Phases at the Interface: A Phonological Cycle Need not be a Phase*

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SUMMARY

Phase Theory (Chomsky 2001, 2008), coupled with Distributed Morphology (Halle & Marantz 1993), explores to what extent phases map to phonological cycles (Marvin 2003a; Newell 2008, etc.). This paper argues that a phonological cycle need not always represent a phase. Data from Novo mesto Slovenian are considered, in which a phonological cycle may occur within the domain of a single phase.

RÉSUMÉ

La théorie des phases (Chomsky 2001, 2008), couplée à la Morphologie distribuée (Halle & Marantz 1993), examine à quel point les phases correspondent aux cycles phonologiques (Marvin 2003a; Newell 2008, etc.). Cet article avance qu'un cycle phonologique ne doit pas toujours représenter une phase. Des données du slovène de Novo Mesto sont examinées, où un cycle phonologique peut se produire dans le domaine d'une seule phase.

1 INTRODUCTION

The pairing of Distributed Morphology (Halle & Marantz 1993) with Phase Theory (Chomsky 2001, 2008) has given rise to a wealth of inquiry on the connection between phase cycles and phonological domains (Marvin 2003a; Newell 2008; Embick 2010, 2014; Newell & Piggott 2014), which effectively re-establishes the phonological cycles of SPE (Chomsky & Halle 1968). The standard position is that syntactic phases map to phonological cycles perfectly. This paper, in turn, argues that a phonological cycle need not always represent a phase. This is similar to Embick (2014), who also warns that there may be mismatches between phonological cycles and syntactic phases. However, Embick also argues that there is in general no correlation between phase-hood and phonological cycles, implying that phase heads may or may not induce a phonological cycle. Some tentative thoughts are offered on this topic towards the end of the paper, suggesting that phases do seem to systematically represent a spell-out point for the

*Lisa has made a major impact on the field of linguistics. Her contribution to our understanding of syntax and morphosyntax is vast. But she is also renowned for her supervisory qualities. I would like to thank Lisa for the respect and kindness she has shown me as a supervisor, during my time at McGill.

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phonology in Slovenian.

The present paper discussed data from Novo mesto Slovenian. In the verbal domain a *construction-specific i*-deletion process is triggered. Additionally, a phonological cycle may occur within the verbal phase domain, which gives rise to specific patterns of stress-shifting and schwa epenthesis over-application. Such a phonological cycle will not interrupt the construction-specific *i*-deletion but will instead permit it to "percolate" across the phase. Merging a new phase head in the structure will, in turn, block further *i*-deletion.

2 TWO TYPES OF CYCLICITY AND DATA

All theories of phonological cyclicity provide some way of determining what factors trigger a phonological cycle. In Lexical Phonology (Kiparsky 1982; Mohanan 1986), the cycles of phonological computation are determined by morphological domains in a fixed way: every derivation passes through a Stem level, a Word level, and finally the Post-Syntactic level. A similar architecture is adopted in Halle & Vergnaud (1987) and more recently in Embick (2014). Cophonology Theory (Orgun 1996; Inkelas & Zoll 2007; Inkelas 2011) in turn makes no distinction between the Word and Stem levels, but rather proposes that any morpheme can potentially trigger a phonological cycle. Recent work in Phase Theory (Marvin 2003a; Newell 2008; Newell & Piggott 2014, *a.o.*) suggests that phonological cycles in fact mirror syntactic phases. This paper argues that this hypothesis is *partially* correct: we will discuss data from Novo mesto Slovenian which suggest that *any* syntactic head can potentially be specified to trigger a phonological cycle.

Embick (2014) introduces the empirical and also theoretical distinction between ℙ(hase)-cycles and ϕ(onological)-cycles, and I adopt this distinction. Below is a brief typology of ℙ/ϕ-CYCLE correlation, similar to the one given in Embick (2014):

Table 1: Possible hypotheses of ℙ/ϕ- CYCLE correlation

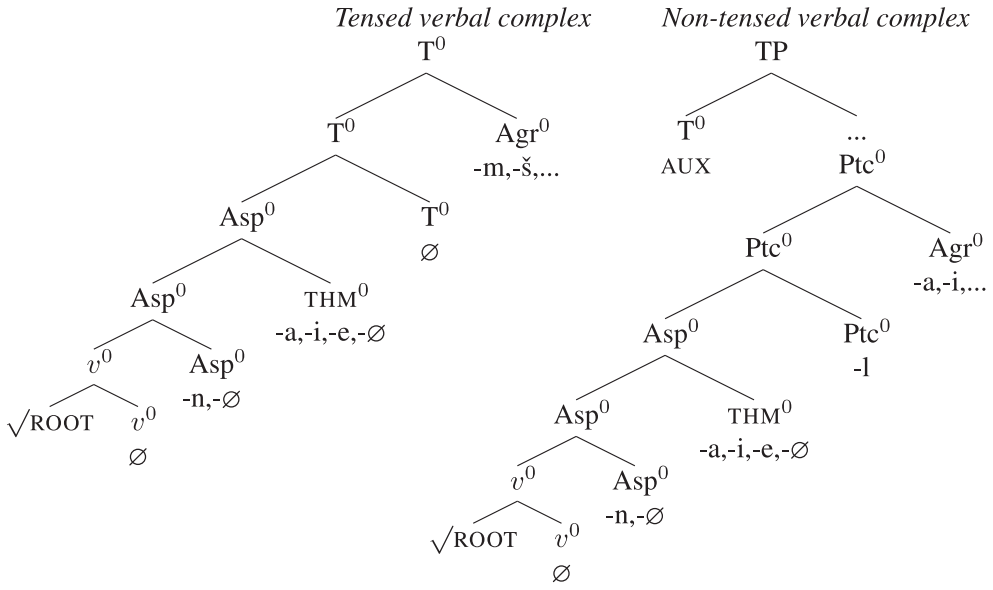
HYPOTHESES	ϕ-CYCLE		ℙ-CYCLE
#1	✓	→	✓
#2	✓	→	{✓,✗}
#3	✗	→	{✓,✗}

It is possible to assume that a ϕ-cycle will always reflect a ℙ-cycle, which entails that a phonological cycle is only possible at phasal boundaries (option #1). This is the most restrictive possibility in this typology. However, this paper argues that #1 is incorrect. The data in the following sections will be used to argue for option #2 (shaded in Table 1): any X^0 can potentially trigger a ϕ-cycle and not only phase heads. This proposal is very similar to that of Embick (2014), who also suggests that any X^0 can trigger a ϕ-cycle. However, Embick (2014) also suggests that there is no meaningful correlation between ℙ-cycles and ϕ-cycles – in other words, he argues for option #3, implying that phase heads do not systematically induce phonological cycles. While this paper does not focus on this option, we give some tentative remarks on this towards the end of the paper. Specifically, we will suggest that option #2 gives a more principled explanation of Novo mesto Slovenian than option #3.

2.1 PROPOSAL IN A NUT-SHELL

In the present paper, we consider data from Novo mesto Slovenian,[1] where a process of *construction-specific* deletion of /i/ occurs exclusively in the verbal domain. In addition, a ϕ-cycle occurs in this verbal domain, but it does not interrupt this construction-specific deletion process, but instead permits it to percolate across the verbal complex. Before we discuss any data, consider the basic verbal template for Slovenian (cf. also Marvin 2003a) in Figure 1:

Figure 1: Tensed verbs and participles



In the basic tensed verbal formations, T^0 is a part of the verbal complex, but in participles T^0 spells out an independent auxiliary and its place in the complex is taken by the participial head Ptc^0, exponed by /-l/. In the data presented in this paper, v^0 is never overt, while Asp^0 is overt only if *semelfactive* (non-imperfective) aspect is encoded. The theme vowel THM is in turn attached to Asp^0. For elaboration and arguments see Dickey (2003) or Božič (2015), and also Gribanova (2015) on Russian, which is mostly similar in the relevant respects.

Of interest for the ϕ/$\mathbb{P}$-cycle distinction is a process of unstressed /i/-deletion that is limited to the verbal domain, as it does not apply in nominal or adjectival constructions. In the terms of Cophonology Theory (Orgun 1996; Inkelas & Zoll 2007) this is a *construction-specific* effect, encoded as a *verbal cophonology*.[2] In the terms of Halle & Vergnaud (1987) and Embick (2014), the deletion is simply encoded as a construction-specific SPE-style rule, specified on some verbal X^0 in the complex. In section 3, we will argue that Asp^0, or perhaps THM^0, triggers /i/-deletion.

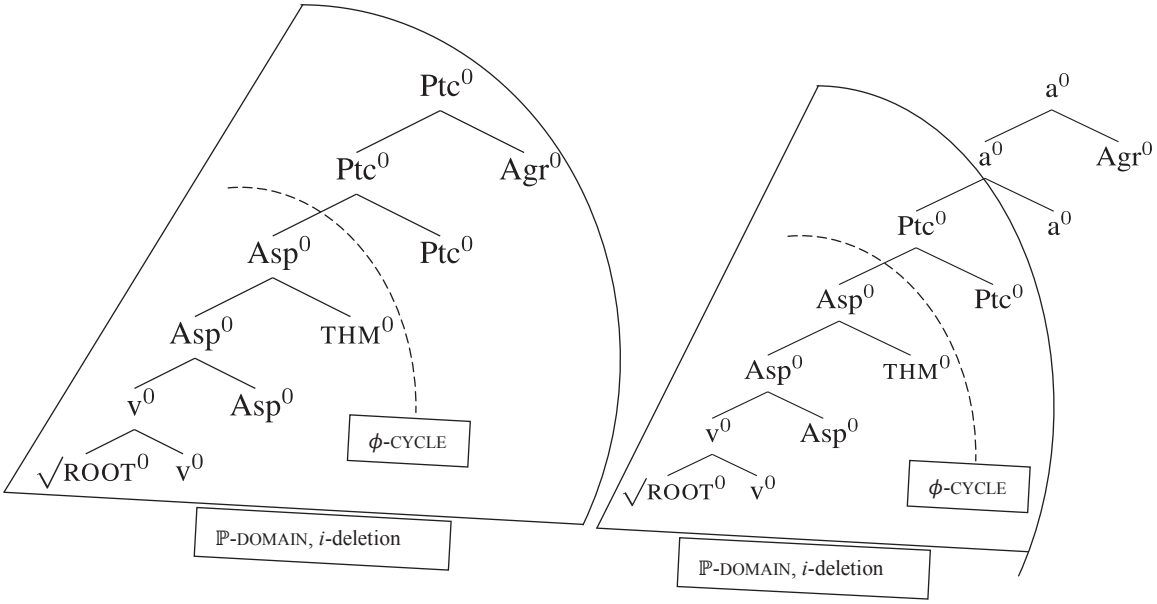
Figure 2 below shows the domains of /i/-deletion: it applies in any verbal complex, regardless of whether it is tensed or not (but Figure 2 shows only participles). As soon as the

[1] Note that portions of the data and analysis are taken from Božič (2015, MA thesis), where, however, the focus lies elsewhere.

[2] In principle, this could be modelled with *constraint indexation* (Ito & Mester 1995; Pater 2010), but such approaches do not usually admit cyclicity and are thus omitted from the discussion here.

participle is turned into an adjective, the adjectival domain is no longer subject to /i/-deletion. In section 3.1, we will show that the exponents of Agr^0 do undergo deletion in plain participles, but not in de-participial adjectives. Under the hypothesis that ℙ-cycles determine the domains of *construction-specific effects*, which is a reasonable expectation of locality, the entire participle has to be computed in a single phase,[3] but de-participial adjectives are computed in two phases.

Figure 2: *i*-deletion, ϕ-cycles and ℙ-cycles



However, a ϕ-cycle is triggered in the verbal complex. As indicated in the trees above, as soon as THM^0 is encountered, a phonological cycle is triggered, in which the exponents of √ROOT-ASP-THM- are computed to the exclusion of the exponents of Ptc^0 and Agr^0. The evidence for this cycle comes from patterns of schwa-epenthesis over-application and stress-shifting. Importantly, this ϕ-cycle *does not interrupt* the construction-specific *i-deletion* process: the latter affects the exponents of the lower heads (√ROOT-ASP-THM-), as well as the exponents of higher heads (Agr^0). This suggests that this cycle is not a ℙ-cycle, but merely a ϕ-cycle, since phase-boundaries are expected to interrupt construction-specific processes. Section 3.1 presents additional evidence for the *absence* of a phase boundary right above Asp^0. These observations will lead us to propose that non-phasal heads can be triggers of ϕ-cycles within a single phase.

2.2 THE BASIC PATTERN

In this section, we consider the construction-specific /i/-deletion process in Novo mesto Slovenian, which is tied to verbal constructions. Novo mesto Slovenian (South Slavic) has been

[3] This is compatible with the definition of phases given in Embick (2010), where the root will not be spelled out when v^0 is merged in the structure, but only after *another phase-head* is merged in the complex – here this is a^0.

discussed before (Božič 2015) and much of the data here stem from that work. We begin by observing the basic paradigms of verbs and their corresponding participles:

Table 2: *a*-CLASS tensed verbs, √jok- "cry"

	SG	DU	PL
1P	'jok-a-m	'jok-a-va	'jok-a-mo
2P	'jok-a-š	'jok-a-ta	'jok-a-te
3P	'jok-a-Ø	'jok-a-ta	'jok-a-jo

Table 3: *a*-CLASS participles (optional stress shift)

	SG	DU	PL
M	'jok-o-w-Ø	'jok-a-l-a	'jok-a-l-Ø
N	'jok-a-l-u	'jok-a-l-a	'jok-a-l-a
F	'jo'k-a-l-a	'jok-a l-e	'jok-a-l-e

SG	DU	PL
'jok-o-w-Ø	jo'k-a-l-a	jo'k-a-l-Ø
jo'k-a-l-u	jo'k-a-l-a	jo'k-a-l-a
jo'k-a-l-a	jo'k-a-l-e	jo'k-a-l-e

Table 2 gives the basic verbal paradigm formed with the theme vowel /-a/, while Table 3 gives the corresponding participial formations. Notice that the stress can shift to the theme vowel optionally in participles.[4] This is a property of a large number of roots in Novo mesto (NM) Slovenian, though not all. This pattern of stress-shifting becomes of interest once *i*-Class verbs are considered:

Table 4: *i*-CLASS tensed verbs, √xran- "feed"

	SG	DU	PL
1P	'xran-Ø-əm	'xran-Ø-va	'xran-Ø-mo
2P	'xran-Ø-əš	'xran-Ø-ta	'xran-Ø-te
3P	'xran-Ø-Ø	'xran-Ø-ta	'xran-Ø-jo

Simple tensed verbs show no stress-shifting and the theme vowel surfaces as zero. However, consider the formation of their corresponding participles in Table 5 below that do allow stress-shifts. If the stress does not shift, the theme is realized as zero, but if the stress does shift, the theme is realized as [i].

Table 5: *i*-CLASS participles (optional stress shift)

	SG	DU	PL
M	'xran-Ø-u-Ø	'xran-Ø-l-a	'xran-Ø-l-Ø
N	'xran-Ø-l-u	'xran-Ø-l-a	'xran-Ø-l-a
F	'xran-Ø-l-a	'xran-Ø-l-e	'xran-Ø-l-e

SG	DU	PL
'xran-Ø-u-Ø	xra'n-i-l-a	xra'n-i-l-Ø
xra'n-i-l-u	xra'n-i-l-a	xra'n-i-l-a
xra'n-i-l-a	xra'n-i-l-e	xra'n-i-l-e

[4] It should be noted that the optionality of this stress-shift is *not* an instance of inter-speaker variation, but rather an instance of intra-speaker variation. In other words, the stress-shift is completely optional within the grammar of a single speaker and it does not seem to be correlated with any particular social factor (i.e. it does not represent different registers of speech).

This "deletion" alternation appears to be an instance of an active synchronic process that is conditioned purely by stress. It should be noted that the theme /i/ never surfaces unstressed in the verbs of NM Slovenian, which makes for a fairly robust generalization within the verbal system.

However, more evidence can be uncovered for the argument that the alternation in question is a true phonological process. If we consider *semelfactive* verb forms, where the aspectual suffix /-n/ intervenes between the root and theme, more alternations arise:

Table 6: *Semelfactive* tensed verbs, √max- "hit"

	SG	DU	PL
1P	'max-n-e-m	'max-n-e-va	'max-n-e-mo
2P	'max-n-e-š	'max-n-e-ta	'max-n-e-te
3P	'max-n-e-Ø	'max-n-e-ta	'max-n-e-jo

Table 7: *Semelfactive* participles (optional stress shift)

	SG	DU	PL
M	'max-n-Ø-u-Ø	'max-ən-Ø-l-a	'max-ən-Ø-l-i
N	'max-ən-Ø-l-u	'max-ən-Ø-l-a	'max-ən-Ø-l-a
F	'max-ən-Ø-l-a	'max-ən-Ø-l-e	'max-ən-Ø-l-e

	SG	DU	PL
M	'max-n-Ø-u-Ø	max-'n-i-l-a	max-'n-i-l-Ø
N	max-'n-i-l-u	max-'n-i-l-a	max-'n-i-l-a
F	max-'n-i-l-a	max-'n-i-l-e	max-'n-i-l-e

The semelfactive requires the theme /-e/ in simple tensed verbs, but in participles it requires the theme /-i/. Semelfactive verbs can also be subject the optional stress-shift as indicated in Table 7. Notice that, with root stress, the theme surfaces as zero, but with theme stress it surfaces as [i]. In addition, the M.PL inflection also alternates: with root stress, it surfaces as [i], but with theme stress it surfaces as zero. This further suggests that the alternation between [i] and zero is phonological since we are dealing with a conspiracy of phonological factors: notice that the M.PL exhibits no alternations in non-semelfactive forms, where the inflection is always zero. But this seems to be a purely phonological effect: semelfactives always suffix the *sonorant* /-n/ to the root, creating a √CVC-R (R=sonorant) cluster. In regular, non-semelfactive forms where a *sonorant* is already part of the root's exponent, we observe the same alternation:

Table 8: √CVCR tensed verbs, √prazn- "empty"

	SG	DU	PL
1P	'prazn-e-m	'prazn-e-va	'prazn-e-mo
2P	'prazn-e-š	'prazn-e-ta	'prazn-e-te
3P	'prazn-e-Ø	'prazn-e-ta	'prazn-e-jo

Table 9: √CVCR participles (optional stress shift)

	SG	DU	PL
M	'prazn-Ø-u-Ø	'prazən-Ø-l-a	'prazən-Ø-l-i
N	'prazən-Ø-l-u	'prazən-Ø-l-a	'prazən-Ø-l-a
F	'prazən-Ø-l-a	'prazən-Ø-l-e	'prazən-Ø-l-e

SG	DU	PL
'prazn-Ø-u-Ø	praz'n-i-l-a	praz'n-i-l-Ø
praz'n-i-l-u	praz'n-i-l-a	praz'n-i-l-a
praz'n-i-l-a	praz'n-i-l-e	praz'n-i-l-e

Table 9 shows a participle constructed on a root that has √CVCR as its fonotactic shape.[5] Notice the same alternations between [i] and zero that we observed in the semelfactives. This same pattern can be found with other √CVCR-roots, such as /√pown-/ "fill", /√misl-/ "think", /√kərm-/ "feed (cattle)", etc. It seems that the alternations then *do* need to be phonological in nature, giving rise to the following *phonotactic* generalizations:

(1) THEME: If the theme is /-i/, it can only surface if stressed.
(2) M.PL: The M.PL inflection can surface as [-i], only if the stress is on the root and if the root is √CVCR.

It seems that the M.PL inflection could then always be /-i/ underlyingly. A good reason to think this is because the participial paradigms in Slovenian share the same "default" set of inflections that we find in nouns and adjectives. E.g. M.PL in nouns and adjectives is by default coded by /-i/. In addition, verbs whose roots consist of only a single consonant allow the M.PL /-i/ to surface, presumably because it is the only stressable vowel in the word (shaded in Tables 10-11):

Table 10: Participle of √b- "be"

	SG	DU	PL
M	'bi-w-Ø	'b-l-a	'b-l-i
N	'b-l-u	'b-l-a	'b-l-a
F	'b-l-a	'b-l-e	'b-l-e

Table 11: Participle of √š - "go"

	SG	DU	PL
M	'š-u-Ø	'š-l-a	'š-l-i
N	'š-l-u	'š-l-a	'š-l-a
F	'š-l-a	'š-l-e	'š-l-e

This provides convincing evidence for the claim that unstressed /i/ is subject to phonological deletion in the verbal system of NM Slovenian, suggesting the following URs for the verbal forms:

(3) *a*-class (M.PL): /jok-a-l-i/ → ['jokal] ~ [jo'kal]
(4) *i*-class (M.PL): /xran-i-l-i/ → ['xranəl] ~ [xra'nil]
(5) *Semelfactives* (M.PL): /max-n-i-l-i/ → ['maxənli] ~ [max'nil]
(6) *i*-class √CVCR (M.PL): /prazn-i-l-i/ → ['prazənli] ~ [praz'nil]

However, as was stated at the start of this section, the /i/-deletion that we have witnessed is a *construction-specific* property of verbs, as we do not find it in nouns or adjectives:

[5] There are diagnostics which show that these CVCR-shapes really are roots. For instance, they do not display semelfactive semantics like true semelfactives do: a semelfactive verb in Slovenian cannot be modified by certain temporal adverbs such as *cel dan* "whole day" or *dolgo* "for a long time", but the √CVCR-roots can.

(7) *Nouns*: ['vlak-i] “trains” (nom.pl.m), ['govor-i] “speeches” (nom.pl.m), etc.
(8) *Adjectives*: ['lep-i] “beautiful” (nom.pl.m), ['prijazn-i] “kind” (nom.pl.m), etc.

In nouns and adjectives (7)–(8), the inflection /-i/ never deletes. The important observation is that the masculine plural /-i/ that we find in (7)–(8) must be the same inflection that codes masculine plural in participles, since the *entire paradigm* of *gender-number inflections* is the same – see Božič (2015) for details and an overview of data. This means that M.PL /-i/ can be attached to verbs and undergo deletion, but if it is attached to a nominal or adjectival base, it must be *preserved*. For instance, if /-i/ is attached to the noun base /√vlak-/ “train”, it will not delete, outputting ['vlaki], but it will if attached to the verbal base /√xran-/ “feed”, outputting ['xran].

2.3 SCHWA EPENTHESIS

There is a further segmental alternation we did not discuss in the previous section. Once unstressed /i/ undergoes deletion, schwa sometimes occurs in the structure, depending on the phonotactic context in the word: consider the schwa in (4) above and also in (5)–(6). The presence of this schwa seems to be phonotactically motivated. Just like Standard Slovenian and most of spoken Central Slovenian (Jurgec 2007a, b), NM Slovenian does not tolerate coda clusters with a *rising sonority profile*, which are repaired by *schwa epenthesis*. This occurs throughout the grammar; cf. the nouns ['iskra] “spark (NOM.SG)” ~ ['iskər] (GEN.PL), ['platnu] “canvas (NOM.SG)” ~ ['platən] (GEN.PL), etc. Given these general phonotactic facts, the schwa in the verbal system must also be the result of epenthesis. However, it is unclear what precisely regulates the site of epenthesis. In other words, why is ['maxənli] the correct form in (5), and not *['maxnəli]? And why not *['praznəli] in (6)?

It seems tempting to solve the situation with cyclicity. If /prazn-i-/ is first computed in a cycle, to the exclusion of the Ptc^0 /-l/ and Agr^0 /-i/, this gives the desired predictions: /prazn-i/, if stressed on the root, undergoes /i/-deletion and subsequent schwa-epenthesis, deriving ['prazən] as the output of the first phonological cycle. This analysis is on the right track due to independent evidence found in the class of roots that seem to have no underlying vowel:

Table 12: √CR tensed verbs, √mr- “die”

	SG	DU	PL
1P	u-'mr-e-m	u-'mr-e-va	u-'mr-e-mo
2P	u-'mr-e-š	u-'mr-e-ta	u-'mr-e-te
3P	u-'mr-e-Ø	u-'mr-e-ta	u-'mr-e-jo

Table 13: √CR participles, √mr- “die”

	SG	DU	PL
M	u-'mər-Ø-u-Ø	u-'mər-Ø-l-a	u-'mər-Ø-əl-Ø
N	u-'mər-Ø-l-u	u-'mər-Ø-l-a	u-'mər-Ø-l-a
F	u-'mər-Ø-l-a	u-'mər-Ø-l-e	u-'mər-Ø-l-e

The Tables 12–13 show the paradigm of a root with a final sonorant but no vowel. The theme is /-e/ in tensed verbs, but zero in participles. The crucial form is again the M.PL. This form reveals two schwa-vowels, when one would be enough to render the form phonotactically licit; i.e. *[u'mrəl] is just as licit from a phonotactic standpoint as [u'mərəl], given the UR /u-mr-Ø-l-i/. This is an instance of *schwa-epenthesis over-application*, which is also one of the usual diagnostics for positing a phonological cycle. It should be noted that roots such as √mr- systematically pattern as in Table 13 when the theme is zero. Examples include √dr- "knock over", √pr- "resist", √tsvr- "fry".

The behavior of √CR roots, as in Tables 12–13, then suggests that a cyclic analysis proposed above is on the right track. It seems that /√ROOT-ASP-THM/ are first processed in a phonological cycle before the exponents of Ptc^0 and Agr^0 are included in the derivation:

Table 14: Cyclic computation of the participial stem (M.PL)

CYCLE 1	/√mr-Ø-/	/√prazn-i-/	/√xran-i-/
i-deletion *ə-epenthesis*	 'mər	'prazn 'prazən	'xran
CYCLE 2	/'mər-l-i/	/'prazən-l-i/	/'xran-l-i/
i-deletion *ə-epenthesis*	'mərl 'mərəl		'xranl 'xranəl
	['mərəl]	['prazənli]	['xranəl]

In both cycles, unstressed /i/-vowels first undergo deletion, which is followed by schwa-epenthesis in the cases where the deletion gives rise to a phonotactically illicit consonantal cluster.

A further piece of evidence for such a cyclic analysis comes from the stress-shifting patterns we have observed. In all the verbal paradigms in NM Slovenian, stress *never* shifts *beyond the theme vowel*.[6] Like the previous data, this suggests that the theme vowel represents the edge of a phonological word at some point in the derivation, so that stress can *align* with it (McCarthy & Prince 1993; Halle 1998) and so derive the "stress-shifts" that we have observed.[7]

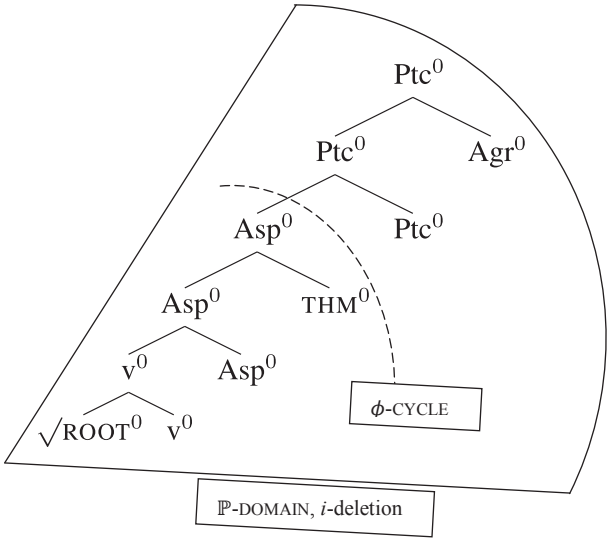
[6] The only exceptions to this generalization are the two mono-consonantal roots √š- "go" and √b- "be", given in Tables 10–11. In these roots, the stress does occur on the inflections because those are the only vowels in their respective words. Under the cyclic analysis that we have proposed, this should not occur, and we instead predict their M.PL forms to be *['šəl] and *['bəl] and not ['šli] and ['bli]. However, verbs like this are often termed *light verbs*. It is possible that they contain less structure than other verbs, which could explain why they do not exhibit a cycle in their verbal stem. It should be noted that these two verbs show that the domain of stress-shifting and the presence of schwa-epenthesis *do form a natural class*, which is predicted under the cyclicity analysis. The only question that needs to be answered is why precisely the cycle is not triggered in these two verbs. This is left for future research.

[7] A further matter needs to be cleared up that we will only briefly touch on here. We have not provided an explanation for why the M.PL /-i/ fails to delete with √CVCR-forms. Božič (2015: 102) suggests that this stems from a type of *mora preservation effect* within the *iambic foot* consisting of two syllables: given /'prazn-i-l-i/, the first cycle is

3 A ϕ-CYCLE WITHIN A ℙ-CYCLE

In the previous section, we presented evidence that the verbal complex is computed in two phonological cycles. Below we provide arguments for the claim that the entire verbal complex must nevertheless be one phase. The schematic representation of this domain is repeated from Figure 2:

Figure 3: the verbal domain of /i/-deletion



The phonological cycle in the verbal stem that we posited must be triggered by Asp^0, or perhaps by THM^0, depending on how the relevant diacritics that trigger cycles are formalized. However, it is important to observe that this cycle does not interrupt the *construction-specific* /i/-deletion process, since /i/-deletion, as argued in the sections above, has to apply in both cycles of phonological computation. This suggests that the entire verb and participle consists of a single phase, since it is reasonable to expect that phases, as locality boundaries, *should* interrupt *construction-specific effects*. If [√RT-ASP-THM] constituted its own phasal domain, then the next phase, i.e. [PTC-AGR], would need to specify the exact same construction-specific /i/-deletion process. Because this deletion process is a property of *all verbs*, and not just participles, it is more principled to tie it to something lower in the verbal domain.

Another diagnostic for phase-hood is the locality of allomorphic processes (Embick 2010), since phase boundaries typically interrupt them. Božič (2016) shows that Ptc^0 (exponed by/-l/) is responsible for triggering a type of root allomorphy that is best analyzed as root suppletion – see Božič (2016) for details:

/'prazn-i/→[('pra^1.zə^{1}n^1)], where the output contains three moras. The second cycle is /('pra.zən)-l-i/→[('pra.zən).li] where the mora count within the foot is preserved. However, if *i*-deletion applied, it would need to be followed by subsequent schwa-epenthesis, yielding *[('pra.zə).nəl], where the previous *foot-internal* [n] would now be *foot-external* due to re-syllabification. In such derivations, the foot ends up having only *two moras*, e.g. *[('pra^1.zə^1).nəl], which means that the mora count from the previous cycle would not be preserved (the output of the 1st cycle has 3 foot-internal moras).

(9) *Root allomorphy* (Božič 2016)

√**žanj**	-e	-m	*vs.*	√**ž**	-e	-l -a
reap-THM	-1P.SG			reap-THM	-Ptc	-F.SG

This pattern is best analyzed as an instance of root suppletion since it is completely unproductive and tied to a handful of forms in which different segments "alternate" in the context of Ptc^0. This means that Ptc^0, as the trigger of suppletion, needs to be accessible at the stage when Vocabulary Insertion is applying to $\sqrt{ROOT}^0$. If [√RT-ASP-THM] were its own phase, then Ptc^0 could not be accessible to Vocabulary Insertion when inserting at the root.

It then follows that the entire verbal complex must be a single phase in NM Slovenian. In addition, this means that the cycle triggered within the complex is a ϕ-cycle and *not* a ℙ-cycle. This analysis implies that a phonological cycle need *not* always represent a phase; it may just be a purely phonological cycle triggered within a larger syntactic phase cycle.

3.1 ℙ -CYCLE ALWAYS A HARD SPELL-OUT BOUNDARY?

As discussed at the start of section 2, Embick (2014) goes beyond the claim that this paper has made and proposes that any correlation between ϕ-cycles and a ℙ-cycles is accidental. This means that a ℙ-cycle may or may not represent a hard spell-out boundary for the phonology. While a full investigation of this for Slovenian needs to be relegated to a future paper, we will here note that ℙ-boundaries seem to systematically *interrupt* phonological processes in NM Slovenian. As noted before in section 2.2 in (7)–(8), nouns and adjectives systematically retain unstressed /i/-vowels and show no deletion effects.

An even more interesting illustration of this comes from *de-participial adjectives*, which are essentially adjectives formed out of participles with a *null adjectivizer*. They are constructed from unaccusative roots:

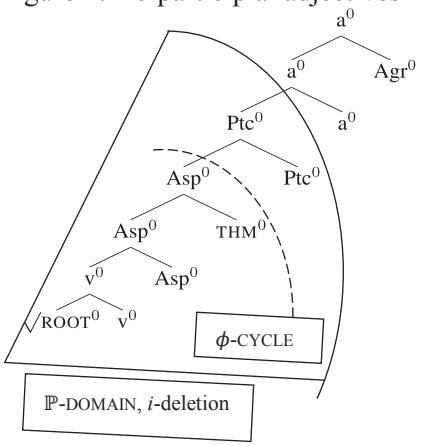
(10) Unaccusative roots (√mr- "die", √pad- "fall", etc.)

a. *Participles* (M.PL): /u-mr-Ø-l-i/ → [u'mərəl] / *[u'mərli]

b. *De-participial adj.* (M.PL): /u-mr-Ø-l-$Ø_a$-i/ → *[u'mərəl] / [u'mərli]

Unaccusative roots such as √mr- or √pad- in (10) can either form regular participles (10a), or de-participial adjectives (10b). According to Marvin (2003b), the de-participial adjectives are formed on a participial stem to which a *null adjectivizer* is attached. However, Marvin (2003b) only considers Standard Slovenian where (10a) and (10b) are phonologically identical, as no /i/-deletion occurs in the standard language. In NM Slovenian, they in turn behave differently: the M.PL /-i/ can attach to the participial stem and then *must* undergo deletion, as in (10a), but if it attaches to an adjectivized stem, it *cannot* undergo deletion, as in (10b).

Figure 4: De-participial adjectives



De-participial adjectives are shown in Figure 4, where the introduction of the null adjectivizer *interrupts* the construction-specific /i/-deletion. In other words, the M.PL /-i/, as the exponent of Agr^0, is attached to a^0, which is outside the verbal phase. The fascinating distinction between regular participles and de-participial adjectives is that they are identical in terms of their phonological URs, since the adjectivizer in the de-participial adjectives is *null*. And yet they show different phonological behaviors.

There is also independent evidence for the presence of the null a^0. De-participial adjectives can, for instance, be quantified over by adjectival quantifiers, such as the adjectival determiner *ta* (Marušič & Žaucer 2007) shown in (12), but regular participles cannot (11):

(11) Vojaki so **(*ta)** u'mərəl. *Participle*
soldiers AUX TA die-PTC.M.PL
"Soldiers have TA died."

(12) **Ta** u'mərli vojaki. *De-participial adjective*
TA die-DE.PTC-ADJ.M.PL.NOM soldiers
"The soldiers that have died."

In sum, ℙ-boundaries systematically interrupt phonological processes in NM Slovenian, even when the URs between two different words are segmentally identical. It seems very tempting if not necessary to say that ℙ-boundaries must be *hard spell-out boundaries* for the phonology in some sense in NM Slovenian. If Embick (2014) is correct, and ℙ-boundaries really do interrupt phonological effects in an unpredictable way, then the NM Slovenian facts have to receive a much less principled analysis. For instance, under his view, we would need to say that a^0 accidentally happens to trigger a phonological cycle that is *i-preserving* (and not *i*-deleting). Whether this is truly necessary is unclear at this point. But we can conclude by stressing that keeping ℙ-boundaries as hard spell-out points for the phonology gives the better analysis of NM Slovenian.

REFERENCES

Božič, J. (2015). *Spell-Out of Phonological Domains: The Case of Slovenian*. Master's thesis, University of British Columbia, Vancouver, BC.

Božič, J. (2016). Locality of Exponence in Distributed Morphology: Root Suppletion in Slovenian. In Christopher Hammerly and Brandon Prickett, eds., *Proceedings of NELS* 46, 137-146. GLSA: Amherst, MA.

Halle, M. & Marantz, A. (1993). Distributed morphology and the pieces of inflection. In *The View from Building 20, MIT Working Papers in Linguistics*, 111–176. Cambridge, MA: MIT Press.

Chomsky, N. (2001). Derivation by Phase. In Kenstowicz, M., ed., *Ken Hale. A Life in Language*, 1–52. Cambridge, MA. MIT Press.

Chomsky, N. (2008). On phases. In Freidin, R., Otero, C. P., & Zubizarreta, M. L., eds., *Foundational issues in linguistics theory: essays in honor of Jean-Roger Vergnaud*, 133–166. Cambridge, MA: MIT Press.

Chomsky, N. & Halle, M. (1968). *The Sound Pattern of English*. New York: Harper and Row.

Dickey, S. M. (2003). Verbal aspect in Slovene. In Stolz, T., ed., *STUF - Language Typology and Universals*, vol. 56. 182–207.

Embick, D. (2010). Localism versus globalism in morphology and phonology. Cambridge, MA: MIT Press.

Embick, D. (2014) 'Phase cycles, φ-cycles, and phonological (in)activity' In S. Bendjaballah, M. Lahrouchi, N. Faust, and N. Lampitelli eds. *The form of structure, the structure of forms: Essays in honor of Jean Lowenstamm*, 270-286. Amsterdam: John Benjamins.

Halle, M. 1998. The Stress of English Words 1968-1998. *Linguistic Inquiry* 29: 539-568.

Halle, M. & Vergnaud, J.-R. (1987). *An Essay on Stress*. Cambridge, MA: MIT Press.

Inkelas, S. (2011). The interaction between morphology and phonology. In Goldsmith, J., Riggle, J., & Yu, A. C. L., eds., *Handbook of phonological theory: 2nd edition*, 68–102. Oxford: Wiley-Blackwell.

Inkelas, S. & Zoll, C. (2007). Is grammar dependence real? A comparison between cophonological and indexed constraint approaches to morphologically conitioned phonology. *Linguistics* 45: 133–172.

Itô, J. & Mester, A. (1995). Japanese phonology. In Goldsmith, J. A., ed., *The Handbook of phonological theory*, 817–838. Oxford: Blackwell.

Jurgec, P. (2007a). *Novejše besedje s stališča fonologije: Primer slovenščine.* PhD thesis, University of Ljubljana, Ljubljana.

Jurgec, P. (2007b). Schwa in Slovenian is epenthetic. Handout from *Second Annual Meeting of the Slavic Linguistics Society*. Berlin, August 24th.

Kiparsky, P. (1982). Lexical morphology and phonology. In Yang, I.-S., ed., *Linguistics in the morning calm*, 3–91. Seoul: Hanshin.

McCarthy, J. J. & Prince, A. (1993). Generalized alignment. In Booij, G. & van Marle, J., eds., *Yearbook of Morphology* 1993, 43–67. Dordrecht: Kluwer.

Mohanan, K. P. (1986). *The theory of lexical phonology*. Reidel: Dordrecht.

Marvin, T. (2003a). *Topics in the Stress and Syntax of Words*. PhD thesis, MIT, Cambridge, MA.

Marvin, T. (2003b). Past Participles in Reduced Relative Clauses: A Cross-Linguistics Perspective. *Linguistica* 43(1): 141–160.

Newell, H. (2008). *Aspects of the morphology and phonology of phases*. Doctoral Dissertation. McGill University.

Newell, H. and Piggott, G. (2014). Interactions at the syntax-phonology interface: Evidence from Ojibwe. *Lingua* 150: 332-362.

Orgun, C. O. (1996). *Sign-Based Morphology and Phonology with special attention to Optimality Theory*. PhD thesis, University of California, Berkeley, Berkeley, CA.

Pater, J. (2010). Morpheme-specific phonology: Constraint indexation and incosistency resolution. In Parker, S., ed., *Phonological Argumentation: Essays on Evidence and Motivation*, London. Equinox.