

# Prefixes in Czech zero-derived nominalizations and verbs

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## Abstract

This article investigates the relationship between prefixed verbs and related zero nominalizations in Czech. Specifically, we focus on the fact that the prefix in zero-derived nominalizations is often systematically different from the one in the related verb. Our goal is to understand why this is so. Our analysis relies on the idea that zero nominalizations share with verbs some functional projections, but their structure is impoverished. The most relevant property that zero nominalizations lack is Aspect. Since prefixes are crucially involved in aspectual interpretation, the absence of aspect in nouns triggers a special shape of the prefix. The implementation draws on the Nanosyntax theory of spellout (Starke 2018, De Clercq 2019).

## 1 Introduction

In Czech, verbs may carry a prefix similar in meaning to English particles. A couple of examples is in (1).<sup>1</sup>

- (1) lézt      v- lézt      s- lézt      od- lézt      vy- lézt  
craw      in crawl      down crawl      away crawl      out crawl  
'crawl, crawl in, crawl down, crawl away, crawl out'

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<sup>1</sup>We dedicate this article to our friend Petr Karlík. What we admire about Petr is his never-ending intellectual curiosity and the obvious joy that doing linguistics brings to him. This is also the reason why it is so much fun to be around when he is in his office, and we look forward to having more of that in the future!

It is going to be relevant that the prefix has two basic grammatical functions. First, it describes a path along which the event proceeds. This function is most clear with manner of motion verbs like those in (1) (in other cases, the meaning of a particular prefix may be idiomatic). The second function of the prefix is that it changes the aspectual properties of the event expressed by the verb. (2) sums up.

- (2) The contribution of a prefix
- a. describe a path
  - b. change aspect

In this article, we observe that prefixes in Czech often differ in shape depending on whether we find them on verbs or zero-derived nouns. In (3), we show this for the prefix *na-* ‘on.’ When this prefix is found on the (zero-marked) imperative form, the prefix is short, see (3a). When it is found on a (zero-derived) noun, the prefix is long, see (3b).<sup>2</sup>

- (3) a. Na- piš -Ø to. (\*ná-piš-Ø)  
 on write IMP.2.SG it  
 ‘Write it.’
- b. ná- pis -Ø (\*na-pis-Ø)  
 on write -NOM.SG  
 ‘sign’

The same distinction between verbs and zero-derived nouns sometimes influences also vowel-zero alternations in the prefix. We show this in (4). What we can see in (4a) is that in the imperative, the prefix *pod(e)-* ‘under’ surfaces with a vowel at its right edge. However, this vowel is missing in the (zero-derived) nominalization in (4b).

- (4) a. Pode- piš -Ø to. (\*pod-piš-Ø)  
 under write IMP.2.SG this  
 ‘Sign it.’
- b. pod- pis -Ø (\*pode-pis-Ø)  
 under write -NOM.SG  
 ‘signature’

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<sup>2</sup>Vowel length is marked by an acute accent sign, *á* is a long *a*. The alternation in vowel-length depicted in (3) has been investigated in Scheer (2001), Ziková (2008), Caha & Ziková (2016).

Neither of these alternations can be fully reduced to phonology, since the relevant phonological conditions are identical across the two environments. In this paper, we shall therefore explore the precise morphological conditions under which these alternations arise.

Our main point is going to be that both alternations can be explained by combining two analytical ideas. The first idea concerns the relationship between prefixation and aspect. It says that the aspectual contribution of a prototypical prefix can be characterized by two partly independent notions (see Borik 2002, Gehrke 2008, Biskup 2019). The first notion is telicity – meaning that prefixes add a result state to the event expressed by the verb. For instance, when we say *He pushed the chair in*, the particle *in* conveys the fact that the ‘pushing’ event is not unbounded: it finishes when the chair is inside some contextually salient location. Traditionally, this type of verb meaning is tested by the availability of temporal modifiers like *in an hour/for an hour*.

The second type of aspectual contribution of the prefix is that it makes the verb perfective. This notion is related to ‘viewpoint aspect.’ Perfective verbs depict events as if viewed ‘from the outside,’ i.e., in their entirety, as units with a clear start and end on the temporal axis. Imperfective verbs depict events ‘from inside,’ i.e., as ongoing. In Czech, perfectivity gives rise to the future interpretation of apparent present-tense forms, it yields incompatibility with verbs such as *begin*, etc.

Importantly, some recent approaches argue that each of the aspectual functions of the prefix (telicity and perfectivity) is independent of the other, and that each of them occupies a different region in the sequence of verbal functional categories. Following a number of authors (e.g., Svenonius 2004, Ramchand 2008b, Gehrke 2008, Arsenijević 2010, Tatevosov 2011), we adopt here the idea that the resultative/telic function of the prefix is introduced low down in the verbal structure, while perfectivity is only relevant at a later point in the derivation. Schematically, we can depict this proposal as in (5).

(5) [ PERFECTIVITY [ ... [ F2 [ F1 [ RESULTATIVITY V ] ] ] ] ]

There are a number of ways how we can model the fact that the prefix usually contributes both meanings. Some authors (e.g., Arsenijević 2010, Biskup 2019) rely on a syntactic Agree relation between an aspectual operator situated in the higher position and the prefix (located in the lower

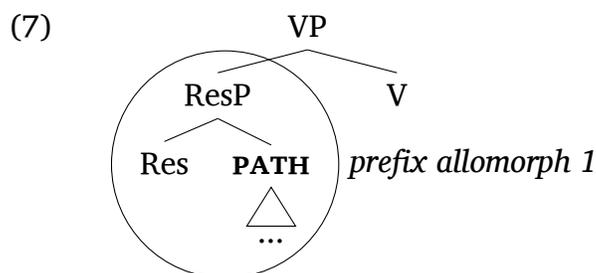
position). Svenonius (2004) proposes that in order to contribute perfectivity, the prefix actually moves from the low position to the higher position (cf. Caha & Ziková 2016). Ramchand (2008b) suggests a semantic account, where a high Asp head gives rise to a perfective aspect just in case there is a result introducing prefix inside the (decomposed) VP. When the prefix is not there, the same Asp head yields an imperfective interpretation.

In our account, we will use the structure in (5) in order to explain the variation in the shape of the prefix. In particular, when we combine this view with the widely shared assumption that zero-derived nouns have a truncated structure, we arrive at the possibility that verbal and nominal structures may differ in the presence/absence of Asp, see (6):

- (6) a. verbal structure: [ PERF [ ... [ F2 [ F1 [ RES V ] ] ] ] ]  
 b. nominal structure: [ F1 [ RES V ] ]

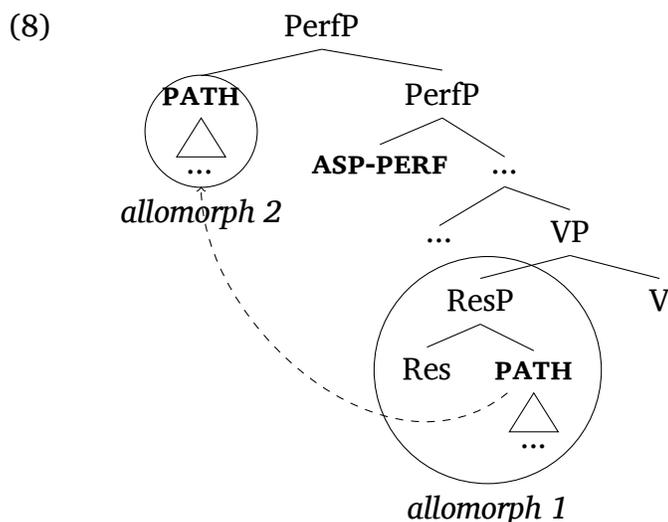
Once structures like this are in place, it becomes tempting to understand the different shapes of prefixes in verbs and their nominalizations as related precisely to the presence/absence of the higher aspectual projection. When the prefix only has the low resultative function, it has one shape. When it has both functions, it has a different shape. And this is the direction in which we shall be going.

Our specific implementation of this analytical intuition will be couched in terms of phrasal lexicalization and movement. What we shall propose is that the prefix originates as a sister to the verb, lexicalizing a phrasal constituent that minimally contains a Path component and the resultative projection. In this low position, the prefix contributes resultativity, see (7). In this low position, when the prefix contributes only resultativity, it has a shape that we designate as *prefix allomorph 1*.<sup>3</sup>



<sup>3</sup>For simplicity, we draw the prefix to the left of the verb (rather than to the right), though we shall say more about this topic later.

In order to also contribute perfectivity, the prefix moves higher up in the structure (following Svenonius 2004). We show this in (8).



What we also propose is that as the prefix is moving, it strands its top-most Res projection in the base position. In other words, only a part of the prefix moves, yielding a sub-extraction of the Path component from within the resultative prefix, as depicted in (8). The reason why we propose this is to have a handle on the fact that the prefix has a different pronunciation depending on whether it is purely resultative or whether it also contributes perfectivity. What sub-extraction does for us is that the prefix has different features in each of these functions, and the allomorphic variation of the prefix simply reflects this fact.

The article is organized as follows. In Sections §2-§4, we provide the basic overview of prefix alternations in Czech. In these sections, we focus on alternations in length (§2) and on vowel-zero alternations (§3), as well as on the role that root plays in these alternations (§4). In section 5, we investigate the spatial contribution of prefixes and focus on their relationship to prepositions. In §6, we highlight the role that prefixes have in establishing the result of the event and propose that they spell out the resultative Res head. Section §7 provides the structure of nominalizations, and Section 8 describes in detail the motivations for sub-extractions, while sections §9 and §10 considers the fate of the projection left behind by this process. Section §11 concludes.

## 2 Vowel-length alternations

Let us first introduce the length alternation found with vowel-final prefixes (building on Scheer 2001, Ziková 2008, Caha & Ziková 2016). We illustrate the relevant behavior in (9). In (9a), we have the imperative of the verb ‘take out’ and the prefix is short. In (9b), we have a zero-derived noun, and the prefix is long.

- (9) a. **vy-** ber -Ø  
 out- take -IMP.2.SG  
 ‘take out, select’
- b. **vý-** běr -Ø  
 out- take -NOM  
 ‘selection’

The examples form a phonologically near-minimal pair. Yet in one case, the prefix is short, and in the other case, it is long. Therefore, as the previous work has argued, the allomorph choice is not governed by phonology, but morphology. Specifically, it depends on whether the prefix appears in an imperative (9a) or in a result noun (9b).

In addition to the imperative, the forms that require the short prefix include the infinitive, the present tense, the past participle and the *ing*-type nominalization. They are given in the table (10). These are productive forms and they can be formed from virtually any verb.

(10) The distribution of the prefix *vy-*/*vý-* in the paradigm

	INF	PAST PT.	-ING NOM	PRES	IMP	NOUN
<i>vy-</i>	<b>vy-br-at</b>	<b>vy-br-al</b>	<b>vy-br-ání</b>	<b>vy-ber-e</b>	<b>vy-ber-Ø</b>	<b>vý-běr-Ø</b>

On the other hand, the zero nominalization (given in the last column) is non-productive, and many verbs have a gap here. (The fact that there may be gaps is important, but it should not blur the pattern: whenever a zero-derived noun exists for a prefix like *vy-*, the prefix is long in this environment.)

The table has just one form with the long prefix (a zero-derived result noun), and this is also the form we shall mainly focus on during our discussion. However, we briefly note that there are other cases where the prefix is long, even though they are all irregular and non-productive. For example, we sometimes find adjectival forms such as the one in (11b). It is not clear to what extent these are based on the corresponding zero noun in (11a), or whether they are derived independently of the noun in (11b).

- (11) a. **vý-** bor -n -ý  
 out- take -ADJ -AGR  
 ‘excellent’
- b. **vý-** bor -Ø  
 out- take -NOM.SG  
 ‘committee/selection’

Regardless of how this is resolved, we see from the meaning of (11a) that the form is purely stative and resembles regular adjectives. The logic of the alternation thus opposes productive verbal eventive forms to various non-productive formations low in eventivity. The distribution of allomorphs is then summarized as in (12).

- (12) Vowel-length alternation in Czech prefixes:
- a. productive eventive inflectional forms: CV-
- b. non-productive non-eventive derivational forms: CVV-

Caha & Ziková (2016) provide two arguments for the conclusion that the specific component of ‘eventivity’ that is relevant for regulating the alternation in vowel length is aspect (perfectivity). Both of the arguments discussed by Caha & Ziková (2016) show that the forms with a long prefix do not behave as perfective forms, but as imperfective forms. A data of this type have been previously used in Tatevosov (2011) to argue that prefixation and perfectivity are not the same thing (cf. Borik 2002). Tatevosov’s basic idea is that the prefix is located low down in the structure, while perfectivity is a relatively high functional projection, see (13).

- (13) [ **ASP-PERF** [ ... [ F2 [ F1 [ **PREFIX** verb ] ] ] ] ]

Tatevosov points out that if we accept the picture in (13), we expect the existence of structurally impoverished forms that contain the prefix, yet lack perfectivity, as in (14).

- (14) [ F2 [ F1 [ **PREFIX** verb ] ] ]

As Caha & Ziková (2016) argue, the Czech forms with long prefixes fall under this characteristic. In order to see that, consider one of the traditional perfectivity tests, which is the incompatibility of perfective verbs with inceptives like *začít* ‘start.’ In (15a), we show that the infinitive of an imperfective unprefixated verb can combine with the verb *začít* ‘begin.’ In (15b), we show that when the verb is prefixed, it is incompatible with the verb. This is a standard pattern for Slavic, where prefixation makes verbs perfective.

- (15) a. Petr začal měnit pneumatiky.  
 Petr started change.INF tires  
 ‘Petr started to change tires.’  
 b. \*Petr začal vy-měnit pneumatiky.  
 Petr started out-change.INF tires

Interestingly, zero-derived nouns with long prefixes behave as imperfective with respect to this test, see (16a). On the other hand, the productive nominalization with the short prefix patterns as perfective, see (16b). Thus, the dividing line between imperfective vs. perfective forms coincides with the distinction between long vs. short prefixes.

- (16) a. Petr začal s vý-měn-ou pneumatik.  
 Petr started with out-change-INS tires  
 ‘Petr started changing the tires.’  
 b. \*Petr začal s vy-měn-ě-n-ím pneumatik.  
 Petr started with out-change-TH-ING-INS tires

The data in (16) therefore provide the first reason why we shall link the quantity of the prefixal vowel to the presence/absence of an Asp projection in the functional spine.

The second reason given in Caha & Ziková (2016) for proposing that prefixal length correlates with perfectivity is that some verbs have (irregularly) prefixes with long vowels. While the set of such verbs is restricted, they exist, and all of them are imperfective, see (17a) for an example.<sup>4</sup>

- (17) a. Délka prefixu zá- vis-í na vidu.  
 length of.prefix behind hang-PRES on aspect  
 ‘The length of the prefix depends on aspect.’  
 b. Petr za- věs-í sluchátko.  
 Petr behind hang-PRES receiver  
 ‘Petr will hang up.’

The imperfective nature of the verb in (17a) can be seen from the fact that the verb has a present tense interpretation. This is impossible with perfective verbs, such as the one given in (17b). This verb has a short prefix, and the same verbal form (marked by *-í* following the root) has a future tense interpretation.

<sup>4</sup>See Gehrke (2008:159) for analogous cases in Russian.

This once again suggests that the presence of the long prefix does not turn verbs perfective; only the short prefix does. The conclusion we shall draw from this is that the forms where prefixes are always long are structurally impoverished; they lack the aspectual projections characteristic for full-fledged verbs. One of the goals of our paper will then be to explain how the presence/absence of the aspectual projection influences the shape of the prefix.

Before we leave this section, it is important to note that some V-final prefixes do not alternate. In table (18), we give minimal pairs involving the verbal root *stup* ‘step.’

(18) Vowel final prefixes

	IMPERATIVE	ZERO NOUN	
ALTERNATING PREF			
get on	<i>na-stup</i>	<i>ná-stup</i>	onboarding
get out	<i>vy-stup</i>	<i>vý-stup</i>	offboarding
step away	<i>u-stup</i>	<i>ú-stup</i>	retreat
step in for someone	<i>za-stup</i>	<i>zá-stup</i>	substitute
come here	<i>při-stup</i>	<i>pří-stup</i>	access
crawl through	<i>pro-lez</i>	<i>prů-lez</i>	a manhole
NON-ALTERNATING PREF			
change (vehicle)	<i>pře-stup</i>	<i>pře-stup</i>	transfer
move on	<i>po-stup</i>	<i>po-stup</i>	<i>progression</i>
SUPPLETIVE PREF			
to join by flowing	<i>s-tékat</i>	<i>sou-tok</i>	confluence

In the left-hand column, we see the imperative form corresponding to the bare root. In the imperative, the prefixes are short. The right-hand column gives the corresponding nominalization. We can see that most prefixes become long, and we call them alternating prefixes. However, some prefixes remain short (e.g., *po-* ‘on,’ *pře-* ‘over’), and we call them non-alternating. Whether a prefix alternates or not is a lexical property of such prefixes, and, as far as we can tell, it cannot be deduced from anything (Caha & Ziková 2016).

The last line contains a special case of a ‘length’ alternation between a prefix with a long vowel (in the nominalization) and a C-final prefix

in the verb. The example reveals the possibility that also C-final prefixes may have counterparts with long vowels. We will treat such examples as a special case of prefix suppletion, i.e., as a case where two different prefixes must be lexically stored. This is different from the other cells, where the prefixes are either identical (syncretic) or related to one another by regular length alternation.

### 3 Vowel-zero alternations

Let us now turn to the second class of prefixes (i.e., consonant-final prefixes). These prefixes generally have the same form in the imperative as in the nominalization, see the table (19). They therefore (apparently) belong in the class of ‘non-alternating’ prefixes, though more details regarding this conclusion will follow.

(19) Consonant final prefixes

	VERB	NOUN	
C-FINAL SHAPE			
step in	<i>v-stup</i>	<i>v-stup</i>	entrance
step away	<i>od-stup</i>	<i>od-stup</i>	distance
V-FINAL SHAPE			
step down	<i>se-stup</i>	<i>se-stup</i>	descend
step apart	<i>roze-stup(-te)</i>	<i>roze-stup</i>	(social) distance

The allomorphy we find with these prefixes is of a different kind, namely that they alternate between a C-final shape and a V-final shape. The C-final shape is illustrated in the upper part of the table, the V-final allomorphs are exemplified in the bottom part. However, in both parts of the table, the same allomorph generally appears both on the verb and on the noun.

It is important to say right away that this time, the alternation between V-final shape and the C-final shape is not some kind of a lexical property of the prefix. Each of the prefixes in the table can have a V-final shape and a C-final shape (i.e., we have both *v~ve* and *roz~roze*). The specific shape is usually a function of the root that follows.

The conditions that govern the  $V\sim\emptyset$  alternation at the right edge of the

prefix are generally phonological in nature (cf. Gribanova & Blumenfeld 2013 for Russian). For example, Czech disallows word-initial geminates. Therefore, when the root begins with a consonant that is identical to the prefix (as in (20)), the prefix surfaces in the vowel-final shape. When the initial consonant is different, the prefix needs no vowel, see (21).

- |      |   |      |                                    |
|------|---|------|------------------------------------|
| (20) | a. <b>se</b> -sypal<br>together-poured  | (21) | a. * <b>ve</b> -sypal<br>in-poured |
|      | b. * <b>s</b> -sypal<br>together-poured |      | b. <b>v</b> -sypal<br>in-poured    |

(22) and (23) shows a verb that begins with *v*. Before such a root, the prefix *v*- must have a vowel-final shape, see (22). However, the prefix *s*- has a C-final shape, see (23).

- |      |                                   |      |                                      |
|------|-----------------------------------|------|--------------------------------------|
| (22) | a. <b>ve</b> -valil<br>in-rolled  | (23) | a. * <b>se</b> -valil<br>down-rolled |
|      | b. * <b>v</b> -valil<br>in-rolled |      | b. <b>s</b> -valil<br>down-rolled    |

For completeness, we note that the prohibition on the sequence of identical consonants only affects word-initial geminates. Prefixes that are of the shape VC-, or CVC- allow for the sequence of identical consonants, see (24a,b).

- |      |  |
|------|--|
| (24) | a. <b>roz</b> - <b>zuřil</b><br>INCEPTIVE be.angry<br>'become angry'   |
|      | b. <b>od</b> - <b>dálil</b><br>away- further<br>'to move further away' |

Another factor that determines the allomorphy of vowel-final prefixes is whether the root contains an initial consonant cluster. These cases are generally tricky, because two apparently identical consonant clusters may behave differently for the purpose of prefix vocalization, as illustrated in (25). In (25), both cases have the prefix attaching to a verb that begins with the cluster *br*, yet the shape of the prefix is different.

- (25) a. **se-bral**  
together-picked
- b. **s-brousil**  
away-brushed

An observation made in Ziková (2008) is that the difference in (25) is related to the morphological structure of the relevant forms, which is shown below:

- (26) a. **se- br -a -l**  
together- take -TH -PAST  
'picked up'
- b. **s- brous -i -l**  
away- brush TH -PAST  
'brushed off'

As we can see, the differential behavior depends on whether the root has a vowel or not. When the root has no vowel (as in (26a)), the prefix has the vowel-final shape, when the root has a vowel (as in (26b)), the other allomorph is found. The reason for this, as Ziková proposes, is that roots like 'take' (which only consist of consonants) do not contain true consonant clusters. Instead, they have an empty nucleus position in between the two consonants. Assuming further that also the prefix has an empty nucleus at its right edge, the vocalization of the prefix follows from the requirement that sequences of two empty nuclei are forbidden (Scheer 2004). This is depicted in (27a), where  $\emptyset$  stands for an empty nucleus position.

- (27) a. **se- bør -al** (\***sø-** bør -al)  
together- take -ed together- take -ed
- b. **sø- brous -il**  
away- brush -ed

On the other hand, the root 'brush' *brous-* has a true cluster with no relevant empty nucleus in between *b* and *r*; therefore, the prefix-final empty nucleus may therefore remain without a vowel. The vowel is not needed, since even without it, we do not end up with a sequence of two empty nuclei. This is shown in (27b).

It is important to note all C-final prefixes (i.e., all of C-, VC- or CVC- prefixes) behave uniformly in these contexts; the example in (28) shows this.

- (28) a. **roze- bør -al** (\***rozø-** bør -al)  
apart- take -ed apart- take -ed
- b. **rozø- brous -il**  
apart- brush -ed

- c. **ode-** bør -al      (\***odø-** bør -al)  
away- take -ed      away- take -ed
- d. **odø-** brous -il  
away- brush -ed

All of this may seem complex, but the ultimate point is that in a number of cases, the conditions on prefix vocalization can be reduced to phonological constraints like ‘avoid word-initial geminates,’ or ‘avoid sequences of empty nuclei.’ (29) sums up.

- (29) V~∅ alternations in Czech prefixes
- a. V-final shape appears to avoid word-initial geminates or sequences of two empty nuclei
  - b. C-final shape appears elsewhere

## 4 Roots with empty nuclei and their prefixes

Interestingly, there is a set cases where the generalizations in (29) fail (at least on the surface). In order to see that, let us focus on the class of roots like *br-* ‘take’ – i.e., those that have a bogus cluster with an empty nucleus position in between the consonants. With these roots, the V~∅ alternation has interesting properties that seems to be worthy special attention. In order to see that, consider the imperative of the verb *roze-br-al* ‘take apart,’ shown in (30a). We can see that in the imperative, the root has a different shape than in the past tense in (28a), and so it actually does contain a vowel. (In other words, we have *br-* in the past tense and *ber-* in the imperative). Interestingly, the presence of the vowel in the imperative root has no effect on the prefix, which still shows up with a vowel at the right edge. This is *prima facie* unexpected, because on the surface, we are not avoiding a sequence of two empty nuclei.

- (30) a. roze- ber -∅      (\*roz-ber-∅)  
apart take IMP.2.SG  
‘to take apart, to analyze’
- b. roz- bor -∅      (\*roze-bor-∅)  
apart take -NOM.SG  
‘analysis’

However, what is most curious from our perspective is the fact that there is a contrast here with the zero-derived nominalization in (30b). Specifically, the zero-derived nominalization also has a vowel in the root (like the imperative), yet the prefix does not (in fact cannot) contain a vowel, even though on the surface, the relevant phonological conditions appear to be identical to those in the imperative. In other words, there seems to be a morphological constraint at play here, which differentiates between what happens in the zero nominalization vs. in the imperative.

To see the distribution of the prefix in full, table (31), gives the full paradigm associated to the root ‘take.’ Each row depicts a particular combination of this root and a prefix.

(31) Prefixes with *br-* ‘take’

		PRES	IMP	INF	PAST PART.	NOUN
<i>vy-</i>	‘out’	<b>vy-ber-e</b>	<b>vy-ber-Ø</b>	<b>vy-br-at</b>	<b>vy-br-al</b>	<b>vý-bor-Ø</b>
<i>za-</i>	‘behind’	<b>za-ber-e</b>	<b>za-ber-Ø</b>	<b>za-br-at</b>	<b>za-br-al</b>	<b>zá-běr-Ø</b>
<i>na-</i>	‘on’	<b>na-ber-e</b>	<b>na-ber-Ø</b>	<b>na-br-at</b>	<b>na-br-al</b>	<b>ná-bor-Ø</b>
<i>pře-</i>	‘over’	<b>pře-ber-e</b>	<b>pře-ber-Ø</b>	<b>pře-br-at</b>	<b>pře-br-al</b>	<b>pře-bor-Ø</b>
<i>s-</i>	‘down’	<b>se-ber-e</b>	<b>se-ber-Ø</b>	<b>se-br-at</b>	<b>se-br-al</b>	<b>s-bor-Ø</b>
<i>od-</i>	‘away’	<b>ode-ber-e</b>	<b>ode-ber-Ø</b>	<b>ode-br-at</b>	<b>ode-br-al</b>	<b>od-bor-Ø</b>
<i>roz-</i>	‘apart’	<b>roze-ber-e</b>	<b>roze-ber-Ø</b>	<b>roze-br-at</b>	<b>roze-br-al</b>	<b>roz-bor-Ø</b>

The table is divided into three major sections by the horizontal lines. In the uppermost part, we see the pattern exhibited by prefixes that alternate in vowel length. As already discussed in Section 2, we have a long vowel in the zero nominalization (shaded) and a short vowel elsewhere.

In the middle (horizontal) section, we see an example of a vowel-final prefix (*pře-*) that does not alternate in length: it has the same shape throughout the paradigm. This is what consonant-final prefixes usually do as well, recall (19). However, with the verb ‘take,’ this is not the case.

We can see this in the bottom section of the table. This area contains examples with C-final prefixes. We can see that here the nominalization has a different shape of the prefix (C-final) than the other forms (V-final). This difference does not correlate with the surface phonology. Specifically, in the present tense and in the imperative, the root has the shape *ber*. On phonological grounds, such a shape does not seem very different from *bor*,

we would expect to find a C-final prefix in such an environment (as we do in the nominalization).

In sum, it seems to be the case that in the table (31), the V~Ø alternation is influenced by morphosyntax, and it follows the same logic as the length alternation in the upper part of the table: we get one shape within the productive inflectional paradigm of the verb, and we get a different shape in the non-productive zero-derived noun.

The table also contains vertical lines. These indicate regions with different roots. The present tense and the imperative contain the root *ber-*, the infinitive and the past tense contain the root *br-*, and the nominalization has a different root still (*bor-/b[je]r-*). We shall analyze these roots as (mildly) suppletive allomorphs of the root ‘take.’

The root *br-* ‘take’ is not the only root that shows this kind of pattern. In the remainder of this section, we present a near exhaustive list of roots that pattern like *br-*. The main part of our data in this section comes from work by Petra Berecková (Berecková in preparation), who has compiled an exhaustive list of the relevant root-prefix combinations and verified the vocalization patterns by corpus searches and work with native speakers.

In our presentation of the data, we shall proceed by individual roots. In table (32), we start by the root *ps-* ‘write.’ We can see that also this verb has a root that alternates between a -CC- shape (in the middle two columns) and a -CVC- shape (in the remaining columns).

(32) Prefixes with *ps-* ‘write’

	PRES	IMP	INF	PAST PART.	NOUN
<i>vy-</i>	<b>vy-píš-e</b>	<b>vy-piš-Ø</b>	<b>vy-ps-at</b>	<b>vy-ps-al</b>	<b>vý-pis-Ø</b>
<i>na-</i>	<b>na-píš-e</b>	<b>na-piš-Ø</b>	<b>na-ps-at</b>	<b>na-ps-al</b>	<b>ná-pis-Ø</b>
<i>u-</i>	<b>u-píš-e</b>	<b>u-piš-Ø</b>	<b>u-ps-at</b>	<b>u-ps-al</b>	<b>ú-pis-Ø</b>
<i>při-</i>	<b>při-píš-e</b>	<b>při-piš-Ø</b>	<b>při-ps-at</b>	<b>při-ps-al</b>	<b>pří-pis-Ø</b>
<i>za-</i>	<b>za-píš-e</b>	<b>za-piš-Ø</b>	<b>za-ps-at</b>	<b>za-ps-al</b>	<b>zá-pis-Ø</b>
<i>pře-</i>	<b>pře-píš-e</b>	<b>pře-piš-Ø</b>	<b>pře-ps-at</b>	<b>pře-ps-al</b>	<b>pře-pis-Ø</b>
<i>s-</i>	<b>se-píš-e</b>	<b>se-piš-Ø</b>	<b>se-ps-at</b>	<b>se-ps-al</b>	<b>s-pis-Ø</b>
<i>od-</i>	<b>ode-píš-e</b>	<b>ode-piš-Ø</b>	<b>ode-ps-at</b>	<b>ode-ps-al</b>	<b>od-pis-Ø</b>
<i>pod-</i>	<b>pode-píš-e</b>	<b>pode-piš-Ø</b>	<b>pode-ps-at</b>	<b>pode-ps-al</b>	<b>pod-pis-Ø</b>
<i>nad-</i>	<b>nade-píš-e</b>	<b>nade-piš-Ø</b>	<b>nade-ps-at</b>	<b>nade-ps-al</b>	<b>nad-pis-Ø</b>
<i>před-</i>	<b>přede-píš-e</b>	<b>přede-piš-Ø</b>	<b>přede-ps-at</b>	<b>přede-ps-al</b>	<b>před-pis-Ø</b>
<i>roz-</i>	<b>roze-píš-e</b>	<b>roze-piš-Ø</b>	<b>roze-ps-at</b>	<b>roze-ps-al</b>	<b>roz-pis-Ø</b>

The vertical lines demarcate regions with different roots. In the nominalization, we see an *s*-final root *pis*. In the imperative, the root has the same vowel (*i*), but it ends in *š*. This cannot be treated as a regular palatalization, since *s*-final roots in this class do not show palatalization (e.g., the imperatives *od-nes-∅* ‘carry away,’ *na-pas-∅* ‘graze’). Therefore, we shall analyze these as different roots.

The imperative root is grouped together with the present tense root, because of the fact that they are both *š*-final (which is irregular). There is a vowel length difference between them, but this can be seen as an effect of a regular imperative shortening (long vowels always shorten in the imperative, e.g., *háž-e* ‘he is throwing’ ~ *haž* ‘throw!’). Therefore, individual roots are confined in the same paradigm regions as the various allomorphs of *ber-e* ‘take.’

Let us now turn to the various prefixes (each row contains one prefix). In the top part of the table, we have the by-now familiar pattern of *V*-final prefixes. These have a long prefix in the zero nominalization and a short prefix elsewhere.

In the middle section, we see the non-alternating prefix *pře-* ‘over.’ There is nothing exciting happening here, we just note this to remind ourselves that some *V*-final prefixes do not alternate.

In the bottom section of the table (32), we can see that *C*-final prefixes have two shapes: one for the verbal paradigm and another one for the nominalization. This is indicated by shading. This split is not driven by surface phonology, because the present tense root as well as the imperative root contain a vowel (just like the nominalization). However, it is only in the nominalization where the root’s vowel is ‘taken into account’ by the prefix, which switches to the *C*-final allomorph. This behavior is uniform across all the prefixes. In sum, we see that the bifurcation between the zero nominalization and the rest of the paradigm is systematic. We also see that morphology must also be involved in determining the shape of the prefix, since phonology alone cannot help us. Interestingly, the way the morphology controls the *V*~*∅* alternation runs parallel to what we witness with the alternating vowel-final prefixes.

Let us now move on to the root *ml-* ‘grind.’ We can see the relevant forms in (33). In the top row, we see the vowel-final prefix *vy-/vý-*. As expected, we find the short vowel in the inflectional verbal paradigm, and a long vowel in the zero nominalization.

(33) Prefixes with *ml-* ‘grind’

	PRES	IMP	INF	PAST PART.	NOUN
<i>vy-</i>	<b>vy-mel-e</b>	<b>vy-mel-Ø</b>	<b>vy-ml-et</b>	<b>vy-ml-el</b>	<b>vý-mol-Ø</b>
<i>pod-</i>	<b>pode-mel-e</b>	<b>pode-mel-Ø</b>	<b>pode-ml-et</b>	<b>pode-ml-el</b>	<b>pod-mol-Ø</b>
<i>roz-</i>	<b>roze-mel-e</b>	<b>roze-mel-Ø</b>	<b>roze-ml-et</b>	<b>roze-ml-el</b>	—
<i>s-</i>	<b>se-mel-e</b>	<b>se-mel-Ø</b>	<b>se-ml-et</b>	<b>se-ml-el</b>	—

In the lower part of the table, we show three lines with consonant final prefixes. Only the topmost line out of these three – featuring the prefix *pod-* ‘under’ – has a full paradigm (i.e., including the zero nominalization). In this line, we can once again see that we have the vowel-final allomorph in the verbal paradigm (regardless of whether the root has a vowel or not), and the C-final allomorph in the nominalization.

The two lowermost rows are only partly relevant, even though what they show is rather typical. In particular, what we see here is that the zero nominalization column is empty, because the relevant zero nominalization does not exist (it is a non-productive category). The reason why we include these two lines is to demonstrate the fact that even in the absence of the nominalization, we still find the ‘unexpected’ vowel-final allomorph of the prefix before CVC roots (*mel* in (33)). This is unexpected, because ‘regular’ CVC roots show the C-final allomorph of the prefix. We illustrate this in (34), where we use the root *maz* ‘smear.’ It begins with an *m* just like ‘grind,’ yet it has a non-alternating vowel. This predictably yields the C-final allomorph of the relevant prefixes.

(34) Prefixes with *maz-* ‘smear’

	INF	PAST PART.	PRES	IMP
<i>roz-</i>	<b>roz-maz-at</b>	<b>roz-maz-al</b>	<b>roz-maž-e</b>	<b>roz-maz-ej</b>
<i>s-</i>	<b>s-maz-at</b>	<b>s-maz-al</b>	<b>s-maž-e</b>	<b>s-maz-ej</b>

And so even though we do not know for some of the rows in (33) what the prefix in the nominalization is, we still need to explain why we find the vowel-final forms like *roze-* ‘apart’ before roots that have the CVC shape on the surface. In concrete terms, we need to explain the difference between the present tense *roz-maž-e* ‘smear apart, spread’ in (34) and *roze-mel-e* ‘grind’ in (33). Somehow, the difference must be linked to an independent

difference between the two roots, namely that the former root has a stable vowel (present in all forms), whereas the latter root has an alternating vowel, which may also be absent.

It is quite typical that various roots show ‘incomplete paradigms,’ lacking the nominalization. The table below shows the same set of facts for the root *hn-* ‘chase.’ Note that the shape of this root in the present tense and in the imperative (*žen-*) can be understood (at least historically) as an effect of inserting a vowel that palatalizes the initial consonant (*h~ž* alternation is common in Czech). However, we shall analyze this as two suppletive roots.

(35) Prefixes with *hn-* ‘chase’

	PRES	IMP	INF	PAST PART.	NOUN
<i>na-</i>	<b>na-žen-e</b>	<b>na-žeň-Ø</b>	<b>na-hn-at</b>	<b>na-hn-al</b>	<b>ná-hon-Ø</b>
<i>s-</i>	<b>se-žen-e</b>	<b>se-žeň-Ø</b>	<b>se-hn-at</b>	<b>se-hn-al</b>	<b>s-hon-Ø</b>
<i>roz-</i>	<b>roze-žen-e</b>	<b>roze-žeň-Ø</b>	<b>roze-hn-at</b>	<b>roze-hn-al</b>	—
<i>od-</i>	<b>ode-žen-e</b>	<b>ode-žeň-Ø</b>	<b>ode-hn-at</b>	<b>ode-hn-al</b>	—

In the bottom part, we see the same distribution of prefixes as with all the preceding roots. The unexpected forms are the present tense forms like *roze-žen-e* ‘chase apart.’ All of this is, however, old news; the main purpose of the table is to illustrate the systematic nature of this pattern.

The remaining roots that alternate between a CC shape and a CVC shape are given in (36). They are grouped together in a single table, and we only show their combinations with the prefix *roz-* ‘apart.’

(36) Various roots with *-roz*

ROOT	INF	PAST PART.	PRES	IMP	NOUN
‘make bed’	<b>roze-stl-at</b>	<b>roze-stl-al</b>	<b>roze-stel-e</b>	<b>roze-stel-Ø</b>	—
‘devour’	<b>roze-žr-at</b>	<b>roze-žr-al</b>	<b>roze-žer-e</b>	<b>roze-žer-Ø</b>	—
‘shit’	<b>roze-sr-at</b>	<b>roze-sr-al</b>	<b>roze-ser-e</b>	<b>roze-ser-Ø</b>	— <sup>5</sup>
‘tear’	<b>roze-dr-at</b>	<b>roze-dr-al</b>	<b>roze-der-e</b>	<b>roze-der-Ø</b>	—

Horizontal lines separate individual roots. We can see that none of these verbs has a zero nominalization, yet they all pose the same issue as the other partial paradigms seen above. In particular, it is unexpected that a present tense form like *roze-stel-e* (see the first line) has a V-final prefix.

To some up: even though the  $V\sim\emptyset$  alternation at the right edge of C-final prefixes appears phonology driven, there is a small niche of the grammar where the alternation ‘overapplies,’ providing a V-final version of the prefix before a CVC root. This is generally the case with roots that have an alternating vowel, i.e., with roots that also have a -CC- shape in other parts of the paradigm. Even more interestingly, the overapplication is restricted to verbal forms, and does not extend to nominal forms. As a result, the  $V\sim\emptyset$  alternation with these roots exhibits the same distributional pattern as with prefixes that alternate in length. We will now provide a unified account of these alternations, where the same process that is responsible for length alternation is also the triggering cause for the  $V\sim\emptyset$  alternation with roots alternating between -CVC- and -CC- shapes.

Our account has three main ingredients. The first ingredient of our analysis is a specific proposal concerning the structure of prefixes. Specifically, we shall claim that as a function of their syntactic environment, prefixes have a slightly different structure in zero nominalizations and in verbal forms. These structural differences between nominal and verbal prefixes will occupy us in Sections §5 and §6.

The second ingredient is the idea that zero nominalizations have less syntactic structure than verbal forms (see e.g., Borer 2014, Fábregas 2014). We shall devote our attention to this in Section §7

The final ingredient is the nanosyntactic theory of spellout (Starke 2018), including a particular version of feature driven movement explored in De Clercq (2019). This will be covered in Sections §8-§10.

## 5 Prefixes and prepositions

In this section, we lay out our assumptions concerning the structure of prefixes. As highlighted in the introduction, Czech prefixes have multiple

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<sup>5</sup>With some prefixes, this root allows the C-final allomorph (unexpectedly). Curiously, the C-final allomorph is then found with both suppletive roots. For example, alongside the expected *ode-sr-al*, *ode-ser-e* ‘shit away,’ we also get forms like *od-sr-al*, *od-ser-e* ‘shit away,’ or (also unexpected) *v-sr-al*, *v-ser-e* ‘shit in.’

grammatical meanings. In order to model the fine morphological details of the prefix alternations, we will now make an inventory of these features and determine their structure inside the prefix.

In order to do that, let us first look more closely at the fact that prefixes describe a path of movement along which an event unfolds. As an example, consider the pair of sentences in (37).

- (37) a. Petr **od-** letěl do Stockholmu.  
Petr away- flew to Stockholm  
'Petr departed for Stockholm (by plane).'
- b. Petr **při-** letěl do Stockholmu.  
Petr in flew to Stockholm  
'Petr arrived to Stockholm (by plane).'

Both sentences contain the sequence 'fly to Stockholm.' The sentences differ only in the choice of the prefix. The sentence (37a) contains the prefix meaning 'away,' while (37b) has *při-* 'in, at.' Using the approach proposed in Zwarts (2005), we are assuming that the trace of the event 'flying to Stockholm' must be in the set of Paths denoted by the prefix. This means that in (37a), the event of flying has a trace which starts at some contextually given location and goes away from this location. This correctly gives the meaning 'depart by flying.' In (37b), in contrast, the flying event unfolds along a Path that reaches a particular contextually given location. This gives the meaning 'arrive by flying.'

In the literature, it is standard to assume that paths described by spatial markers can be broken down into two main components, namely Path and Place (Jackendoff 1983). The basic Paths that have been recognized in the literature are Goal Paths (*to*), Source Paths (*from*) and Routes (*via*). Each such Path can be associated to multiple locations, also called Places, e.g., *inside* or *below*. Depending on the type of Path, the relevant Place serves either as the starting point of the movement (*from inside/from below*), as its end point (*to inside/to below*) or as a route (*via inside/via below*). Such decomposition of path denotations applies equally well to both prepositions and prefixes.

For illustration, we list a couple of Czech prefixes and prepositions in (38). In the table, we look at three basic locations (AT, IN, ON) and we list the prefixes and prepositions that express the paths that can be defined with respect to these locations.

## (38) Czech directional markers

	PATH	PLACE	PREFIX	PREPOSITION
a.	TO		<i>při-</i>	<i>k</i>
b.	FROM	AT	<i>od-</i>	<i>od</i>
c.	VIA		?	<i>kolem</i>
d.	TO		<i>v-</i>	<i>do</i>
e.	FROM	IN	<i>vy-</i>	<i>z</i>
f.	VIA		<i>pro-</i>	<i>skrz</i>
e.	TO		<i>na-</i>	<i>na</i>
f.	FROM	ON	<i>s-</i>	<i>z</i>
f.	VIA		<i>pře-</i>	<i>přes</i>

In the table, highlighting indicates that some prefixes (though far from all) are homophonous to a corresponding preposition (cf. Matushansky 2002, Gribanova 2009). For example, the prefix *od-* ‘away’ is homophonous to the preposition *od* ‘away from,’ see (39) for an example.

- (39) **Ode**-hnali mě **od** bazénu.  
 away-chased.3PL me away.from pool  
 ‘They chased me away from the pool.’

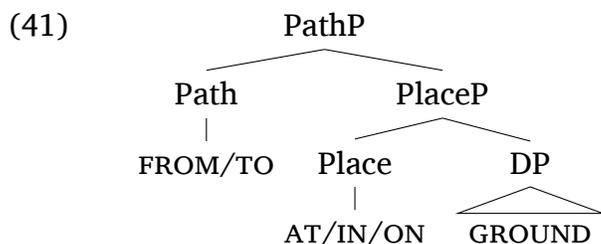
At the same time, there are also prefixes that do not correspond to any preposition. An example of such a prefix is *vy-* ‘out/up’ which is matched by the preposition *z* ‘out of, from.’ (The morpheme *vy-* ‘out’ cannot be used as an adposition at all.)

- (40) **Vy**-hnali mě **z**/\***vy** bazénu.  
 out-chased.3PL me out.of pool  
 ‘They chased me out of the pool.’

The reason why these facts are important to us is that syncretism generally reflects a situation where the two syncretic elements share one part of their meaning, but also differ in some respects. Spatial prepositions (by definition) express the syntactic categories of Place and Path, and therefore, it seems that attributing to the prefix the same features (namely Path and Place) goes a long way towards understanding the homonymy in (40) and elsewhere. However, since the prefixes and prepositions are not iden-

tical, we do not want to go as far as saying that they have exactly the same features. In other words, we need to also specify how prepositions and prefixes differ.

Before we get there, let us now say more about the syntactic structure of the Path and Place features as proposed in the existing literature. Specifically, it has been argued that each of these features corresponds to a separate head in the syntactic structure (see Koopman 2000, van Riemsdijk & Huybregts 2002, Zwarts 2005, Svenonius 2010, Pantcheva 2010). We show this in (41).

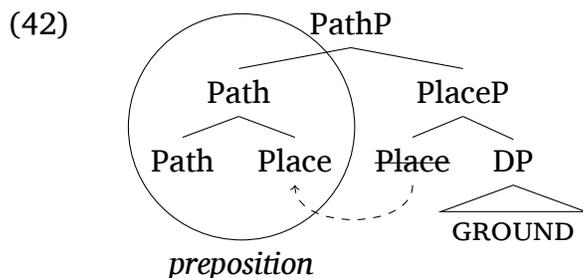


In (41), the Place head combines with a DP first. The DP serves as the so-called Ground argument (Talmy 1978). The Place head determines a set of points in space relative to this DP. For example, *in the box* is going to yield a set of points which are internal to the box. The Path head applies to this denotation and delivers a set of Paths whose final or initial point coincides with one of such points, yielding a goal or a source Path respectively.

It is relevant to note that in Czech, many adpositions and prefixes express Path and Place simultaneously, i.e., cumulatively inside a single morpheme. We could see this in (38), where the prepositions for goal, source and via paths unpredictably differ. The same holds for the prefixes: it is impossible to decompose them into an invariant Place marker and a separate Path marker.

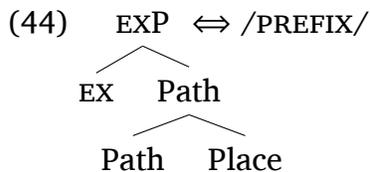
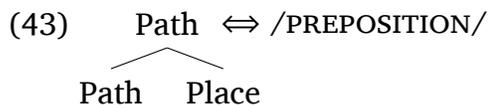
In our analysis, we shall take this to mean that the adpositions are portmanteau morphemes expressing both Path and Place. One way this can be achieved is by proposing that Place and Path form a constituent in Czech, and they are pronounced by phrasal spellout (McCawley 1968, Weerman & Evers-Vermeul 2002, Neeleman & Szendrői 2007, Starke 2009). In traditional theory, the relevant constituent can be derived via head-movement. We show this in (42), though we shall later adopt an alternative mecha-

nism where Path and Place are directly merged together in a separate workspace.



Once Path and Place form a constituent, as in (42), the mechanism of phrasal spellout allows that the two features can be pronounced by a single cumulative marker. This analysis is depicted in (42) by the circle around the relevant constituent, and we shall assume it in what follows. We will explain the details of the insertion procedure as we go.

The question that we set out to explore now is how we can analyze the difference between prepositions and prefixes. The specific proposal we shall adopt here is that both directional prepositions and prefixes describe a Path: this is their common core. However, the prefix contains (under our analysis) an extra layer of meaning. We depict this below, where (43) gives the structure of the adposition (reflecting the structure in (42)), while (44) is the structure of the prefix.



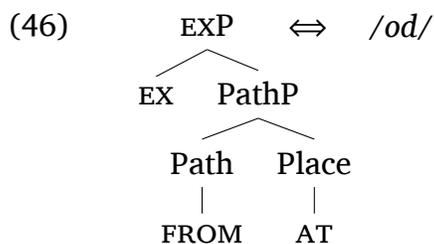
According to this analysis, Czech prefixes differ from prepositions in that they have an extra element of meaning, coded as EX in (44). We shall elaborate on the content of the EX projection shortly; for now, the point is that once these abstract structures are adopted, we can correctly capture the relationship between the morphological shapes of prefixes and prepositions, in particular the fact that they are sometimes the same, but other times they differ.

The basic idea is that allows us to capture this is that lexical entries are not tailor made for a specific structure (each structure a set of features),

but they can (in principle) spell out multiple structures (feature sets). Concerning the specific implementation of this idea, we shall adopt here the approach based on the Superset Principle, given in (45).

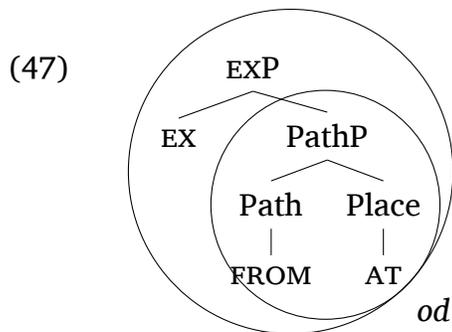
- (45) *The Superset Principle, Starke (2009):*  
 A lexically stored tree L matches a syntactic node S iff L contains the syntactic tree dominated by S as a subtree.

The wording of the principle presupposes that lexical insertion may target non-terminal nodes. Under this view, phonological information is associated to a potentially complex syntactic tree, called the lexically stored tree. An example entry is in (46), which is the lexical entry for *od* ‘away.’ Recall from (39) that this marker can be used both as a preposition and a prefix.



The specific prefix *od* embeds a source Path (FROM) originating at a location that is AT something; we note this by placing the abstract meanings FROM AT under the relevant nodes.

The Superset Principle (45) says that this lexical entry can be used to pronounce any constituent contained in the lexically stored tree. This means that it can pronounce not only the full prefix structure, but also the structure of the preposition, which it contains. This is depicted in (47).



The reason why both the preposition structure and the prefix structure can be spelled out by the same morpheme is that they are both contained inside the lexical entry for the prefix. Therefore, *od* ‘away from’ can be used both as a prefix and as a preposition.

Let us now turn to preposition-prefix pairs where there is no identity. As an example, recall the meaning ‘out of’, which is expressed by the prefix *vy-* and the preposition *z*, recall (40), repeated in (48).

- (48) **Vy**-hnali mě **z**/\***vy** bazénu.  
 out-chased.3PL me out.of pool  
 ‘They chased me out of the pool.’

The reason why the identity between prefixes and prepositions fails in such cases is that syncretism is never obligatory. Specifically, the syncretism in (47) only arises because there is no dedicated morpheme for the [FROM AT] PathP node. If there was a dedicated lexical entry for the prepositional structure, syncretism would fail to arise. Since this is what we find for the lexical items in (48), we analyze this using the entries in (49) and (50).

- (49)            EXP ⇔ /vy/            (50)            PathP ⇔ /z/
- EX    PathP

    /    /

  Path  Place

  |      |

FROM  IN

Path    Place

  |      |

FROM  IN

The entry (49) can (once again) be used to spell out both the prefix structure and also the preposition structure. However, since the entry (50) can also pronounce a PathP constituent corresponding to the preposition, the entries (49) and (50) compete for the spellout of the preposition structure. The entry (50) is a perfect match (it has fewer superfluous features), and it therefore wins in competition (due to a principle known as the Elsewhere Condition, Kiparsky 1973). As a result, the prefix structure is pronounced as *vy-* ‘out of,’ while the preposition with the same meaning is different.

Let us now turn to what the head EX stands for. An idea defended in Svenonius (2004) (cf. Romanova 2007) is that Slavic prefixes are analogous to English particles, and that particles are in turn nothing else but intransitive prepositions. To see the reasoning, consider the following examples from Svenonius (2007):

- (51) a. The police will fire tear gas **in** the window.  
 b. The police will fire tear gas **in**.

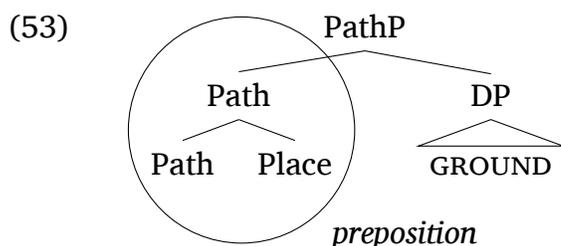
According to Svenonius, the preposition *in* found in (51a) relates two arguments: Figure (*tear gas*) and Ground (*the window*). In the event, the Figure is the mobile entity and travels along a Path that is defined with respect to the Ground, i.e., *the window*. The particle in (51b) corresponds to the same morpheme as the preposition, and differs from it in that it lacks an overt Ground. According to Svenonius, this is the essential difference between prepositions and particles. In the case of particles, the precise end point of the Path (the Ground) has to be inferred from the context.

This description naturally extends to the Slavic situation (as Svenonius 2004 points out); the pair of examples in (52) brings it out.

- (52) a. Petr kráčel **od** fakulty.  
 Petr walked away.from faculty  
 ‘Petr walked away from the faculty.’  
 b. Petr **od**-kráčel.  
 Petr away-walked  
 ‘Petr walked away.’

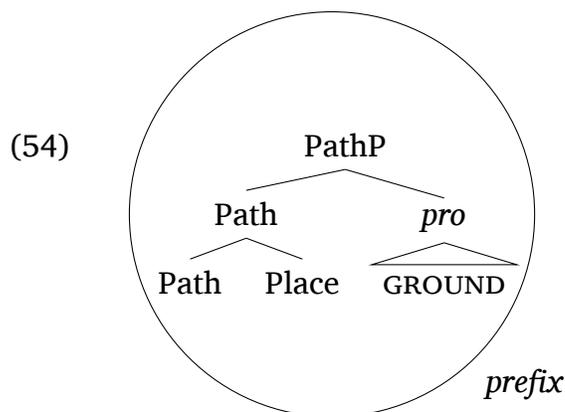
In terms of our theory, we can encode this descriptive difference by proposing that particles/prefixes lack the Ground argument because they incorporate it. Under this view, the Ground argument is present in the structure, and corresponds to a *pro*-type DP whose reference must be determined from the context. This *pro*, we propose, is the mysterious EX that is contained in prefixes (and missing in prepositions).

In order to see how that works in detail, consider first the structure we have proposed above for prepositions in (41). We give its essence in (53), where we ignore the head-movement step.



In this structure, the rough constituency is the same as in (41) in that

we have Place and Path grouped in a single constituent, and the Ground is outside of this constituent. What we propose is that when the Ground argument is missing, it is spelled out inside the prefix, as in (54).



This is nothing but a specific implementation of the idea that prefixes and prepositions are not identical, but they stand in a containment relation (with prefixes containing prepositions).

However, the lack of the Ground argument is not the only difference between prepositions and verbal prefixes. To see that, consider the fact that some prepositions in Czech (the so-called ‘improper’ prepositions) simply allow for the Ground argument to go missing without automatically turning into prefixes. An example is given in (55).

- (55) Improper prepositions
- a. Petr kráčel **kolem** fakulty.  
Petr walked around faculty  
‘Petr walked past/around the faculty.’
  - b. Petr kráčel **kolem**.  
Petr walked around  
‘Petr walked by.’
  - c. \*Petr **kolem**-kráčel.  
Petr around-walked  
‘Petr passed by.’

The data show that an adposition like *around* (seen in (55a)) can be used intransitively, as in (55b), but this does not immediately lead to prefixation; in fact, the adposition *kolem* cannot be prefixed to the verb at all, see

(55c). Therefore, there must be at least one more thing that distinguishes prepositions and prefixes (the surface absence of the Ground argument on its own is not enough).

Let us now therefore focus on the difference between items like *kolem* ‘around’ and items like *od* ‘away from.’ The pattern in (56) provides a minimal pair to the one in (55).

- (56) a. Petr kráčel **od** fakulty  
 Petr walked away.from faculty  
 ‘Petr walked away from the faculty.’  
 b. \*Petr kráčel **od**  
 Petr walked away.from  
 c. Petr **od**-kráčel  
 Petr away-walked  
 ‘Petr walked away.’

What we can see is that the adposition *od*- ‘away from’ differs from *kolem* ‘around’ in its positioning. While *kolem* ‘around’ cannot be prefixed (recall (55c)), *od*- ‘away from’ must be prefixed.

A related difference concerns interpretation. The sentence with the prefix is interpreted as perfective, while the sentence without the prefix is imperfective. One of the standard perfective/imperfective differences concerns the compatibility with the future tense auxiliary *bude*. Specifically, the prefixed verb is incompatible with *bude* (57a), while the non-prefixed verb is, see (57b).

- (57) a. \*Petr bude **od**-kráčet.  
 Petr will away-walk  
 Intended: ‘Petr will walk away.’  
 b. Petr bude kráčet **kolem**.  
 Petr will walk around  
 ‘Petr will walk around.’

These observations lead us to the conclusion that the absence of Ground is not the only difference between prefixes and prepositions: prefixes also have a special position and semantic contribution.

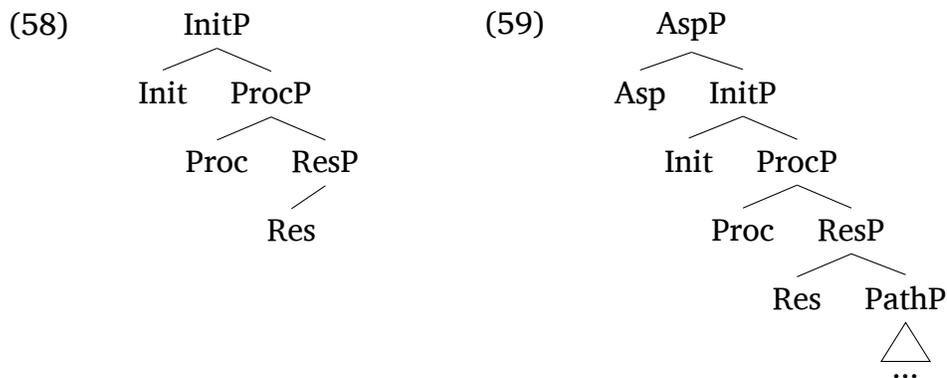
In order to theoretically encode this difference, we will rely on the idea put forth in Ramchand & Svenonius (2002) for English and elaborated for Slavic in work by Romanova (2007). The idea is that prefixes (very much

like particles in English) also add a result state to the event expressed by the verb, which makes the verb telic. The technical aspects of this proposal are couched in Ramchand's (2008a) decomposed-VP model, which corresponds to the second crucial ingredient of our approach.

## 6 Prefixes as resultatives

In Ramchand's decompositional approach verbs, each event may contain up to three different sub-eventual components: Initiation, Process and Result. For example, a verb like *give* in *Mary gave Bill the book* is going to have all three components: *Mary* initiates/causes a process where *the book* is changing location/possession. The process in turn leads to the result that *Bill* has the book.

These three components (called Init, Proc, Res) are structured as shown in (58). We have Init as the topmost sub-event, and in Ramchand's system, it is linked by a 'lead-to' relation with its complement. The complement is complex, and it includes the Proc(ess), which is again linked by the 'lead-to' relation with the result.

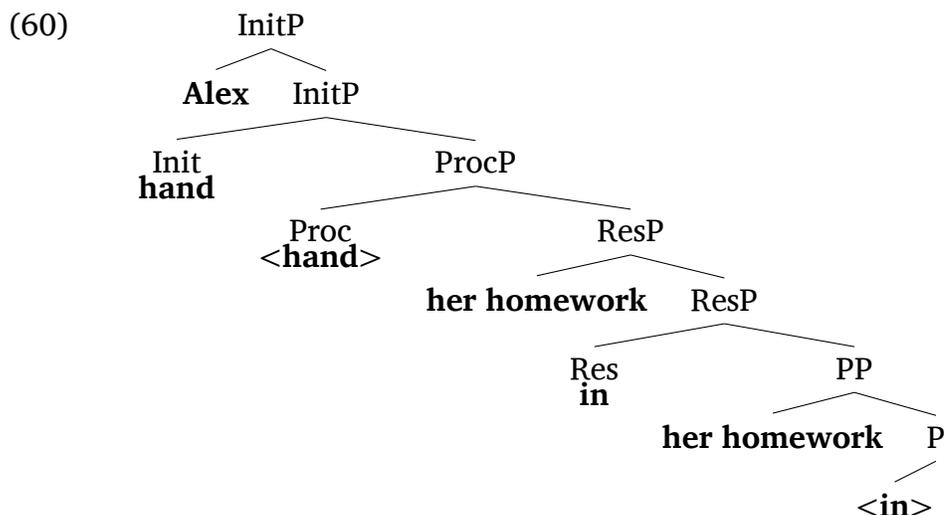


The aspectual information, we assume, is still higher up in the structure (above Init). We will have more to say about the distinction between a perfective and imperfective aspect later on.

In addition to the aspectual head above Init and Proc, in (59), we also place a PathP in the complement position of the Res head. This is the same place where Ramchand also places directionals.

In Ramchand (2008a:131ff) (cf. Ramchand & Svenonius 2002), English particles are introduced as adpositional heads below Res, but obligatory

move up to Res and provide a result to the whole event. Ramchand's proposal for the sentence *Alex handed her homework in* is shown below:



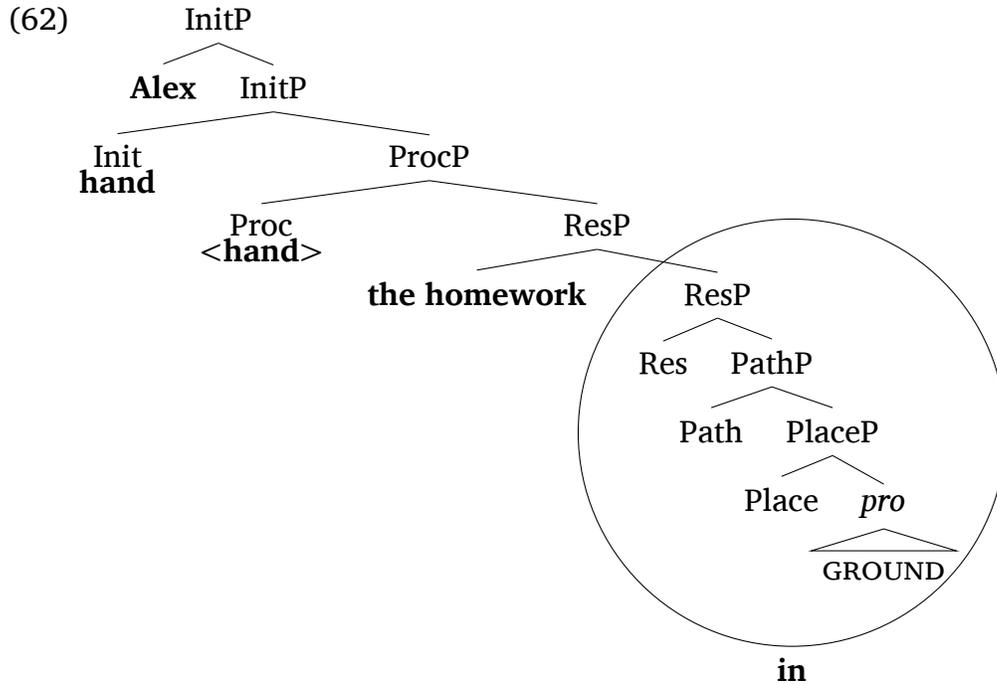
What we see here is that the particle *in* lexicalizes both a P head in the complement of Res and also Res itself. In Ramchand's terminology, the particle 'identifies' the resulting state: as a result of the event, the homework is 'in.' Romanova (2007:104) extends this approach to Russian prefixation and we shall adopt a version of it here as well: what is crucial for us is the idea that prefixes are not only intransitive prepositions (describing a Path with respect to some implicit Ground), they also provide a result to the event by lexicalizing the Res head, thereby making the verb telic.

The idea that prefixes lexicalize Res will, in our account, be one of the properties that distinguishes them from regular intransitive prepositions like 'around;' recall the contrast in (61).

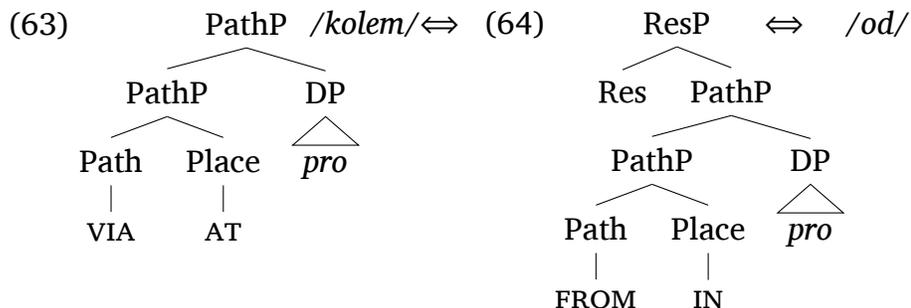
- (61) a. Petr **od-** / \***kolem-** kráčel  
 Petr away- around walked  
 'Petr walked away/around.'  
 b. Petr kráčel \***od** / **kolem**  
 Petr walked away around  
 'Petr walked away/around.'

The specific way in which we shall implement this proposal is by adding the Res head into the set of heads spelled out by the prefixes. The follow-

ing diagram depicts the bare bones of our idea on the very same English sentence discussed in Ramchand, see (62). The reason why we show this tree is not to provide an account for English; rather, the goal is to show that our proposal is related to other similar ideas in the literature with small differences of a rather technical nature.



In sum, what we are proposing is that Czech intransitive prepositions like *kolem* ‘around’ lexicalize the structure as in (63), while prefixes lexicalize the Res head in addition, see (64).



The presence of Res is what gives prefixes the extra resultative value

compared to regular (intransitive) prepositions like ‘around.’ In plain terms, lexicalizing Res turns an intransitive preposition into a morpheme that is simultaneously making the verb telic.

At this point, we have theoretically encoded a difference between three kinds of objects, see (65).

- (65) a. regular prepositions (spell out Path + Place)  
 b. intransitive prepositions (spell out Path + Place and GROUND)  
 c. prefixes (spell out Path + Place, GROUND and Res)

What we have, however, still not touched upon is the relationship between long vs. short prefixes, i.e., we have not yet provided a proposal as to what is the difference between *vy-*/*vý-* both ‘out.’ The obvious point about these two prefixes is that both are prefixes, i.e., they must be both different from *kolem* ‘around,’ which is not a prefix. Guided by this simple reasoning, what we now need to provide is a further bifurcation within the class of prefixes given (65c).

The specific way in which we shall implement the bifurcation will be guided by two types of considerations. The first thing we need to capture is the systematic nature of the alternation in the class of alternating prefixes: there is a clear and predictable relation between the verbal version of the prefix and the nominal version, specifically, the nominal allomorph equals to the verbal allomorph plus length. This is something that we have already seen in Table (18), which we repeat (in an abbreviated form) for convenience in (66).

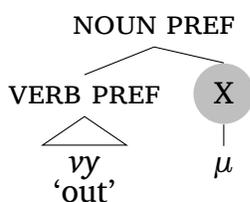
(66) Vowel final prefixes

	VERB	NOUN	
ALTERNATING PREF			
get on	<i>na-stup</i>	<i>ná-stup</i>	onboarding
get out	<i>vy-stup</i>	<i>vý-stup</i>	offboarding
NON-ALTERNATING PREF			
change (vehicle)	<i>pře-stup</i>	<i>pře-stup</i>	transfer
move on	<i>po-stup</i>	<i>po-stup</i>	<i>progression</i>
SUPPLETIVE PREF			
to join by flowing	<i>s-tékat</i>	<i>sou-tok</i>	confluence

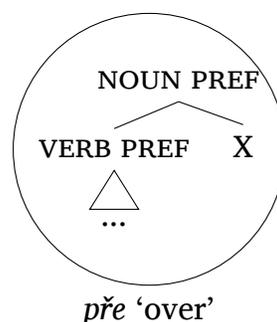
At the same time, we need to capture the fact that there are also two additional classes, which we have called non-alternating and suppletive.

The need to capture these three classes leads us to the following proposal. First of all, the regularity of the alternation is suggestive of a morphological decomposition where length is the morphological realization of a particular feature, present in the nominal prefix but lacking in the verbal prefix. We show this idea in (67). What we depict here is a situation such that the alternating prefix (e.g., *vy-* ‘out’) spells out a particular projection labeled VERB PREF. This is the prefix structure that attaches to verbs. With nouns, an extra feature X must be present, highlighted by shading. The length spells out this additional feature. In this setting, the alternation between *vy* and *vý* is then morphologically compositional, even though the length is phonologically realized jointly with the prefix.

(67)



(68)



Under this view, non-alternating prefixes can be captured as in (68). The idea is that non-alternating prefixes are lexically stored in a way that they can spell out the full nominal prefix as one piece. This blocks the insertion of length as an independent realization of the projection X, and makes sure that such prefixes can also spell out (due to the Superset Principle) any structure that is contained within this prefix; this includes the structure of the verbal prefix. As a consequence, the prefixes do not alternate, because the same lexical item spells out the larger nominal-prefix structure as well as the verbal-prefix structure.

Finally, the analysis depicted in (68) also allows us to capture the irregular alternation between *s-* and *sou-* ‘together.’ The way these prefixes can be incorporated into the theory is by treating *sou-* as the spell out of the verbal-prefix structure, while *s(e)-* will be stored as the spell out of the smaller (verbal-prefix) tree that lacks X. Therefore, even though *sou-*

can in principle spell out the verbal-prefix structure (just like any nominal prefix can), once X is missing, *sou-* will lose in competition to *s(e)-*.

Note that the competition between *sou-* and *s(e)-* has the same result (*s(e)* winning) also for the prepositional structure, because this is an even smaller structure than the structure of the verbal prefix. Therefore, *s(e)* is again a better match. This is a correct result, since *s(e)* can be used as a preposition meaning ‘off’ (even though slightly archaic).

Let us now systematize these observations. The essence of our proposal as it now stands is that the nominal prefix contains the verbal prefix, and that the verbal prefix in turn contains a prepositional structure. This leads to a type of a nesting relation, where a \*ABA constraint is expected to hold over the forms of the nominal prefix, the verbal prefix and a preposition. We note this in (69).

- (69) *A \*ABA constraint on the shape of Ps*  
 In the sequence NOMINAL PREFIX – VERBAL PREFIX – PREPOSITION, only contiguous regions can be marked the same.

This constraint is a correct description of the Czech situation. In Table (70), we illustrate the allowed (contiguous) syncretisms. In the first two lines, we see the items that we call ‘non-alternating’ prefixes. This is because they have the same shape for the verbal-prefix column and the nominal-prefix column. the two lines differ in whether the non-alternating prefix is different from the corresponding preposition (AAB) or identical to it (AAA).

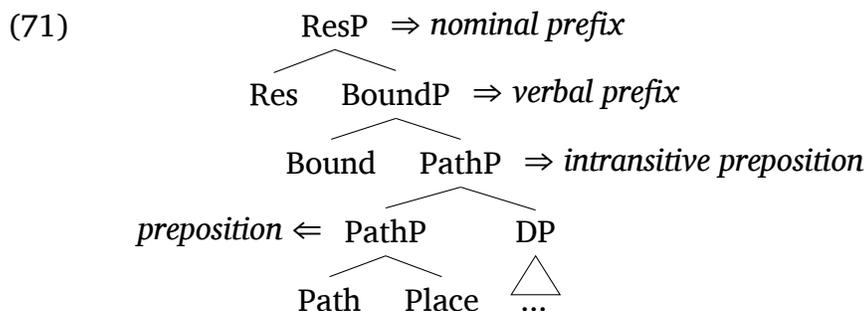
(70) Patterns of syncretism

	nominal prefix	verbal prefix	preposition	pattern
over	<i>pře</i>	<i>pře</i>	<i>přes</i>	AAB
under	<i>pod</i>	<i>pod</i>	<i>pod</i>	AAA
on	<i>ná</i>	<i>na</i>	<i>na</i>	ABB
through	<i>prů</i>	<i>pro</i>	<i>skrz</i>	ABC

The bottom two rows show alternating prefixes, i.e., those that have a different allomorph as verbal prefixes and as prefixes to zero nouns. These always give rise to AB... patterns. When the verbal prefix is the same as the corresponding adoposition (e.g., *na*), we get an ABB pattern. When the preposition is different, we get an ABC pattern. Crucially, the \*ABA

pattern is missing. We take this to be an important observation that suggests that our morphological decomposition of the prefixes is on the right track.

There are, nevertheless, several questions remaining. The first question is what the actual projection is that differentiates verbal and nominal prefixes (so far, we have been using X). let us address this now. We know that both verbal and nominal prefixes (qua prefixes) contain Res. We will investigate here the option that Res is the highest of all the projections: in other words that Res is X. This requires us, however, to have one more lower projection that is present with prefixes and missing with intransitive prepositions like *kolem* ‘around.’ We will tentatively identify this projection as a node that contributes a Bounded interpretation to Paths (the idea of a Bound head in the structure of PPs is originally postulated in Pantcheva 2011). In sum, our final proposal that incorporates all the morphological guises of adpositional-type markers is as in (71):



The remaining questions concern two aspects of prefixes. (i) Their prefixal nature: what makes these morphemes prefixal in Czech, but not in English? (ii) What governs the distribution of the long-short prefix? Why do we get the smaller prefix structure with verbs and the bigger one with nouns? (iii) And finally, how can we use that proposal to account for the special ‘non-phonological’ distribution of  $e\sim\emptyset$  alternation with the set of alternating roots investigated in Section §4?

In the remaining sections, we shall provide first of all a derivation that accounts for the positioning of the prefix with respect to the verb. Then we turn to the issue as to how exactly the alternation between verbal and nominal prefixes arises, focussing primarily on the length alternation. Finally, we address the question how the  $e\sim\emptyset$  alternation can be explained within the same set of analytical assumptions.

## 7 Spelling out the structure of zero nouns

In order to have a concrete example to work with, let us now turn to one of the verbs that have an alternating vowel in their root, namely *br-á-t* ‘to take.’ Recall that what we need to capture are two types of prefix alternations. The first one is the alternation between ‘short’ verbal prefixes (72a,b) and long ‘nominal’ prefixes (72c).

- (72)
- a. Petr **na- br -a -l** doktorandy.  
Petr on tok TH -PAST PhD students  
‘Petr recruited graduate students.’
  - b. Petr **na- ber -e** doktorandy.  
Petr on take PRES PhD students  
‘Petr will recruit graduate students.’
  - c. Petrův **ná- bor** doktorandů  
Petr’s on take PhD students  
‘Petr’s recruitment of graduate students’

The second fact we need to explain is that with roots such as ‘take,’ we get an alternation between vowel-final allomorph and a consonant-final allomorph in the same set of environments.

- (73)
- a. Petr **roze- br -a -l** situaci.  
Petr apart take TH -PAST situation  
‘Petr analyzed the situation.’
  - b. Petr **roze- ber -e** situaci.  
Petr apart take PRES situation  
‘Petr will analyze the situation.’
  - c. Petrův **roz -bor** situace  
Petr’s apart take situation.GEN  
‘Petr’s analysis of the situation’

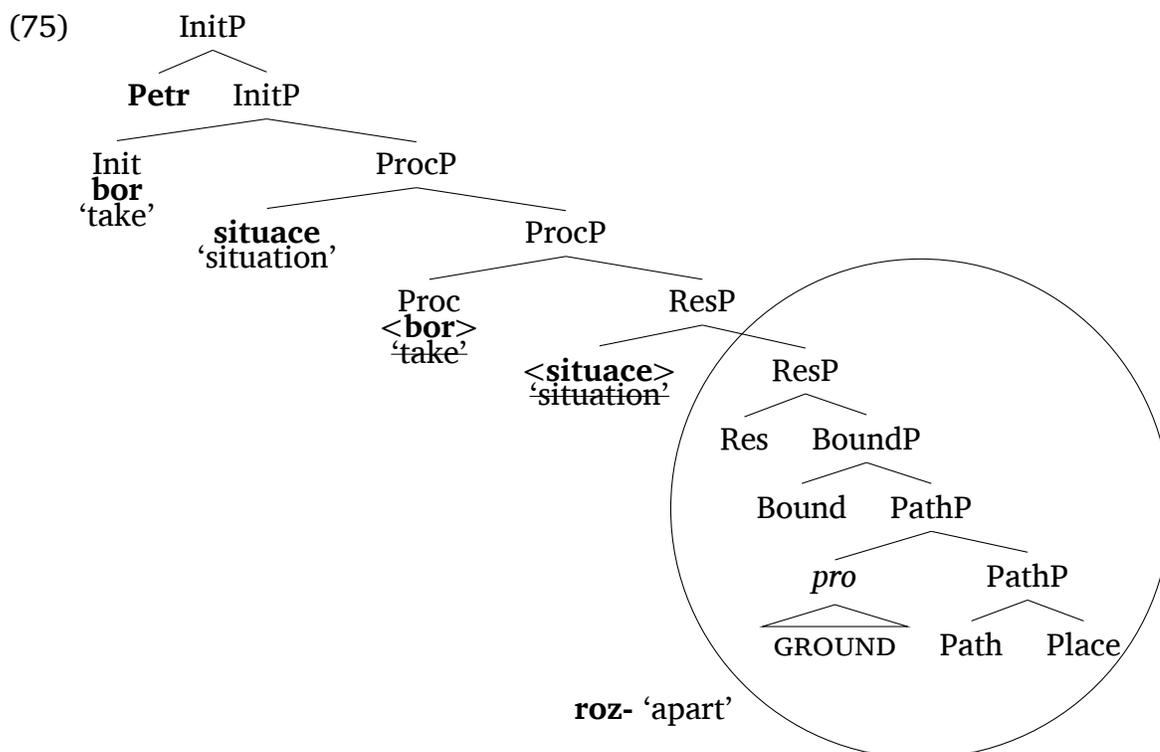
In our analysis of these examples (and the other examples discussed in Section 4), we shall need to distinguish three mildly suppletive forms of the root ‘take,’ see (74).

- (74) Three types of roots
- a. Past participle root (*br-*, CC)
  - b. Present tense root (*ber-*, CVC)

c. Nominal root (*bor-*, CVC)

Given this collection of different roots, what we would like to derive is the fact that the prefix selected by roots (74a,b) is the same, while the nominal root (74c) combines with a different form of the prefix. The account will be morphological (rather than phonological) in nature, since the phonology of the roots apparently groups (74b,c) together (CVC) against (74a) (CC); but as already mentioned, the prefix has one shape in verbs (74a,b) and a different shape in nouns (74c).

In this section, we show how the nominal structure is derived. We shall work under the assumption (Borer 2014, Fábregas 2014) that the structure of zero nouns is contained inside the structure of verbs. The nouns that we are looking at here in (72c) and (73c) are simplex event nouns, containing potentially the slot for the Initiator and the Undergoer (in Ramchand's 2008a terminology). We will therefore analyze the nominal root as an item that is capable of lexicalizing the projections that introduce the Initiator and the Undergoer of the event. The specific way we divide the work between the root 'take' and the prefix 'apart' is as shown in (75).



At the bottom of the tree, we find an elaborate ResP, which includes all the projections that we have introduced in the previous section. In (75), the ResP is spelled out by a non-alternating C-final prefix *roz-* ‘apart.’ In the previous section, we have made it clear that if the structure included an alternating prefix like *vy-* ‘out,’ the bottom part of the structure would be bi-partite: we would have *vy-* ‘out’ spelling out BoundP, and Res would be spelled out by the extra length. Jointly, the two pieces would provide the spell out of ResP as *vý-* ‘out’ (with a long vowel).

Above the ResP, we find a ‘classical’ Ramchand-style structure, similar to her analysis of the light verb ‘take’ in Hindi (Ramchand 2008a:146). In this structure, we place the nominal root *bor* ‘take’ as the spellout of the heads Proc and Init. The lower position is placed in <angled brackets>, a notation that Ramchand uses for traces. Similarly, the noun *situace* ‘situation’ occupies two positions in the structure, since it is both the Resultee (it ends up ‘taken apart/analyzed’ as a result of the event) and it is also the Undergoer as it is getting analyzed in the course of the event.

What is important about this structure is not the word order: as we can see, the particle follows the root *bor* ‘take’ here, which is correct for English but wrong for Czech. We shall look into this issue immediately; what we want to do first is to establish the idea that the verb ‘take’ (represented by the nominal root *bor* in (75)) lexicalizes two components of the structure, namely Init and Proc. As to how exactly this happens within Nanosyntax and how the correct order is derived will be dealt with in the following paragraphs.

In the structure, we also include the two arguments of the verb ‘analyze.’ We have already mentioned the Undergoer/Resultee, but there is also the argument *Petr*, which is the Initiator. In the course of the derivation, the Initiator ultimately moves out of the (decomposed) VP and ends up in a specifier of some verbal or nominal functional projection, a standard proposal for subjects. Following a derivation described in Caha & Ziková (2016), we are assuming that also the second argument ‘situation’ moves out of the decomposed VP to the specifier of a functional head analogous to the AgrOP of Chomsky (1993), which is higher than the InitP (cf. Kayne 1998, Taraldsen 2000). After the arguments evacuate the InitP, the InitP only contains the head material and it is the spellout of such a constituent that we will be describing in what follows. We shall come back to the placement of the verb with respect to the arguments later in (88).

With our assumptions about the arguments clarified, let us now focus

on the issue of how the nominal root *bor* ‘take’ spells out two projections Proc and Res. In our theory of lexicalization (which is based on phrasal spellout), these two heads must form a constituent. There are (in principle) multiple ways in which this can happen, and different languages are likely to use different strategies. For example, in English, we shall propose that these two heads are merged together in a separate constituent in a manner that resembles the result of head movement of Proc to Init. In Czech, however, a different option emerges, namely one where the two heads form a constituent after the prefix evacuates the InitP and moves to the left (thereby preceding the verb).

We shall now present an algorithmic approach to phrasal spellout (based on Starke 2018) that allows us to formalize the precise sequence of derivational steps that lead to the creation of constituents that are lexicalized in individual languages. This algorithm is currently standardly used in Nanosyntax in order to drive derivations in many empirical domains.<sup>6</sup> We give it in (76). A crucial part of this algorithm is the idea that spell out proceeds cyclically. We state this as (76) for clarity, although we note that in the actual implementation, Cyclic Phrasal Spellout is ultimately the consequence of the spellout algorithm to be presented shortly, rather than its pre-requisite.

- (76) *Cyclic Phrasal Spellout.* Spell out must successfully apply to the output of every Merge F operation. Since Merge proceeds bottom-up, so does spellout. After successful spellout, the derivation may terminate, or proceed to another round of Merge F.

The Spellout Algorithm itself is as formulated in (77).

- (77) Spellout Algorithm (based on Starke 2018)
- a. Merge F and spell out.
  - b. If (a) fails, try spec-to-spec movement of the node inserted at the previous cycle, and spell out.
  - c. If (b) fails, move the complement of F, and spell out.

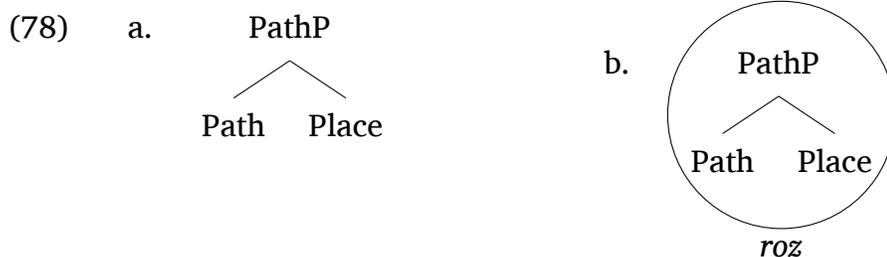
We can see that this algorithm is the actual piece of the theory which im-

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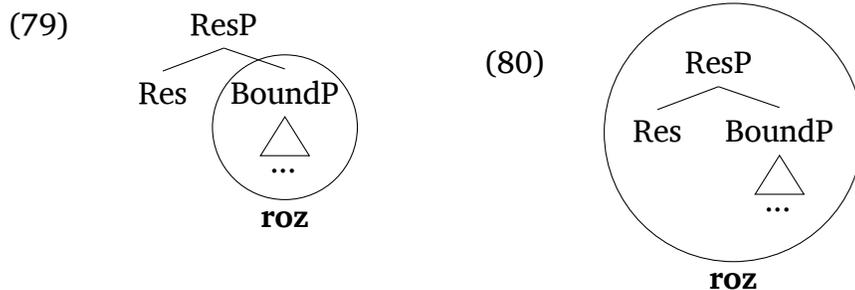
<sup>6</sup>For work using this type of derivations, see De Clercq & Vanden Wyngaerd (2017, 2018), Baunaz & Lander (2018), Bergsma (2019), Caha et al. (2019), De Clercq (2019), Wiland (2019), Caha (to appear), Vanden Wyngaerd et al. (2020), Kloudová (2020), Ziková & Faltýnková (in press).

plements cyclicity. This is due to the fact that all the derivational options always insist on: MergeF – try to spell out, see (77a). If direct spellout fails, the algorithm says that syntax should perform one of two ‘rescue’ movements (Spec movement or complement movement, in a pre-defined order) – and again try to spell out. However, there is no option of adding another feature before spell out of the feature F succeeds.

In our particular case, the derivation first assembles the Path and Place features, as in (78a), and tries to spell out. Spellout is successful, since *roz* ‘apart’ matches this constituent, see (78b).

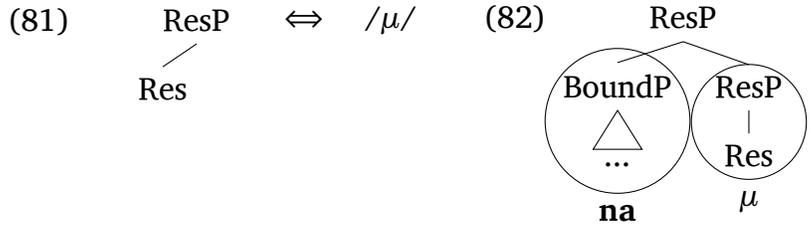


Let us suppose that the derivation then continues on until the whole BoundP is assembled, spelled out as *roz* ‘apart’ and subsequently merged with the Res head, yielding (79). The newly formed structure can still be spelled out by the prefix, see (80).

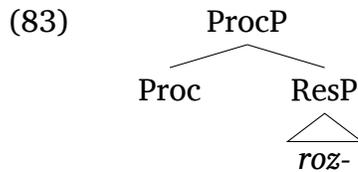


The reason why this derivational step is interesting is because it proceeds differently with the prefix *na-*. This prefix can only spell out BoundP. This means that when Res is merged on top of this prefix, yielding a structure like the one in (79), spellout without movement fails: the lexical entry of *na-* ‘on’ does not contain Res. This means that other options of the spellout algorithm (77) have to be tried. What we are assuming is that the lexical entry for the length marker is as in (81), inserting an extra mora ( $\mu$ ). Therefore, when the Spellout Algorithm tries the complement

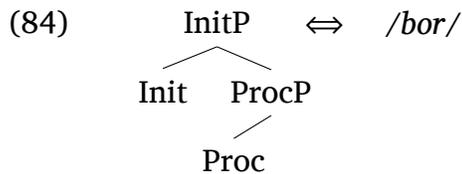
movement of BoundP as in (82), the lexical entry spells out ResP and the prefix is lengthened. In the tree (82), we are leaving out the trace of the moved element, since Starke (2018) suggests that movements triggered by the Spellout Algorithm (77) leave no trace.



The derivation now continues by merging Proc on top of ResP. Suppose we merge it on top of the prefix is *roz-* ‘apart,’ yielding (83).

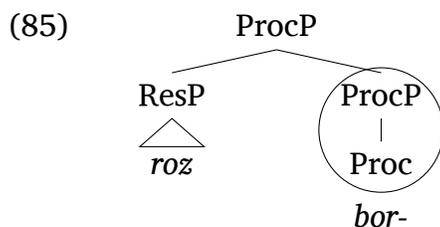


Our idea about the lexical entry for the nominal root *bor* ‘take’ is as given in (84).



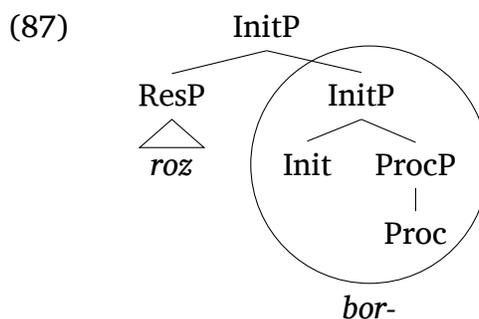
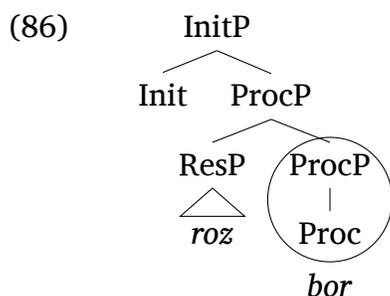
This lexical entry cannot be used to spell out the ProcP in (83), and therefore, spellout fails. When that happens, the Spellout Algorithm requires that specific repair movements take place. The first repair movement is the movement of the Spec of Proc’s complement. However, there is no such Spec in (83), and so this repair movement cannot be executed. As a result, there is no change and spellout still fails.

At this point, the movement of Proc’s complement takes place. The complement corresponds to the ResP spelled out by the prefix *roz-*. Therefore, this movement places the prefix to the left of the root, see (85).



After this movement the remnant ProcP is spelled out by *bor-*, see the circle in (85). Spellout is now possible since the circled ProcP is contained in (84).

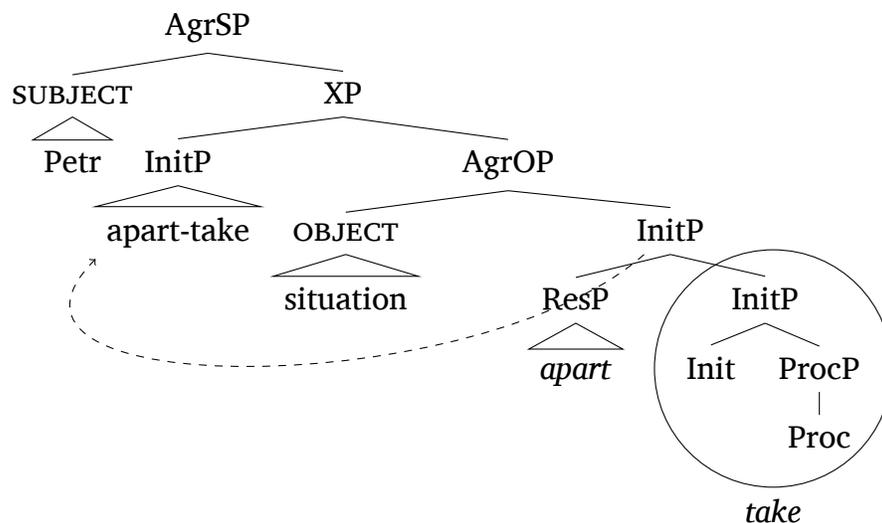
The derivation now continues by adding Init on top of (85), yielding the structure (86), which fails to spell out without any movement. Therefore, Spec movement is tried, yielding (87). Once again, the trace is ignored.



After movement, the remnant InitP is matched by the lexical item for *bor-* ‘take.’ This way, we derive the prefixed noun *roz-bor* in Czech. Had we merged the Proc and Init heads on top of the prefix *ná-*, we would derive the form *vý-bor*. The structure would be the same as in (87), with a difference in the prefix structure. We have addressed this above in (82). In sum, the derivations presented here correctly derive the forms *roz-bor* ‘analysis’ (with a non-alternating prefix) and *ná-bor* (with a long alternating prefix).

The last thing we want to make clear is that the InitP moves in between the arguments that had extracted out of the VP as in (88). We are labelling the landing sites of the subject and the object as AgrS and AgrO respectively; this is meant mainly as a variable for the relevant projection where the argument moves.

(88)



## 8 Merge F > Move FP > Merge FP

In this section, we shall look at how the nominal structure gets expanded into a verbal structure. In order to see what we need to account for, consider the pair in (89), repeated from (72).

- (89) a. Petrův **ná-** **bor** doktorandů  
Petr's on take PhD students  
'Petr's recruitment of graduate students'
- b. Petr **na-** **br** **-a** **-l** doktorandy.  
Petr on take TH -PAST PhD students  
'Petr recruited graduate students.'

First, the nominal root (*bor-*) changes into a verbal root *br-* (the present tense shape *ber-* will be tackled later). Second, the prefix changes from the nominal allomorph *ná-* to the verbal allomorph *na-*, and this activates its aspectual value (recall from (16) that the noun is aspect-less). The final (third) change is the appearance of the thematic vowel.

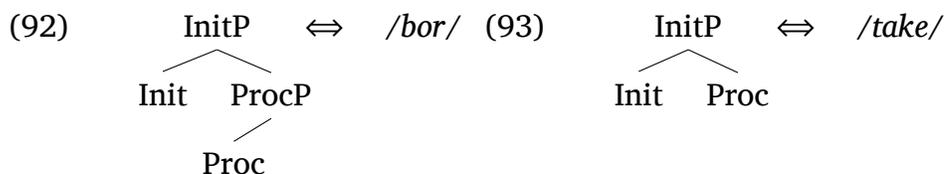
In order to address these issues (the prefix alternation in particular), we will need to introduce new derivational options offered by Nanosyntax. Specifically, we need to look into what happens when a feature F is merged and it actually cannot be spelled out at all, not even when all the options in the Spellout Algorithm (77) are tried. The idea suggested in Starke (2018)

is that if no spellout option works when F is introduced as a head (i.e., in a structure like (90)), then the feature F must be incorporated into a specifier, and the resulting FP is then added to the phrase marker instead of a single feature, see (91).



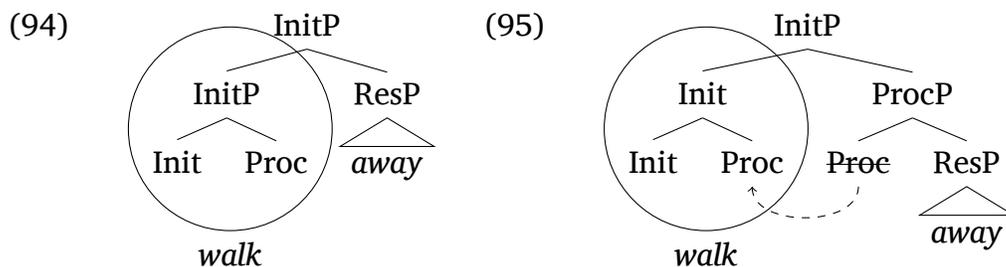
The two different ways of ‘providing F’ (namely (90) and (91)) are called ‘Merge F’ and ‘Merge XP’ respectively. Starke’s idea is that Merge F must be tried first, and only if it fails, Merge XP is tried.

In order to see an actual example of how such a system works, consider the derivation of the English phrase *take out*. This phrase differs from the corresponding Czech phrase in the order of the root and the particle. (In Czech the particle precedes the root, in English, it follows.) A classical Nanosyntactic analysis attributes this difference in order to the two derivational options: while English uses the ‘Merge XP’ option, Czech uses the Merge F option. In order to see why, let us compare the lexical entry that we are assuming for the Czech *bor* ‘take’ and for the English verb *take*. While the Czech verb has a lexical entry as in (92), English has an entry as in (93).



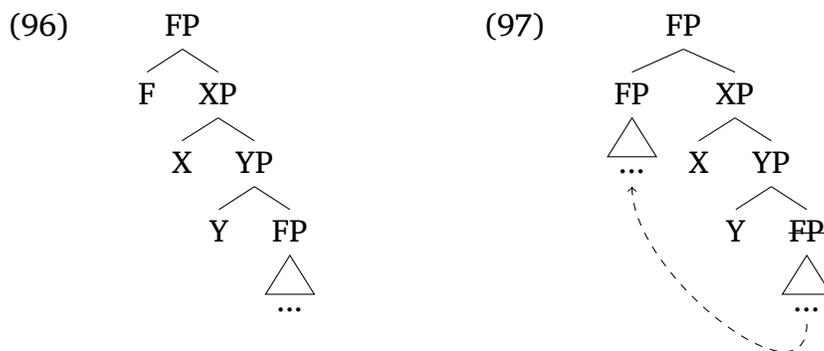
The English entry (93) will never be insertable in a configuration where Proc has a complement in syntax (i.e., ResP). That is because the entry cannot lexicalize such a structure. For this to be possible, the complement of Proc (i.e., ResP) would have to move out (as it does in Czech). But then when the complement moves out of ProcP, it leaves just a single feature Proc inside ProcP, such that Proc is dominated by a unary branching node, as in the Czech (92). However, the English entry has a different geometrical shape. Therefore, it can not apply to a structure where Proc has a complement.

As a result of English having the entry (93), the Merge F option fails in English. What must happen is that Init and Proc are merged in a separate derivational workspace, and only after they are assembled in a constituent, they are Merged (as a phrase) with ResP, see (94). This derivation is similar to a classical head-movement type of analysis, compare (94) and (95).

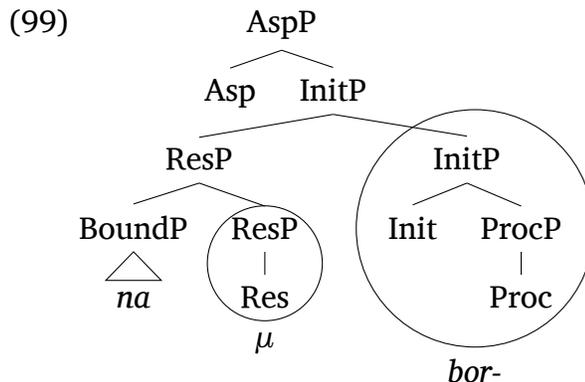
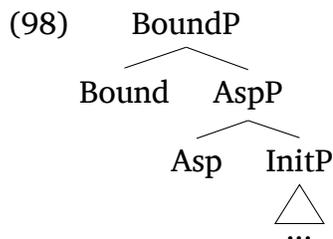


The final derivational option that has not been discussed yet, and which we shall need to drive prefix movement, is Move XP. This derivational option is explored in De Clercq (2019), who suggests that if Merge F fails, Move XP is tried before the Merge XP option. The ‘Move XP’ option consists in scanning the existing phrase marker for a phrase that contains the feature F (which had failed to spell out via the Merge F option).

We depict this in (96) and (97). The idea is that we first try Merge F, yielding a structure like (96). We follow all the steps of the Spellout Algorithm, but ultimately fail. Therefore, the existing phrase marker is scanned for a phrase containing F. If such a phrase is found (as it is in (97)), the phrase is attracted to the top of the phrase marker and ‘provides F’ as a label to the whole phrase. To repeat, the idea is that the derivational option of moving an XP is tried before Merge XP, i.e., before creating a wholly new XP of the same type.

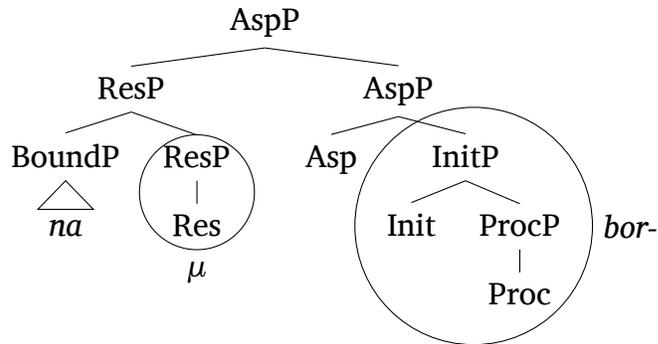


With all of this in place, let us now turn to the derivation of the Czech verb. The place where we left it was at the stage when Proc and Init were introduced, yielding a structure that (under our analysis) corresponds to the zero nominalization. When additional functional heads are added on top of the argument structure projections, a verb emerges. What we are suggesting is that above the argument structure projections, we find aspect. We shall pursue here an approach with two aspectual heads, Asp and Bound, see (98). The idea we follow is that if we add just Asp, we get the default imperfective aspect. When the aspect is perfective (delimited/bounded), we get the perfective aspect. The important thing here is that the boundedness of events (perfectivity) is linked to the same feature as the boundedness of Paths.



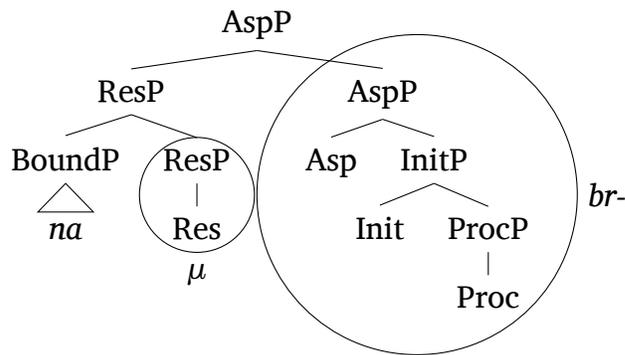
In (99), we apply this idea to the case of the noun *ná-bor* ‘recruitment’ (literally ‘on-take’). Specifically, we are continuing in a cyclic derivation, starting at InitP (whose spellout has been discussed in the previous section) and adding one head at a time. In (99), we are adding the Asp head. This structure cannot be spelled out ‘as is,’ and it will lead to movements. The first movement that must be tried according to the Spellout Algorithm is Spec movement (of ResP), yielding (100).

(100)



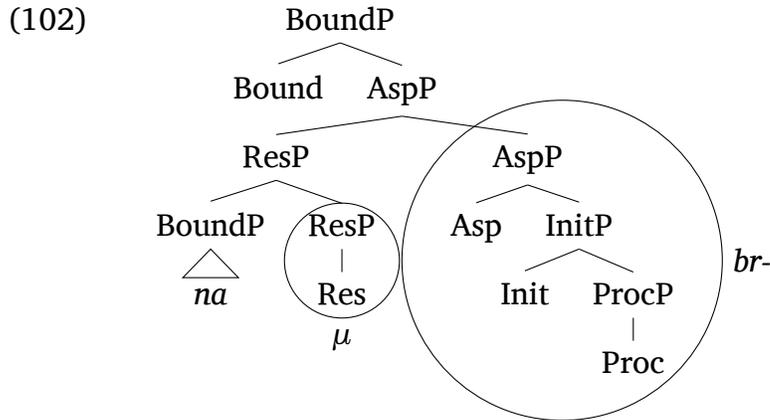
We shall work here under the hypothesis that this spellout option leads to a successful lexicalization by the root allomorph *br-*, yielding (101):

(101)

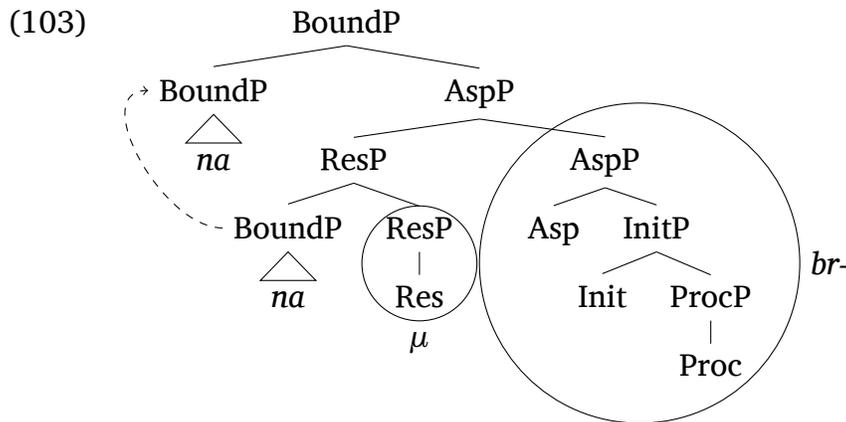


Note that at this point we have a structure that is no longer nominal; due to the presence of Asp, we are crossing into the realm of verbs (though the precise boundary is in part arbitrary). However, despite the fact that the root has taken on the verbal shape, the prefix is still long.

Let us now therefore consider how the prefix shortens. As we have highlighted above, perfectivity only arises when the perfective feature Bound is introduced on top of the imperfective structure (101), see (102).

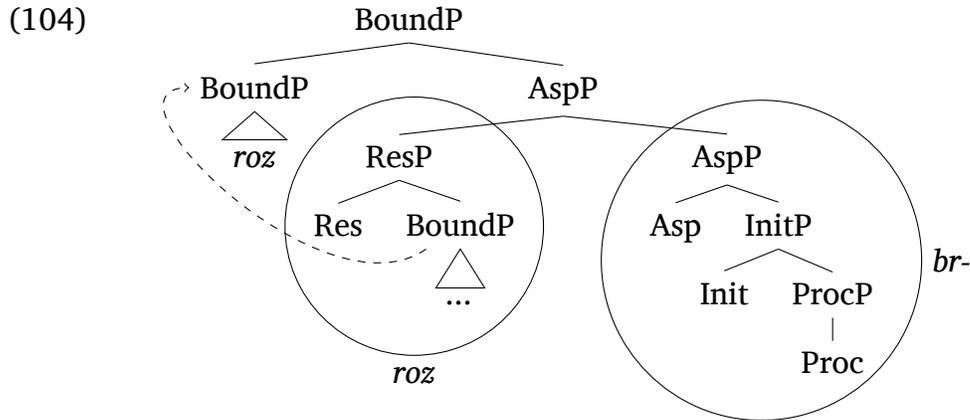


Ultimately, the derivation will lead to prefix shortening, which in Czech correlates with the structure becoming perfective. The way this happens is the following. First of all, we are assuming that there is no successful spellout for the Merge F option (there is no matching suffix spelling out the Bound feature). Therefore, once the spellout of (102) fails, the phrase marker is searched for a phrase that contains Bound, finding the prefix – and moving it up as in (103).<sup>7</sup>

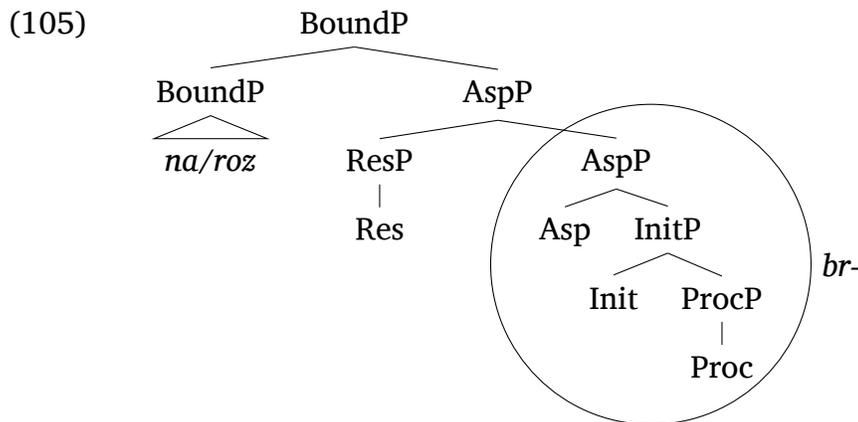


Crucially, the very same sub-extraction is going to take place also with non-alternating prefixes such as *roz-*. The interesting difference here is that *roz-* actually spells out the whole ResP, and so sub-extraction (as if disturbs the ‘lexical integrity’ of the prefix:

<sup>7</sup>This movement step is reminiscent of the Peeling derivations explored in Caha (2009, 2010), Medová & Wiland (2019).



After the sub-extraction, we get a structure that looks as in (105), with the ResP left behind in Spec,AspP due to the sub-extraction of the BoundP from within that ResP.



After sub-extraction, the stranded Res head must be spelled out anew. This is clear in the case of the prefix *roz*, see (104), where the leftover Res head clearly can no longer be spelled out by the prefix. Therefore, the previous lexicalization of ResP must be redone. In requiring re-lexicalization of the stranded Res, we follow the parallel to the Peeling derivations explored in Caha (2009, 2010). In that work, the ‘re-lexicalization’ requirement was phrased as a requirement that leftover peels must be spelled out, which is itself just an instantiation of the general principle that all features must be spelled out (cf. Fábregas 2007).<sup>8</sup>

<sup>8</sup>The spellout of the remnant ResP is going to succeed. On general grounds, we add to

We know that one possible way of spelling out Res is to spell it out agglutinatively by length (i.e., by the addition of an extra mora  $\mu$ ). Suppose that this would be the case. Such a scenario opens the possibility that the extra length will remain in the morphological structure, but it will not be realized on the prefix, because the extra mora no longer forms a constituent with the prefix. Rather, after the movement, the extra length forms a constituent with the verb root, see (105). Hence, we could expect to see cases where a root – which is short in the zero nominalization – becomes long in exactly those forms where the prefix becomes short. Interestingly there are potential candidates for such an alternation, see (106).

(106)

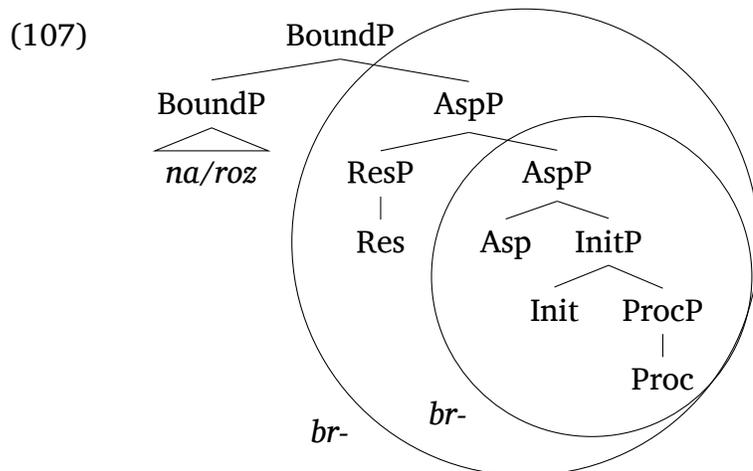
root	noun	verb
weigh	ú vah-a	u váž-i-l
burn	zá pal	za pál-i-l
target	zá měř	za míř-i-l
mix	pří měs	při mís-i-l
burden	pří těž	při tíž-i-l
buy	ná kup	na koup-i-l
extract	vý luh	vy louž-i-l
exclude	vý luk-a	vy louč-i-l
blow	vý fuk	vy fouk-a-l
bite	vý kus	vy kous-a-l
beat	vý prask	vy prásk-a-l
twitch	ú štěp	u štíp-a-l
tie	ú vaz	u váz-a-l
preach	pří kaz	při káz-a-l

We leave it open as to whether or not this interpretation is correct or not, because the main interest of our account centers around another possibility how to spell out Res, which is that Res is spelled out as a part of the verb root, as in (107). Whenever possible, this lexicalization is preferred over agglutinative spellout due to the fact that lexicalization of phrasal nodes (whenever possible) will override the previous lexicalizations at

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this that if it had failed, then the sub-extraction movement wouldn't take place. Instead, the derivation would move on to the Merge XP scenario.

lower nodes (Starke’s 2009 ‘Biggest Wins’ Theorem.).



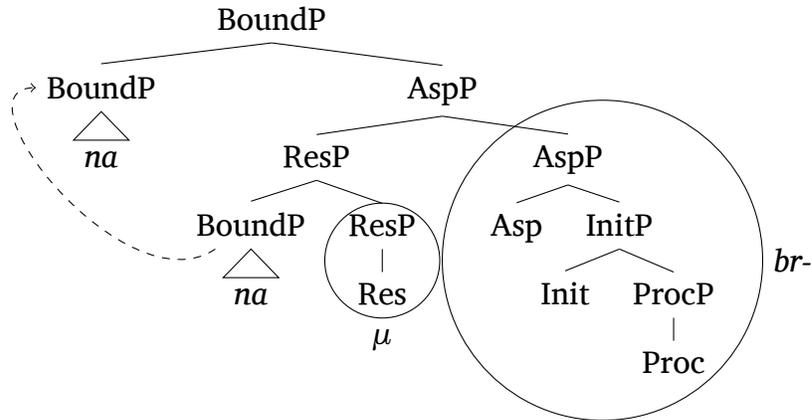
We believe that this phrasal-lexicalization option is what is correct for the root ‘take,’ as depicted in (107).

Before we explore the derivation further, let us make explicit one thing about the structure (107). In particular, we shall assume that the structure depicted there is the common core contained in various verbal forms, including the present tense (*na-ber-e/roze-berr-e*) and the past participle (*na-br-a-l/roze-br-al*). In the next section, we shall therefore look in detail at how the shape of the prefix is derived in (106), because ultimately, this is going to be the shape of the prefix that we shall see in both of these verbal forms.

## 9 Re-lexicalizing prefixes

Our ideas about the fate of prefixes split in two branches. The first kind of narrative pertains to length-alternating vowel-final prefixes. Their derivation is shown in (108).

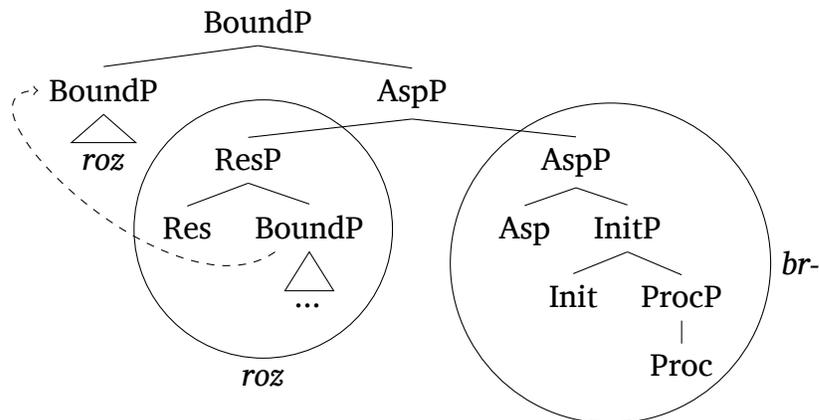
(108)



What we see here is that an alternating prefix like *na-* ‘on’ spells out exactly the same projection at the landing site as before movement. Therefore, there is nothing remarkable to be said about this prefix: the only interesting thing is what happens to the stranded Res head, and this is something that we have already covered in the previous section.

However, when the same movement targets a non-alternating prefix, an interesting thing happens, see (109).

(109)



In particular, what we are seeing here is that the sub-extraction step takes place from within a lexicalized constituent, thereby (as if) disturbing the lexical integrity of a prefix like *roz-*. The main idea that we shall pursue here is that as a result of disturbing the lexical integrity of the prefix, the sub-extracted BoundP has to be lexicalized afresh, and that this re-lexicalization happens in the landing position of the prefix (i.e., after

the movement).

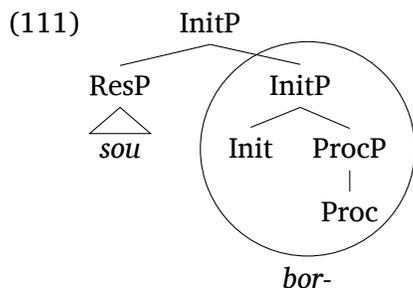
To see the clearest case in favor of proposing re-lexicalization for the sub-extracted BoundP, recall the fact that there exists a suppletive pair of prefixes, namely *sou-* vs. *s-* ‘together.’ This pair of prefixes gives rise to alternations like those in (110).

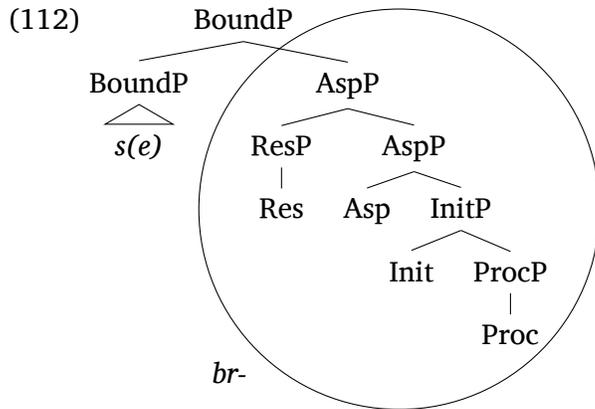
(110)

root	noun		verb	
take	sou	bor	se	br-a-l
write	sou	pis	se	ps-a-l
flow	sou	tok	s	ték-a-l
play	sou	hr-a	se	hr-á-l
tune	sou	lad	s	lad-i-l

Take a look, for instance, on the first line of this table. This line contains the well-known root ‘take.’ When we combine this root with *se-/sou* ‘together,’ we get the verb *se-br-a-l* ‘collected,’ and the noun *sou-bor* ‘collection.’ The root alternates in the way we now expect, but the alternation between *s(e)-* and *sou-* is irregular (suppletive). (There is no productive phonological process in Czech where  $\emptyset$  alternates with *ou*.)

Such a suppletive alternation fares well with the idea that if the sub-extraction of BoundP disturbs lexical integrity, the sub-extracted element in the landing site must be relexicalized. This clearly allows for the possibility that the sub-extracted constituent is spelled out by a completely different lexical item than the original ResP out of which we sub-extract. We depict the structure of the nominal *sou-bor* in (111), and the structure after sub-extraction in (112). In each structure, the lexical item inserted is different. Without assuming re-lexicalization, this would be difficult to capture.





Now notice that as a consequence of prefix re-lexicalization, the prefix *s(e)-* (which replaces *sou-* after movement) enters the picture at the stage of the derivation where the root has already changed its shape from *bor-* to *br-*. The latter root has a bogus cluster with an empty nucleus in between the consonants. As a result, we expect that the shape of the prefix will be *se-* (else we would have the sequence of two empty *\*sø-bør*). From the perspective of phonology, this is perfectly regular and expected.

Importantly, there is no expectation that the realization of the prefix *s(e)-* should be somehow sensitive to the shape of the root in the nominalization (*bor*). This is because there is never any stage in the derivation where *s(e)-* would be prefixed to *bor*. This is because at the stage when the root is *bor*, the prefixal structure is different, and its spellout is taken care of by an independent lexical item, namely *sou-*.

Similarly, we do not expect the shape *se-* before *bor*. The prefix that precedes *bor-* spells out ResP, and *se-* does not even qualify as a candidate to spell out such a constituent, since in the lexicon, *s(e)-* has the size of BoundP. So, there is no expectation that the grammar will somehow extend the shape of the verbal prefix into the nominalization on the grounds of ‘paradigm uniformity.’

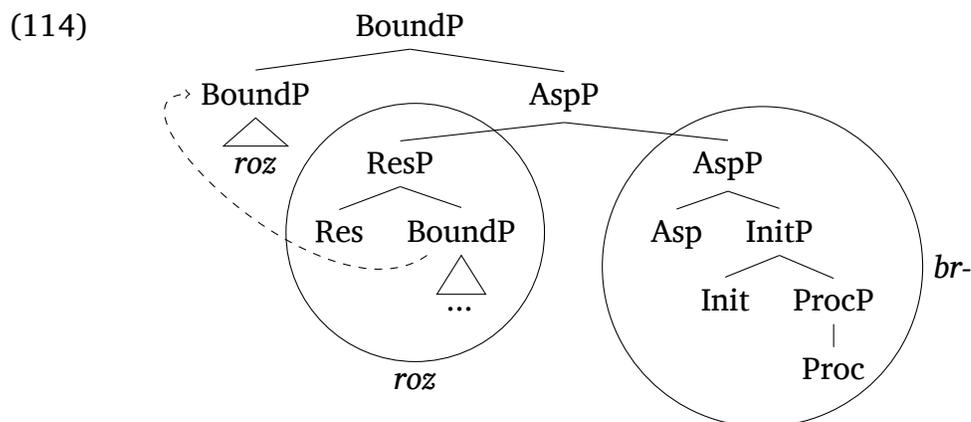
Let us now explore the consequences of this view for the class of non-alternating C-final prefixes like *roz(e)-* ‘apart.’ The concrete example we are trying to explain is as given in (113), repeated from (73).

- (113) a. Petr **roze- br -a -l** situci.  
 Petr apart take TH -PAST situation  
 ‘Petr analyzed the situation.’

- b. Petr **roze-ber -e** situaci.  
Petr apart take PRES situation  
'Petr will analyze the situation.'
- c. Petrův **roz -bor** situace  
Petr's apart take situation.GEN  
'Petr's analysis of the situation'

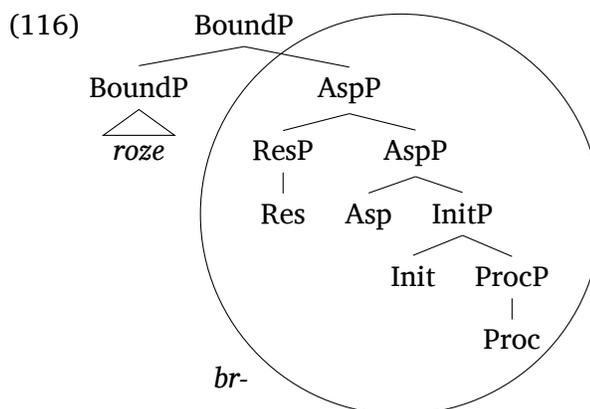
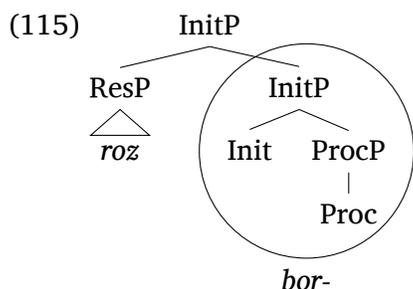
The main puzzling thing here is that the prefix ends with a vowel in (113b), where there does not seem to be any reasons for this. Hence, we observe here a type of a 'paradigm-uniformity' effect such that the vowel in (113b) is only needed, because the root has a shape with no vowel elsewhere in the paradigm, i.e., in (113a). However, the challenge is to make the theory subtle enough in a way that we get such a paradigm effect in (113b), but not in (113c).

We believe that these facts can be captured under the idea of re-lexicalization as described above. In order to see that, let us take a look again at the structure (114), repeated from (109)



What we see here is that sub-extraction with prefixes such as *roz(e)-* disturbs lexical integrity, and therefore, that the sub-extracted BoundP must undergo re-lexicalization on the landing site. We propose that the need for re-lexicalization is what is responsible for the alternation between *roz-bor* and *roze-br-a-l*. In particular, when we create the nominal structure for *roz-bor* (which is structurally smallest and therefore derivationally prior), we insert the prefix as the lexicalization of a ResP. At this point, the prefix attaches to the nominal root *bor*. As a result, the prefix is realized without

the vowel: *roz-bor*, see (115).



However, when BoundP sub-extracts from within the prefix, we must re-lexicalize the structure, and the prefix is inserted afresh: this time, however, it attaches to a different root, hence, *roze-bør-* (*\*rozø-bør*). The fact that the prefix undergoes re-lexicalization prevents any influence between the two prefix shapes; they are completely independent of each other and each of them reflects the phonology of the environment in which it gets inserted.

For what is going to follow, let us make explicit one assumption. Namely, we assume that whenever lexicalization succeeds, there is a round of phonological computation which runs over the sequence of morphemes that spell out the relevant constituent. In our case, this is the sequence PREF-ROOT. When we run phonological computation over the string *rozø-bør-*, prefix vocalization applies and we get *roze-br-* at this point. The empty nucleus at the right edge of the prefix is filled (associated to melody), and from now on, the *e* will behave like any run-of-the-mill vowel (because that is what vowels are: nuclei associated to melody).

As a result, for as long as the prefix spells out the same constituent – namely BoundP – it will keep the shape *roze-*. The reason for this is not that there will be no further cycles of phonological computation that would involve the prefix and the root (there will be such cycles). However, in all these cycles, the prefix will behave as a unit that has a regular vowel at its right edge, and so the shape will only change if there was some phonological rule that would delete this vowel. Alternatively, the shape of the prefix could also change if there was another sub-extraction from

within the BoundP; but barring any such event (vowel-deletion or sub-extraction), the shape *roze-* will be preserved.

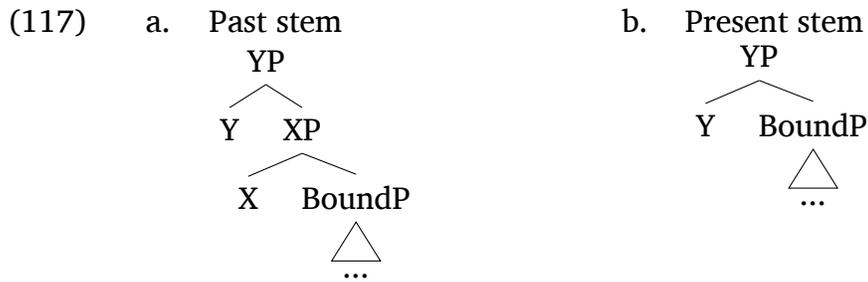
The alternative (that there is no such cyclic phonological computation) would also be compatible with the facts so far, but it would just have two disconnected pieces: the prefix *rozø-* and the root *bør-*. Each of them would contain just a single empty nucleus, and there would be no reason for prefix vocalization as yet. In this latter scenario, prefix vocalization could still happen at some later point. For example, we could wait with prefix vocalization until the whole word *rozø-bør-a-l* is derived, and only then considering the issue of whether the form has two consecutive empty nuclei (or not). That would actually give a good result in the case of *rozø-bør-a-l*. However, this view would fail to capture the paradigm uniformity effect in the form *roze-ber-e*, where there is no need to realize the vowel inside the prefix if prefix vocalization would be determined at the end of the whole derivation. Therefore, we shall now proceed under the assumption that at the point when (116) is derived, the prefix obtains the shape *roze-*, and that it keeps this shape unless some process would require otherwise.

## 10 Capturing the paradigm-uniformity effect

Let us now finally turn to the derivation of the present tense *roze-ber-e*, where the vowel of the prefix is ‘phonologically unjustified’ in that it appears before a CVC root. Our idea (as just described) is that this is an effect of a derivational history; the prefix has a vowel in *roze-ber-e*, because the prefix has obtained this vowel at a prior stage of the derivation, namely when the root had no vowel, as in (116).

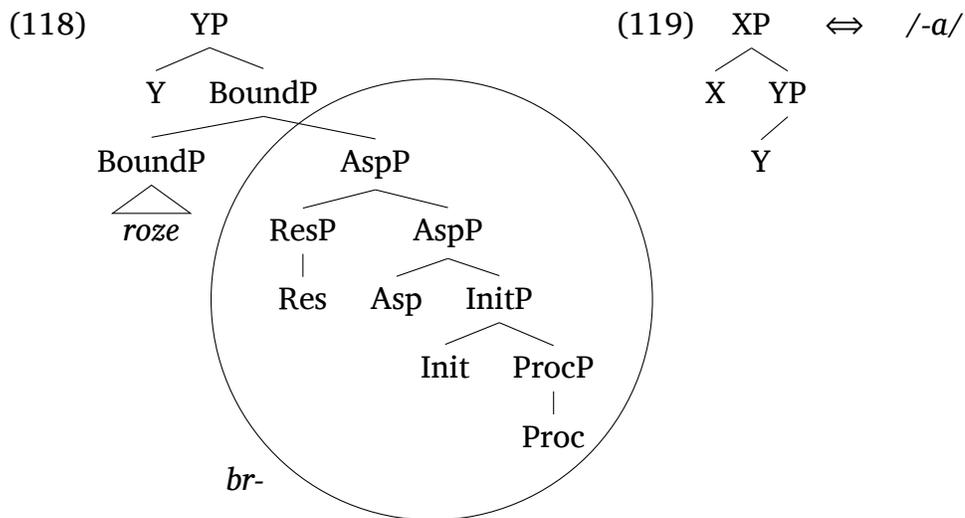
In order to see how this works, let us first mention the fact that the root *ber-* appears in three types of forms, namely in the present tense, in the imperative, and in the present participle. In Czech grammars, these three forms are standardly grouped together as forms that are formed on the basis of the so-called ‘present stem.’ In contrast, the root *br-* appears in the infinitive, in the passive participle and in the past participle (which appears in the past tense and also in the conditional). These latter forms are usually grouped together in traditional grammars as forms based on the ‘past’ stem.

What we are going to assume – though much more investigation is needed – is that the present and past tense differ as shown in (117):

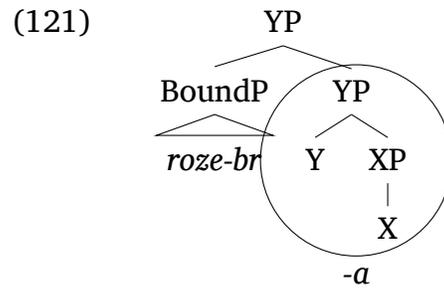
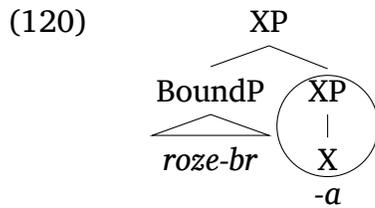


What this picture amounts to is the idea that both the present and the past stem are built on top of a common base, that corresponds to the BoundP in the case of prefixed verbs (and to AspP in the case of unprefixed verbs, though this is not shown in (117)). Another assumption depicted in (117) is that the past stem has an extra feature (X) that is missing in the present stem, which only has the feature Y. One could speculate that the missing head is some kind of a ‘low past tense,’ as it resides around the region where Rizzi & Cinque (2016:150) place an anterior tense head.

Let us now go through the derivations of the past and the present stem respectively. The derivation of the past stem begins by merging the feature X, see (118).

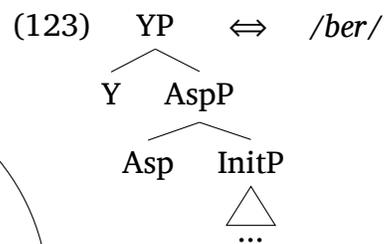
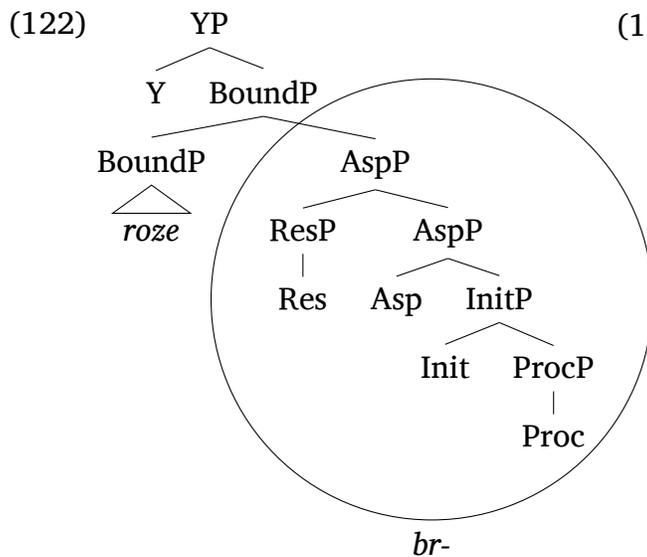


We assume that the theme vowel *-a* (characteristic for the past stem) spells out this head. Its lexical entry is as in (119). This thematic vowel is inserted once its complement undergoes complement movement, as in (120).



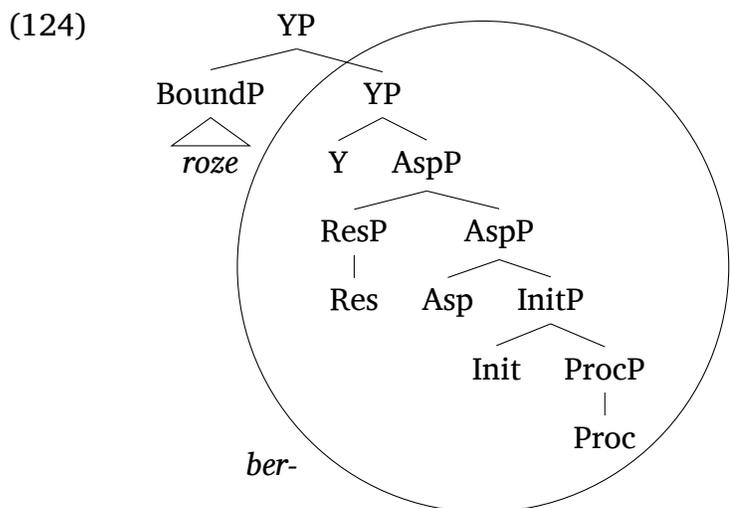
When Y is added, BoundP moves still higher up, forming the past stem *roze-br-a* as in (121). There are no tricky issues here.

The derivation of the present stem *ber* is more interesting. Unlike in (118), we are directly merging the feature Y, leaving out X. This gives us the picture in (122).



What we are assuming is that the feature Y is realized as a part of the present stem *ber-*, which is therefore lexically specified for the whole YP, as in (123). This idea leads to the following derivation. Specifically, when Y is added on top of BoundP in (122), spellout fails. According to the Spellout algorithm (77), the first rescue movement to be tried is Spec movement. If we moved the Spec in (122) (and ignored its trace as usual), this gives us the tree in (124). In this tree, the present-tense root *ber-* can

apply to the YP, as indicated by the circle in (124).<sup>9</sup>



In (124) a new root is inserted. This root contains a vowel. This vowel could potentially influence the shape of the prefix, but we know that in reality it does not. This can be explained as a result of the idea (which we described at the end of the preceding section) that when the prefix got first inserted as BoundP – which happened when it is sister to the root *br-* – there was a cycle of phonological computation, which lead to vocalization: the allomorph *roze-* was derived. In subsequent movement steps, such as the one in (124), the prefix keeps spelling out the same constituent, and so it keeps the same shape, namely *roze-*.

This does not entail that there is no cycle of phonological computation over the string derived in (124), i.e., *roze-ber*. However, there is no rule that would require the deletion of the vowel at the right edge of the prefix, and so the vowel stays. Therefore, the data is compatible with the idea that phonological computation applies at every cycle of insertion.

The form *roze-ber* is, however, incompatible with the idea that prefix

<sup>9</sup>The reader who has read up to here will notice that the Spec movement is non-standard. That is because we are moving a projecting Spec, unlike in the previous derivations, where we were moving non-projecting Specs. There is currently an ongoing research into whether such a derivation should be available (quite likely not). However, there are some alternative suggestions how such derivations may proceed other than by Spec movement, an issue discussed for instance in Kloudová (2020). What we want to convey here is the intuition; the question of the precise implementation is left for some future occasion.

vocalization only happens at the stage (124) (or some later stage). If there were no prior cycles of phonological computation preceding (124), we would at this point have the string *rozø-ber-*, where prefix vocalization is unjustified. Therefore, the facts do not seem to be compatible with such a view.

## 11 Conclusions

In this paper, it was our goal to explain two kinds of prefix alternations: a vowel length alternation and a vowel~Ø alternation. These are usually seen as disconnected; however, we have argued that for a particular set of roots, they show the same type of distribution. This distribution is not phonological, and cares about whether the prefix is a part of a verbal form or a part of a zero-derived noun (and related forms). A unified explanation of these two alternations (i.e., for the cases where they overlap) is therefore called for.

In order to provide this explanation, we have explored a detailed morphosyntactic analysis of the relevant prefixes, addressing their relationship to regular prepositions and intransitive prepositions, while also addressing the morphological distinction between nominal and verbal prefixes. Along the way, we have proposed an interesting type of a \*ABA constraint that seems to restrict the various shapes of adposition-like elements.

In the final part of the paper, we have laid our assumptions about the derivation of the relevant nominal and verbal forms, addressing both the issue of root and prefix allomorphy. We have proposed that nominal prefixes are structurally largest, and differ from verbal prefixes in that they spell out the Res feature. As such, they combine with roots that spell out the related argument structure projections Proc and Init. If no additional projections are added, we get a zero-derived noun with a nominal (ResP-sized) prefix.

Once aspectual information is added, the movement of BoundP from within ResP is triggered, leading to the stranding of Res. With prefixes where Res is realized as length, this leads to prefix shortening. With C-final prefixes that generally do not alternate (spelling out the whole ResP as one piece), this movement disturbs the lexical integrity of the prefix and leads to re-lexicalization. Due to re-lexicalization, this type of prefix movement is not subject to ‘paradigm-uniformity’ effects, thereby deriving

the observation that C-final prefixes in nominalizations only care about the specific shape of the noun root, and prefixes in verbs only care about the shape of the root in verbs.

Finally, in order to account for ‘paradigm-uniformity’ effects within the verbal paradigm, we have proposed that after every round of successful spellout (and most relevantly after the step of prefix movement), there is a round of phonological computation that decides if the prefix is realized with a vowel or not. During this derivational stage, the prefix may obtain a vowel that is subsequently retained even if the root ultimately ends up with a vowel of its own, giving rise to paradigm-uniformity effects within the verbal paradigm.

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