HAVE
	passive aux	perfect aux
1SG.	soX	so
2SG.	siX	si
3SG	jèX	a
1PL.	semə	semə
2PL.	setə	setə
3PL	jèX	a

In (12) two forms of the HAVE auxiliary are identical to the corresponding forms of BE (semə, setə), two forms differ in the presence or absence of the extra timing slot (soX/so, siX/si), and the other two are totally different (jèX/a). Under this alternative interpretation of the auxiliary system, the presence or absence of gemination would have a straightforward explanation in terms of lexical marking, needed anyway, and would have nothing to do with phases. There is gemination in the passive because the passive auxiliaries *soX*, *siX* and *jèX*

have the X timing slot; there is no gemination in the present perfect because its auxiliary forms lack the X slot.[13]

Another alternative analysis, suggested by van Oostendorp (2015), is to consider that there is indeed auxiliary selection by person, but that the difference between the presence of *raddoppiamento* in passives vs. its absence in actives (i.e., transitives, unaccusatives) is the manifestation of a floating mora related to a specific morphosyntactic featural specification, like [passive]. The auxiliary itself need not be lexically specified for an extra timing slot (or mora). Under this view again there is no need to resort to the notion of phase in any of its versions. Further support for an analysis based on floating moras as the realization of morphosyntactic features comes from another Italo-Romance variety spoken in Calvello (Basilicata), where a masculine noun surfaces with an initial geminate consonant when it has a mass interpretation and is preceded by the definite article; otherwise it surfaces with a singleton consonant. The data in (13), from Gioscio (1985), are analyzed in Mascaró (2016) in terms of a floating timing slot (a C, or alternatively a mora) that constitutes the realization of the morphosyntactic feature [MASS].

(13) COUNT   MASS
      lu panə   lu ppanə   'the bread'
      lu fjerrə   lu ffjerrə   'the iron'

There are other problems of an empirical sort. If we had a general analysis of the domains of application of ARF that would follow from Modular PIC, we would have a piece of evidence in favor of the theory. But the evidence presented regarding ARF is at best dubious given that it is limited to the verbal forms *so*, s*i*, a very small subset of the lexical elements triggering *raddoppiamento* in Eastern Abruzzese. In his analysis of Tollo (15 km from Arielli), Hastings (2001: 271-272), lists 37 triggers belonging to different classes: auxiliary forms, complementizers, imperatives, adverbs, prepositions, articles, demonstratives, numerals,

negation, and quantifiers. This data is particularly relevant as a test for Modular PIC, given the fact that gemination in ARF, and in central-southern varieties in general, has been described as restricted to a small prosodic domain that does not appear to be amenable to syntactic analysis as a phase complement domain. Indeed, according to Fanciullo (1986:87-88; see also 82-83, 85-86), "lexical elements, which constantly produce reinforcement in the center-south dialects, occupy, in the phrase, a well-defined place: they are not conceivable if they are not connected rather rigidly to the items to which they refer, with which they come to form a minimal phrase [...]—a kind of hierarchically superior word."[14] Before concluding that the domain of ARF is more adequately and straightforwardly accounted for by Modular PIC than by alternative analyses, it is necessary to test the theory on all the lexical triggers of *raddoppiamento*, not only the few cases discussed in D&S.

As has been shown in this section, the empirical evidence that motivates Modular PIC reduces to a small subset of the relevant evidence in Eastern Abruzzese and is amenable to alternative analyses. For Modular PIC to be considered a tenable approach to the interface, it must also be shown that a wide range of the data analyzed within indirect reference models for the last 30 years is amenable to a Modular PIC analysis. In the next section we argue, with data from Bantu languages and others, that Modular PIC turns out to be too restrictive to account for a number of familiar cases.

4 Modular PIC is too restrictive

As we have just demonstrated, Modular PIC is too powerful. In this section we argue that, paradoxically, Modular PIC is also too restrictive. While D&S claims that Modular PIC provides sufficient machinery to determine the domain of all phrasal phonological processes, so that, as D&S puts it, "the entire Prosodic Hierarchy is superfluous and has to go" (D&S: 618), this section shows that Modular PIC makes wrong predictions in four different types of

cases that receive a straightforward analysis in prosodic constituent theory. We begin this section with data from some Bantu languages, the focus of their Section 5.

4.1 The problem of edges: data from Zulu and Chicheŵa

In order to understand the problem for Modular PIC presented by Bantu languages Zulu (S.30) and Chicheŵa (N.31), cited in D&S, it is necessary to properly understand the core data. (D&S's paper contains quite a number of factual mistakes; see endnote 15.) In both Zulu and Chicheŵa, vowel length is not contrastive; penultimate vowels are lengthened as a correlate of phrasal stress.[15] More specifically, a prosodic phrasal domain boundary (indicated by round brackets) follows the word which has penultimate vowel lengthening. Consider first the phrasing in the simple sentences in (14) and (15), where lengthened penult vowels are bolded:[16]

(14) Zulu (Cheng and Downing 2007, 2009)
    a. (ú-Síph'   ú-phékél'   ú-Thánd'   in-k**úu**khu)
        CL1-Sipho 1SBJ-cooked.for   CL1-Thandi CL9-chicken
        'Sipho cooked chicken for Thandi.'
    b. ((bá-ník'   ú-Síph'   í-bhayisék**ii**li) namhl**áa**nje)
         2SBJ-gave CL1-Sipho CL5-bicycle   today
        'They gave Sipho a bicycle today.'

(15) Chicheŵa (Downing & Mtenje 2011a,b)
    a. (Ma-kóló   a-na-pátsíra   mwaná   ndalámá   zá
        CL6-parent 6SBJ-TAM-give CL1.child CL10.money 10.of
        mú-longo w**áa**ke)
        CL1-sister CL1.her
        'The parents gave the child money for her sister.'
    b. (B**á**anda) ((a-ná-wá-ona   a-le**é**ndó) dz**uu**lo)
        CL1.Banda   1SBJ-PST2-2OBJ-see CL2-visitor yesterday
        'Banda saw the visitors yesterday.'

A simplified syntactic structure for (14) and (15) is given in (16), where // indicates a Spell-Out domain based on the complement of a phase head, as Modular PIC assumes.[17]

(16) [$_{CP}$ C^0 // ([$_{TP}$ Subject T^0 verb [$_{vP}$ v^0 // ([$_{VP}$ IO DO]]) // Adv] //])

What (14) and (15) show us is the following: (a) the subject typically phrases with the remainder of the sentence;[18] (b) the verb plus following (non-modified) complements are

phrased together in a prosodic phrase; (c) temporal adjuncts phrase separately from the constituents in the verb phrase. From (16), it is clear that basing prosodic domains on Spell-Out domains (i.e., on complements of a phase head) would predict that the verb is phrased separately from the objects. In other words, the prosodic phrases in Zulu and Chicheŵa are typically bigger than phases. It should be noted that even if Spell-Out domains are based on the whole phase (and not just the complement of the phase head), the outcome is still too restrictive; for instance, the verb and the subject would still be expected to be phrased separately from the two objects. (See Cheng and Downing 2016 for detailed discussion.)

Turning to more complex sentences, consider the Zulu relative clause in (17) as well as its corresponding schematic structure in (18), again with the Spell-Out domains (using complements of a phase head, following D&S) indicated by //, assuming that D^0 is also a phase head:

(17)   Zulu (Cheng and Downing 2007)
       ((Ín-dod'   é-gqokê   ísí-gq**oo**ko) í-boné   ízi-vak**áá**shi)
        CL9-man REL.9SBJ-wear CL7-hat   9SBJ-see CL8-visitor
       'The man who is wearing a hat saw the visitors.'

(18)   [[$_{DP}$ D^0 // [$_{CP}$ Head N C^0// [$_{TP}$ … T^0 verb [$_{vP}$ v^0 // [$_{VP}$ DO]]]]] T^0 verb [$_{vP}$ v^0 // [$_{VP}$ DO]]]

We see from (17) that the head noun of the relative clause is phrased together with the whole relative clause, as penult lengthening is only found at the right edge of the relative clause (and the right edge of the matrix clause). In contrast, (18) shows that a Spell-Out domain account would split the head noun from the rest of the relative clause, and splitting the verb from its object, giving the wrong predictions. The relative clause example illustrates again that the prosodic domains defined by penult lengthening in Zulu are bigger than the Spell-Out domains.[19]

To account for this data, what Cheng and Downing (2012b, 2016) argue for is the following:

(19) a. Prosodic phrasing can be conditioned by phases, and phonology accesses the final output of the syntactic representation (with phase edges).

    b. Spell-Out domains do not match prosodic domains.

This mismatch holds true regardless of whether a Spell-Out domain corresponds only to the complement of a phase head or to the XP headed by the phase head. (See Cheng and Downing 2016 for detailed discussion.)

From (14) to (18), we see that the standard conception of Spell-Out domains as prosodic domains will parse the simple sentences and relative clauses incorrectly. Essentially, it predicts prosodic boundaries where there are none. What Cheng & Downing (2012b, 2016) argue for, following other recent work on the phonology-syntax interface like Dobashi (2010) and Selkirk (2011), is *non-isomorphism* between syntactic and prosodic structure.

D&S acknowledge the non-isomorphism and claim that Modular PIC is able to account for the type of non-isomorphism found in Bantu language data like that just cited. Let us now evaluate their claim. The data reviewed above are schematized in (20), where the elements that actually have **p**enultimate **v**owel **l**engthening are subscripted with PVL. We indicate the *expected* prosodic boundaries based on the occurrence of penultimate vowel lengthening with a superscript π.

(20) a. $[_{CP}$ C^0 $[_{TP}$ Subject T^0 verb $[_{vP}$ v^0 $[_{VP}$ IO DO$_{PVL}$ $]^\pi$] Adv$_{PVL}]^\pi$]

    b. $[[_{DP}$ D^0 $[_{CP}$ Head N C^0 $[_{TP}$ …T^0 V $[_{vP}$ v^0 $[_{VP}$ DO$_{PVL}$ $]^\pi$]]]] T^0 V $[_{vP}$ v^0 $[_{VP}$ DO$_{PVL}]^\pi$]]

D&S focus on the absence of lengthening where more conventional phase theory would aim to predict its presence: on the verb in (16)/(20a) and on the head noun (or the relative prefix) in (18)/(20b). To account for these types of Bantu data, D&S proposes that within Modular PIC it can be assumed that both C^0 and v^0 are [–PIC$_{pho}$] for the lengthening process. Then it follows that in (20a) there is no lengthening on the verb because at PF both v^0 and its complement are part of the same phonological domain. In (20b) there is no lengthening on the head noun (or the relative prefix), because C^0 does not cause phonological chunking

either. In other words, given Modular PIC, even if C^0 and v^0 are subject to Spell-Out in narrow syntax, they are not endowed with a PIC at PF, and hence the phonology will not consider them domain-final.

However, their proposal does not account for the Bantu data because they have failed to consider the *presence* of lengthening before the adverb in (20a) and the *presence* of lengthening at the end of the relative clause in (20b). If both C^0 and v^0 are $[-PIC_{pho}]$, neither the DO in (20a) nor the DO in (20b) would be expected to be lengthened. To account for the penultimate vowel lengthening of the direct objects and the adverb, they could try to say that it is the whole phase (not the complement of the phase head) that matters and that both vP and CP are $[+PIC_{pho}]$. This would account for the presence of lengthening at the end of the vP (before the adverb) in (20a) and also for its presence at the end of the relative clause in (20b). But this would also predict, contrary to fact, that there should be lengthening *before* the vP in (20a); that is, on the verb and on the head noun. If one doubts that the verb has raised so high, the same question can be asked about the subject in (20a), or the head noun in (20b). What is clear from the data above, and in (20a,b) is that penult lengthening only occurs on words at the *right* edges of phases.

The problem that we raise here has to do with this edge asymmetry. That is, the Bantu data above show that in the prosodic phrasing in Zulu and Chicheŵa, only the right edge appears to be active in the sense that only the right edge conditions phonological processes such as penultimate lengthening. Such an edge asymmetry is problematic for the Modular PIC approach (and for other direct reference approaches). As Cheng and Downing (2016: 186) notes, "…the problem does not just involve a lack of direct mapping between a phase-cycle and a prosodic cycle; rather, there is also an asymmetry between the left and right edges of the phase." This is because linking any prosodic phrasing directly to phases that are associated with the PIC predicts that the whole phase (or the whole complement of the phase

head) is relevant when it comes to the PIC, rather than just its right or left edge. In short, given the data, we cannot conclude that phases form *prosodic islands* because it is not the whole phase that functions as an island. Rather, it is only the right (or, less commonly, left) edge of a phase which conditions a prosodic phrase boundary. In the case of Zulu and Chicheŵa, left edges of phases do not play a systematic role in conditioning prosodic boundaries.[20] Modular PIC is too restrictive to allow for this asymmetry.

4.2 Prosodic influence on the size of domains

Modular PIC, like other direct reference theories, is also too restrictive in the sense that it does not allow for prosodic – as opposed to purely morphosyntactic – information to condition prosodic domain formation. In this section we illustrate the importance of prosodic information with Lekeitio Basque (for a more detailed description and analyses assuming the Prosodic Hierarchy, from which the data are taken, see Elordieta 1997, 2007a, 2015, and Selkirk 2011, among others); Tokyo Japanese shows a similar pattern (see Kawahara 2015 for a detailed description). In Lekeitio Basque a lexical distinction is made between accented words and unaccented words. Phonological domains are determined as follows. Each accented word constitutes a prosodic domain. Unaccented words, however, must be grouped into a single prosodic domain, called accentual phrases in Elordieta (1997), and φ_{min} in Elordieta (2015). The two examples in (21), adapted from Elordieta (1997), illustrate different prosodic groupings with two DPs that are segmentally homophonous (similar examples can be found in Selkirk 2011). Each prosodic domain is marked with parentheses. Following Elordieta (1997), syllable boundaries are indicated with periods in the two examples.

(21) a. L% H*L   L%   H*L
        (la . gú . nen) (di . ru . a)
        friend.GEN.PL money.ABS.SG
        'the friends' money'
     b. L%   H*L
        (la . gu . nen   di . ru . a)
        friend.GEN.SG money.ABS.SG
        'the friend's money'

Accented words have a falling pitch accent, H*L, on the penultimate syllable; prosodic

domains are characterized by an initial L% boundary tone on the first syllable plus the lexical

H*L tone. In (21a) a lexically accented word, a genitive plural noun, *lagúnen*, is followed by

an unaccented word, *dirua* 'money'. Since *lagúnen* is accented, it has the H*L pitch accent

on the penultimate syllable and constitutes a prosodic domain. Consequently, the rest of the

utterance, *dirua*, is a separate prosodic domain. The unaccented word *dirua* appears also with

a H*L tone, mandatory in all prosodic domains of type φ_{min}, but, contrary to lexically

accented words, in this case the contour tone is located on the last syllable, not the

penultimate one. In (21b) both words are unaccented, *lagunen* being genitive singular here. In

this case both words constitute a single prosodic domain.[21] The domain starts with the L%

boundary tone and ends with the H*L on the last syllable.

The example in (22), also from Elordieta (1997), contains several unaccented words. In

such cases, there is a single prosodic domain up to the verb, which, together with the

auxiliary, constitutes a separate prosodic domain.

(22) L%   H*L   L%   H*L
     (Nire amen   dirua)   (galdu dot)
      my mother.GEN.SG money.ABS.SG lose   have.1sg
     'I have lost my mother's money.'

As Elordieta and Selkirk argue (in the publications mentioned at the beginning of this

section), prosodic domains at different levels in Lekeitio Basque are largely determined by

syntactic structure but, crucially, also by the lexical prosodic factors outlined here. Within

Modular PIC, for the examples in (21a,b) one could tentatively say that a Number head with

the feature [plural] (not the singular) is [+PIC$_{pho}$], and hence causes the following word to be phrased separately in (21a). But presence or absence of accent is also an idiosyncratic property of roots; while *lagun* 'friend', in (21a,b), or *etxe* 'house' are unaccented and thus do not trigger the formation of a separate domain in the singular, as in (21b); other roots, like *léku* 'place' or *átze* 'back', are accented and trigger the formation of a separate prosodic domain, even in the singular. Modular PIC, with its rejection of the Prosodic Hierarchy, and its reliance on heads and phases as the sole chunk-defining device, cannot refer to idiosyncratic phonological properties such as the presence or absence of accent on roots and affixes, and hence cannot account for prosodic domains in Lekeitio Basque.

4.3 The problem of modifiers

Modular PIC also cannot account for differences in the prosodic phrasing of modified vs. unmodified noun phrases, which challenge D&S's claim that: "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&S: 617) Consider first data from Kinyambo (a Bantu language spoken in Tanzania). In this language, the process of High Tone Deletion is conditioned by prosodic domains: a High tone is deleted if followed by a High tone in the following word in the same prosodic phrase. (See Bickmore 1990 for detailed discussion.) In (23), the vowel bearing the High tone that undergoes deletion is underlined. As Bickmore (1990) shows, in data like (23a) the High tone of the unmodified subject noun is deleted before the verb, providing evidence that the subject is phrased with the verb. In data like (23b), only the High tone of the subject noun, but not that of the following modifier, undergoes High Tone Deletion, providing evidence for a phrase break between the subject noun+modifier phrase and the verb:

(23) Kinyambo phrasing (Bickmore 1990)

    a. /aba-k<u>ó</u>zi   bá-ka-júna / → (abak<u>o</u>zi bákajúna)
        CL2-workers   2SBJ-TAM-help
        'The workers helped.'
    b. /aba-k<u>ó</u>zi   bakúru   bá-ka-júna / → (abak<u>o</u>zi bakúru) (bákajúna)
        CL2-workers 2.mature 2SBJ-TAM-help
        'The mature workers helped.'

The contrast between (23a) and (23b) clearly shows that D&S's claim is incorrect, as modified nominal subjects (23b) phrase differently from non-modified ones (23a). Under Modular PIC, the phenomenon of High Tone Deletion in (23a) tells us that if D^0 is a phase head, it is endowed with [-PIC$_{pho}$], since the subject DP and the verb belongs to one prosodic phrase. However, Modular PIC runs into trouble in (23b): though the D^0 is [-PIC$_{pho}$], the subject is nonetheless phrased separately from the verb. The only possible way for D&S to ensure that the additional modifier in (23b) yields a prosodic break is to allow the modifier to somehow induce a [PIC$_{pho}$], but this move would again face the "edge asymmetry problem" because then High Tone Deletion would incorrectly be predicted to be blocked at the left edge of the modifier. As we see in (23b), though, High Tone Deletion is only blocked following the modifier, not before it. This is the sort of language-internal evidence that falsifies Modular PIC, according to D&S's own criteria.

    The same problem arises in accounting for the distribution of penultimate vowel lengthening in Chicheŵa. As we can see from (24a) below, the indirect object noun phrase *anyaní* 'baboon' is *not* separated from the direct object *nsómba* 'fish' by a prosodic boundary in a neutral sentence. However, when the indirect object noun phrase is modified, as in (24b), the noun phrase is prosodically parsed separately from the direct object. Recall that penult lengthening (bolded) is the correlate of prosodic phrasing:

(24) Chicheŵa (Downing & Mtenje 2011a, b)
  a. (A-lendó   a-na-dyétsa   a-nyaní   nsóomba.)
      CL2-visitor 2SBJ-TAM-feed CL2-baboon CL10-fish
      'The visitors fed the baboons fish.'
  b. (A-lendó   a-na-dyétsá   a-nyaní   á-saanu) (nsóomba).
      CL2.visitor 2SBJ-TAM-feed CL2-baboon CL2-five   CL10-fish
      'The visitors fed five baboons fish.'

As Cheng & Downing (2016) point out, it is quite common in Bantu languages for modified nouns to have different phrasing properties from unmodified ones. Besides the examples cited here, the effect of modifiers on phrasing in Tsonga has received attention, as it forms a central case study in Selkirk's (2011) handbook chapter. Outside of Bantu languages, work such as Nespor & Vogel (1986), Ghini (1993), Selkirk (2000), Sandalo and Truckenbrodt (2002), D'Imperio et al. (2005), Elordieta, Frota and Vigário (2005), and Prieto (2005) has shown the effect of nominal modifiers on the phrasing of subject and object nominal phrases in various Romance languages. It is therefore surprising that this sort of data was overlooked by D&S in testing Modular PIC.

It is, in fact, a challenge for direct reference approaches to the interface in general to account for such data. For Modular PIC to be able to account for this pattern, a DP must be a phase when it is modified, but not a phase when it is not modified. This makes an account in terms of phases more and more difficult.[22] As Cheng & Downing (2016) point out, the interaction between syntactic and prosodic factors (like minimality or branchingness of a nominal phrase or eurhythmy in a prosodic parse) is easy to model in indirect approaches, in contrast, as one expects prosodic constituent formation to be subject to prosodic well-formedness constraints. (See Bickmore 1990, Downing & Mtenje 2011b, Nespor & Vogel 1986, Prieto 2005 and Selkirk 2011 for a variety of indirect reference approaches to this problem.) Lastly, it should be noted that in Chicheŵa, the left edge of the DP (either direct or indirect object) boundary is not active in (24a,b), illustrating again the edge asymmetry problem mentioned in the preceding sections.

4.4 The problem of Chimwiini

D&S's discussion of "Bantu" focuses on languages where the prosodic phrasing is typically larger than a phase. However, they must be aware from work like Selkirk (1986), cited in their references, that one also finds Bantu languages like Chimwiini where prosodic phrasing is smaller than a phase. (See, too, Kisseberth & Abasheikh 1974, 2004; Kisseberth 2005, 2010a,b, 2017; Truckenbrodt 1995, 1999.) The cue to phrasing in Chimwiini is the (potential) occurrence of a long vowel and obligatory accent (marked with an acute accent). As shown in (25), we do not find an accent on every word, but, rather, only on words at the right edge of lexical XPs. Vowel length is also not freely distributed on the surface, rather contrastively long vowels (bolded) can surface only in the antepenultimate or penultimate syllable of a prosodic phrase:

(25)   Distribution of accent and vowel length in Chimwiini (Kisseberth 2017)

    a.   ∅-som**ée**le   'he read'
    b.   ∅-somele chi-b**úu**ku   'he read a book'
    c.   ∅-somele chi-buku íchi 'he read this book'

Based on these patterns, Kisseberth (in a number of works), along with Selkirk (1986) and Truckenbrodt (1995, 1999), has argued that a prosodic phrase break follows every lexical XP; more examples illustrating this point are given in (26):[23]

(26)   Prosodic phrasing in Chimwiini (Kisseberth 2010a)
    a.   (sul<u>t</u>ani úyu) ((su<u>li</u>le m-loza   mw-**aa**náwe) mú-ke)
        'This sultan   wanted to marry his son (to)   a woman.'
    b.   ((ni-wa-pele w-**aa**ná)   m**aa**ndá)
        'I gave   the children   bread.'
    c.   (Hamá<u>d</u>i) (((mw-an<u>d</u>iki<u>li</u>le mw-**áa**na) xá<u>t</u>i)   ka N**úu**ru)
        'Hamadi   wrote for   the child a letter to Nuuru.'

As we can see, there is always a phrase break separating the subject and the verb, and there is always a phrase break separating post-verbal complements. As Cheng & Downing (2016), following others, show, these are the breaks predicted by a constraint aligning prosodic phrase edges with lexical XP edges:

(27) AlignR(XP, Phonological Phrase) (Selkirk 2000, Truckenbrodt 1995, 1999, Kisseberth 2010a, b)

Align the right edge of a lexical XP with the right edge of a Phonological Phrase.

These are, however, clearly not the phrase breaks predicted by a classic Spell-Out domain approach to prosodic phrasing, as a Spell-Out domain potentially includes more than one lexical XP (see the examples from Zulu and Chicheŵa above).

Even though D&S (p. 597) proposes that "phases must be small enough to allow every phonologically relevant stretch of the linear string to be described," we think that Modular PIC cannot account for the Chimwiini phrasing pattern shown in (26). If they assume that every D^0 is a phase head (and its NP complement would be the Spell-Out domain) in Chimwiini, we would not be able to explain why the DP *sultani úyu* 'this sultan' would be phrased together: the NP *sultani* should constitute the Spell-Out domain. Furthermore, we would still have the edge asymmetry problem: *mwaanáwe* 'his son', *waaná* 'the children', and *mwáana* 'the child' in (26a-c) are **not** separated on their left edge from the verb (but they are separated on their right edge from the other elements in the verb phrase). If we only take C^0 and v^0 to be phase heads, assuming that the verb has at least moved to v^0, we would expect (a) the verb to be phrased separately from the objects as the latter belong to a separate Spell-Out domain; (b) the verb and the subject to be phrased together. Lastly, assuming a combination of D^0 and v^0 to be phase heads also does not help: it would still have the problems pointed out earlier connected to D^0 being a phase head, as well as the edge asymmetry problem.

A further problem raised by the Chimwiini data, as Kisseberth (2005, 2010a,b, 2017) makes clear, is that of recursive assignment of final tonal accent. The position of tonal accent in Chimwiini is morphologically determined. Accent is assigned to the final syllable of verbs with a 1st or 2nd person subject prefix,[24] and to the penult in the elsewhere case:

(28)   Accent assignment in Chimwiini (Hyman 2016: 34)
        1st person   n-jiilé   'I ate'   chi-jiilé   'we ate'
        2nd person   jiilé   'you ate'   ni-jiilé   'you pl. ate'
        vs.
        3rd person   jíile   's/he ate'   wa-jíile   'they ate'

While the accent distinction is motivated by morphological properties of the verb, the actual accent need not be realized on the verb. Instead, it is realized on the final vowel of every Phonological Phrase within the scope of the verb phrase. As Kisseberth (2010a,b; 2017) argues, this pattern of accent assignment is best accounted for by an appeal to recursive Phonological Phrasing. Final accent assignment then targets every phrase-final vowel of a recursive Phonological Phrase that includes the trigger verb, as in (29d).

(29)   Chimwiini recursive phrasing (Kisseberth 2005: 142-143)
        a. (n-jil**ee** n̲amá)
             I-ate   meat
            'I ate meat.'
        b. (sí) (chi-lele ma-sku ma-zimá)
            we we-slept night   whole
            'We slept the whole night.'
        c. ((ni-m-lisile   mw**e**enziwá) d̲ee̲ní)
             I-1OBJ-pay.to 1.friend   debt
            'I paid my friend the debt.'
        d. (((ni-m-t̲ind̲il̲ile mw**aa**ná)n̲amá) k**aa**   chi-sú)
             I-1OBJ-cut.for 1.child   meat   with   knife
            'I cut for the child meat with a knife'

The Chimwiini data are problematic for Modular PIC, then, not only in terms of having prosodic phrases that are *smaller* than Spell-Out domains, but also in terms of recursive processes such as Final Accent Assignment which would require that the grammar look inside each Spell-Out domain, in contradiction to the PIC. Modular PIC is thus too restrictive, in its reliance on phases in defining prosodic domains, to account for the data.

    To sum up this section, because Modular PIC puts the focus on phase heads (in a very unrestrictive version of phase theory), it cannot account for phonological phrasing determined by other types of syntactic information, like phase edges, DP edges and presence vs. absence of branching. Nor can Modular PIC account for phrasing determined, at least in

part, by prosodic conditions and prosodic information, like presence of lexical accent or phrase length or balance between prosodic constituents. (For further discussion of these kinds of issues and additional references, see Kentner and Féry 2013 and D'Imperio et al. 2005, among many others.)

5 Conclusions

It is uncontroversial that there is *some* transfer of information from syntax to phonology – phonology does not just compute a string of terminals. Phase theory creates two new types of constituents, the phase and the domain defined by the PIC, for phonology to refer to. It is reasonable to conjecture that either phases or phase complements (or both) are part of what phonology can refer to, either directly or indirectly (*modulo* prosodic constituent formation). Modular PIC takes a strong direct reference stance: in a modified Phase Theory, phase complements are the *only* domains relevant in phonology and prosodic constituents are superfluous. In this response, we have demonstrated that Modular PIC does not provide a convincing alternative to prosodic constituent-based theories of the interface, as it is both too powerful and not powerful enough. We have shown that the analysis offered of *Raddoppiamento fonosintattico* in Eastern Abruzzese does not justify the loss of restrictiveness Modular PIC brings to phase theory. Modular PIC is also shown to be too restrictive to account for phenomena, from Bantu languages and others, which have received satisfactory analyses within interface theories that appeal to prosodic constituents. We conclude that Modular PIC does not successfully replace prosodic constituent approaches to the interface. Phase domains cannot constitute direct access domains for phonology, and the PIC should retain its original, restrictive formulation (Chomsky 2001, and subsequent literature).

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Notes

[1] In Chomsky (2001) it is actually not very clear whether the domain of H or the phase itself is subject to Spell-Out. D&S adopt the version according to which Spell-Out affects the domain of H.

[2] (4c) corresponds to (25) in D&S; the structures (4a, b) follow the trees (19) and (21) in D&S, respectively; (4d) is based on D'Alessandro and Ledgeway (2010: (35)).

[3] See Richards (2011) as well as D&S for a discussion of the defective *v* in unaccusatives and passives.

[4] The diacritic nature of this parameterization is also noted by Manzini and Savoia (2016: 231): "We note that ±phase or ±PIC are not lexical parameters, since they involve not bona fide properties of lexical items, but rather encode derivational instructions. In general, while the terminology of Chomsky (2001, 2007) is maintained, it is partially voided of its actual content."

[5] It is difficult to see how a phase head which is $[-PIC_{syn}, -PIC_{pho}]$ is different from a head that is not in the phase skeleton.

[6] An anonymous reviewer points out that, because of the lack of restrictions on the possible combinations of $[\pm PIC_{syn}]$ and $[\pm PIC_{pho}]$, the prosodic domains defined by $[+PIC_{pho}]$ are only loosely related to syntactic phases. We agree, but we do not elaborate further on this point for space reasons.

[7] One could instead suppose that it is each phonological process that is specified for the $[\pm PIC_{pho}]$ character of each phase head. But since the same type of specifications must be made for the syntax it makes more sense to encode all specifications related to the PIC on phase heads.

[8] D&S does not give examples of *so*, *si* in copular sentences; *so vvikkjə* is taken from Hastings (2001:239).

[9] Most forms of the auxiliary (*so*, *si*, *a*, *semə*, *setə*, *a*) derive historically from BE (Latin *sum*: *so*, *si*, *semə*, *setə*) and one derives from HAVE (Lat. *habeo*: *a*).

[10] In the pluperfect the auxiliary is not a past form of BE or HAVE. Diachronically, it derives from a sequence containing both Latin *sum* and *habeo*; i.e. *so 'vé* 1SG, *si 'vé* 2SG, *a 'vé* 3SG/PL, with person marked on the first element, and *s'avemə* 1PL, *s'avetə* 2PL, best analyzed as compound forms (D'Alessandro and Ledgeway 2010).

[11] To these arguments we should add the fact that in Eastern Abruzzese, and in general in systems with selection by person, it is usually only the indicative present perfect that is affected and not all perfect tenses (unlike in the case of selection by verb type found in Italian and French, for instance).

[12] "A priori the latter option [the lexicon contains homophonous *so* (essere) and *so* (avere)] is less appealing since it necessitates the postulation of a more complex lexicon, namely one containing two pairs of homophonous auxiliaries, which do not differ in any aspect of their phonological make-up, but nevertheless have different RF-triggering capacities" (Biberauer and D'Alessandro 2006:90).

[13] The presence of syncretism (or homophony) across some verbs is not uncommon. In Catalan, for instance, the verb *anar* 'to go' is used as an auxiliary, with the preposition *a*, with a future meaning, as in English. But identical forms from the present tense of the same verb, in all persons but first and second plural, are used as an auxiliary to form the past tense. So, *vaig* means 'I go', *vaig a fer* means 'I'm going to do', and *vaig fer* means 'I did' (but in 1st plural: *anem* 'we go', and *anem a fer* 'we are going to do' vs. *vam fer* 'we did'). It is unlikely that the same lexical item can be involved in the realization of both future and past.

[14] Several authors accept Fanciullo's diagnosis (Hastings 2001, Loporcaro 1997a: 3.4.8, 1997b:48-49, Vogel 1997:64-65, Ledgeway 2009:39-47, de Sisto 2014:2.6, 5.2.3, Borrelli 2002:33).

[15] D&S attributes to Kanerva (1990) the claim that: "In Bantu, the right edge of phonologically relevant domains is generally marked by penultimate vowel lengthening." (p. 615) D&S uses the term Bantu as if there were only *one* Bantu language, or Bantu languages were identical with respect to the phenomena discussed. There are between 300 and 600 Bantu languages (Nurse 2006), and detailed analyses of syntactically-defined prosodic

domains are only available for a small number of them. It is therefore inaccurate and misleading of D&S (p. 616) to suggest that "the patterns are essentially identical" in Bantu in general. On the contrary, one finds a great deal of variety in the phonological cues to prosodic domains (see the discussion of Kinyambo and Chimwiini for example), in the syntactic properties of the languages, and in the typical size of the prosodic domains. One need look no further than the languages and references cited in D&S to determine how misleadingly it represents "Bantu" prosodic patterns. See Cheng and Downing (2007, 2009, 2012a,b, 2016), Downing (2010, 2011) and Downing and Mtenje (2011a,b) for more detailed discussion of the Zulu and Chicheŵa patterns surveyed here.

[16] The phrasings provided in this section are taken over from the sources indicated. When the difference between recursive and non-recursive phrasing is relevant, it is discussed in the text.

[17] We follow Julien (2002) and Buell (2005, 2006) in assuming that the verb in Bantu languages undergoes movement to a position between T^0 and v^0 (see also Cheng and Downing 2016). Furthermore, the adverb in (14b), (15b) and (16) is considered to be adjoined to vP (see Cheng and Downing 2014).

[18] We do not discuss here the "optional" phrasing of the subject as a separate prosodic phrase in both Zulu and Chicheŵa. See Cheng and Downing (2009, 2016) for detailed discussion.

[19] Even if we do not consider D^0 to be a phase head, the problem pointed out for (17) and (18) remains. We would expect, for instance, that the verb in the relative clause or the main clause should be phrased separately from its object.

[20] The left edge seems to play a role when we are dealing with left dislocated topics or adjuncts such as non-restrictive relative clauses. See Cheng and Downing (2009) for discussion.

[21] H tones spread to the left up to a specified tone, and in (21a), the second L% is downstepped. These details are omitted for clarity.

[22] Note that approaches with dynamic phases, such as Bošković (2014), will also not be able to account for these facts. For Bošković, as for Modular PIC, the difficult fact to account for is the lack of a prosodic boundary in unmodified noun phrases.

[23] In the Chimwiini data, underlined coronal consonants are [dental]. See Kisseberth (2005, 2010a, b, 2017) and Kisseberth & Abasheikh (1974, 2004) for more detailed discussion of Chimwiini phonology.

[24] Accent is also assigned to the verb in a relative clause (which has a special conjugation).