

RESEARCH

How to be positive

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In this paper, we discuss a cross-linguistically rare pattern of comparative formation found in Slovak. This pattern is theoretically interesting, because it violates a candidate universal on the relationship between the positive and the comparative degree. The universal, discussed in Grano & Davis (2018), says that the comparative is always either identical to, or derived from, the positive degree. This universal is violated by a number of adjectives in Slovak. These adjectives have a suffix *-k* in the positive degree, which is absent in the comparative. We capture this pattern in terms of a non-containment structure of the positive and the comparative degrees and the nanosyntax model of spellout (Starke 2009 et seq.).

Keywords: adjectives; gradability; positive; comparative; containment

1 Introduction

We start by presenting some background on comparatives in Slovak. Consider first the data in (1):¹

(1)	POSITIVE	COMPARATIVE	
	star-ý	star- š-í	‘old’
	múdr-y	múdr-ejš-í	‘wise’
	sliz-k-ý	sliz-k-ejš-í	‘slim-y’

The first thing to note is that all the forms can be segmented into an adjectival base followed by an agreement marker (*-y/-ý* in the positive and *-í* in the comparative).² We are setting these agreement markers aside in our analysis, since the main focus of our paper rests on how the comparative is formed. In the table (1), the comparative is always formed by taking the positive degree (minus agreement) and suffixing it with *(ej)š* (followed again by agreement). The comparative marker shows an allomorphy between the markers *š* and *ejš*, which we shall disregard for now.³

¹ Accents over vowels indicate length. Wedges over consonants indicate palatalisation. For instance, *š* is IPA ʃ , *ž* (to be encountered later) is IPA ʒ . The difference between orthographic *i* and *y* in the agreement ending represents the difference between soft and hard declension.

² The agreement marker tracks the number, gender and case of the head noun. All tables show masculine singular nominative forms.

³ Traditional grammars describe this allomorphy as phonologically governed. The long allomorph (*ejš*) appears after consonant clusters and after sibilants, the short one (*š*) elsewhere (Dvonč et al. 1966: 210–12). We adopt this analysis here, but we do not rule out the possibility that there may be a morphosyntactic principle underlying the distribution of these allomorphs, as is the case in Czech (Caha et al. 2019).

It will become highly relevant that the same procedure is observed also by adjectives that are morphologically complex in the positive degree. An example of such an adjective is on the bottom line of (1). The adjective consists of a root, followed by a suffix *-k*, followed by the agreement marker. We shall refer to this marker *-k* as an *augment*. In the adjective *sliz-k-ý* ‘slimy,’ the augment is preserved in the comparative, giving rise to *sliz-k-ejš-í* ‘slimier.’ We label such a pattern of comparative formation the CONTAINMENT pattern, because of the fact that the positive degree is used as the basis to which the comparative marker *-(ej)š* attaches.

Against this background, consider the fact that adjectives with augments sometimes show a different pattern of comparative formation, given on the bottom line of the table below:

(2)	POSITIVE	COMPARATIVE		
	star-ý	star-š-í	‘old’	CONTAINMENT
	múdr-y	múdr-ejš-í	‘wise’	
	sliz-k-ý	sliz-k-ejš-í	‘slim-y’	
	ťaž-k-ý	ťaž-š-í	‘heav-y’	TRUNCATION

What we see here is that for the adjective *ťaž-k-ý* ‘heavy,’ the augment must be dropped before the comparative marker. The expected form **ťaž-k-ejš-í* is ungrammatical. We call this the TRUNCATION pattern: the comparative contains something which is less than the form of the positive degree, even when discounting the agreement marker.

The broader relevance of these data is linked to the truncation pattern in particular, because it contradicts a candidate universal proposed by Grano & Davis (2018: 133).

(3) *Candidate Universal*

Universally, the comparative form of a gradable adjective is derived from or identical to its positive form.⁴

The way Grano & Davis (2018) understand this universal is to explicitly rule out a situation like the one found with the Slovak adjectives of the *ťaž-k-ý* ‘heavy’ class. As they put it, ‘it should [...] be impossible to find a language in which both the positive and comparative forms are independently derived from a common base’ (their pattern D; Grano & Davis 2018: 134). This is exactly what happens with *ťaž-k-ý* ‘heavy’, where the common base is the root *ťaž-*, to which the positive adds the suffix *-k*, whereas the comparative adds *-š*, both followed by an agreement marker.

Summarising the pattern illustrated by the adjectives in (2) schematically, we can distinguish the following three classes:

(4)	root	POS	CMPR
	old	—	—
	heav-y	AUG	—
	slim-y	AUG	AUG

The adjectives of the *old* class have no augment, either in the positive or the comparative. The *heavy* class adjectives have an augment in the positive, but lose it in the compara-

⁴ It is not clear to us what Grano & Davis (2018) think about cases of suppletion like *good-bett-er*, which do not seem to be covered by their universal. We suspect that they implicitly disregard suppletion, i.e., that their universal only applies to cases of regular comparative formation. We discuss root suppletion in Slovak in section 7.

tive. The adjectives of the *slimy* class, finally, have an augment both in the positive and the comparative.

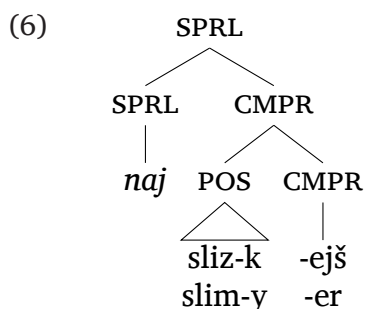
In what follows, we develop an analysis for this pattern and its distribution in the Slovak adjective system. In section 2 we discuss the problem from the perspective of the relation between morphological and structural containment, and present a global outline of the analysis. In section 3 we present a detailed empirical overview of the Slovak evidence. Section 4 considers the question whether the distribution of *-k* in the positive and comparative can be reduced to independently established semantic or phonological properties of the relevant roots. Section 5 provides our hypothesis concerning the morphosyntactic structure of the positive and the comparative. Building on these structures, Section 6 gives a fully formal and algorithmic treatment of the patterns within nanosyntax. Section 7 discusses the relationship between the relevant patterns and suppletion with special reference to Bobaljik (2012). Section 8 addresses some issues concerning the meaning of the positive and the comparative heads in the proposed framework.

2 Morphological and structural containment

There is a nontrivial relationship between structural and morphological containment. For example, Bobaljik (2012) has argued at length that the structure of the superlative universally contains the structure of the comparative. Supporting evidence for this claim is that there are languages where the structural containment is reflected in morphological containment as well. A case in point is again Slovak, where the superlative is formed by prefixing the comparative form with *naj*-. This is shown in (5) for the four adjectives discussed earlier in (2), with a Bobaljik-style structure in (6).

(5)

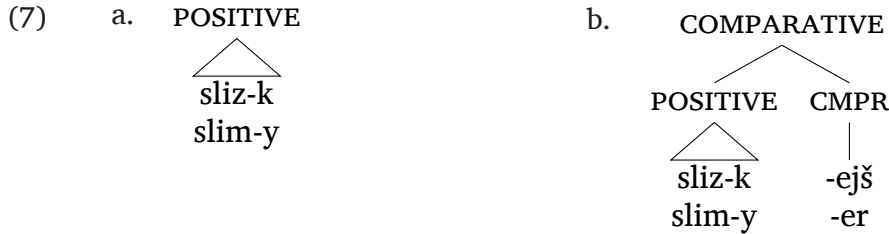
CMPR	SPRL	
star-š-í	naj-star-š-í	‘old’
múdr-ejš-í	naj-múdr-ejš-í	‘wise’
sliz-k-ejš-í	naj-sliz-k-ejš-í	‘slimy’
ťaž-š-í	naj-ťaž-š-í	‘heavy’



Yet at the same time, not all languages reflect this structural containment relationship in terms of morphological containment, whereby the superlative is formed by adding a morpheme to the comparative. In English, for example, a superlative like *short-est* does not contain the comparative form *short-er*. In such languages, as Bobaljik suggests, the superlative marker (*-est*) either pronounces both CMPR and SPRL as a portmanteau marker, or CMPR is silent in the context of SPRL.

Our concern here is the structural relationship between the positive and the comparative, and what the Slovak data can tell us about it. Bobaljik does not put forth an explicit argument to the effect that the structure of the comparative contains the structure of the positive, but he understands that to be the null assumption (see Bobaljik 2012: 32, ex. (37)). If that is indeed the case, we have no trouble whatsoever explaining the containment

pattern using the structures that Bobaljik proposes. In (7a), the positive is taken to have a certain structure, and the comparative structure is derived by merging a comparative head on top of this structure (as shown in (7b)). The containment pattern, illustrated here by the adjective *slim-y-er*, is straightforwardly predicted by such structures.



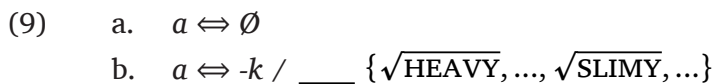
However, if we put a truncation-class adjective in the same structure, we inevitably end up with a wrong result, as shown in (8b).



The containment structure leads us to expect the form in (8b), which is, however, ungrammatical, the correct comparative form being *ťaž-š-í* ‘heavier’, without the augment. The conclusion we come to is that in order to account for the truncation pattern, we need to say something special.

One logical option would be to pursue an analogy to the analysis of *-est* and say that the Slovak comparative marker is a portmanteau for CMPR and *-k*. However, in Slovak, this analysis is implausible. Specifically, in English, *-er* never precedes *-est*: this is because *-est* spells out *-er* plus SPRL. In Slovak, this is different. Specifically, in the containment class, *-k* does precede the comparative marker. This makes it obvious that the comparative marker does not spell out *-k*, and hence, the disappearance of *-k* in the truncation class must have some other reason.

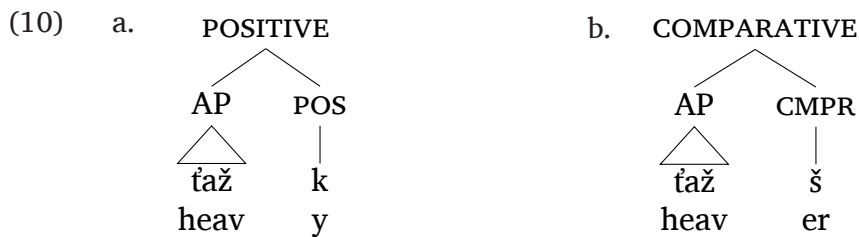
Another strategy would be to rely on context-sensitive rules. A possible analysis of the augment using this type of device is depicted below:



What the rules say is that there is a particular functional head in the extended projection of all Slovak adjectives, which is called little *a* in (9). This head is generally left unexpressed (see (9a)), but receives an overt realisation (as *-k*) in the context of the roots which actually have *-k* in the positive (this is what (9b) says).

The challenge for such rules is how one should distinguish between the containment and the truncation class. In particular, in order to achieve the disappearance of the augment *-k* with the truncating adjectives in the comparative, the rule in (9b) will somehow have to be deactivated for the roots of the ‘heavy’ class in the context of a higher CMPR head. While this can certainly be achieved (e.g., by a rule of impoverishment, or an additional zero exponent), we do not find such a style of solution attractive.

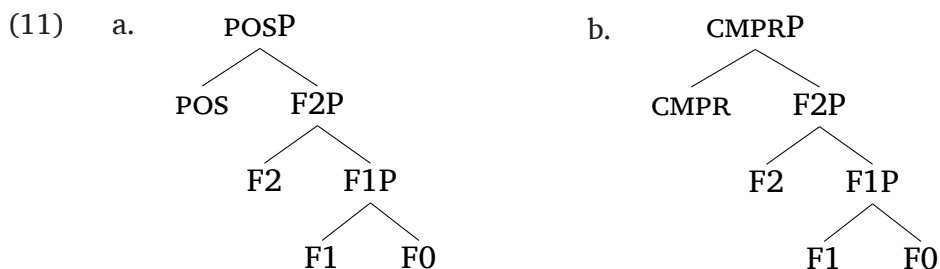
We will therefore explore here an alternative which derives the existence of the Slovak truncation pattern from a particular type of structure. The specific type of approach we propose here is given in (10), and it relies on non-containment structures. These assume a decomposition of the positive degree into two parts (each potentially complex): an adjectival base (called AP for now) and a head POS, as shown in (10a). POS is a label that does not necessarily designate a specific head (we shall in fact change the label later on); its goal for now is simply to say that the positive degree has some structure that is not a part of the base to which the comparative attaches, see (10b).



We will call the structures *symmetric* because the two degrees share a common base (AP), and each develop this base in a different direction. These different directions are labelled POS and CMPR for now. They may each correspond to a single head, but they may each correspond to a series of heads. We make a specific proposal about this in section 5.⁵

It is easy to see that these structures straightforwardly handle the truncation pattern. The augment is dropped in the comparative, because the POS head, which dominates the augment, is absent in the comparative.

However, it seems harder to deal with the containment pattern. With nothing else said, the augment should *always* be absent in the comparative. To handle containment, we need two additional proposals. The first one is a further decomposition of the AP. Specifically, we argue that the AP given in (10) decomposes into three projections, which (for now) we label simply F0, F1, and F2; as we shall show in section 5, these features correspond to independently needed ingredients of gradable adjectives. Combining this decomposition of the AP with the idea of a symmetric relationship between the degrees, we end up with the hierarchies in (11) as the more refined version of the structures in (10) (ordering aside).



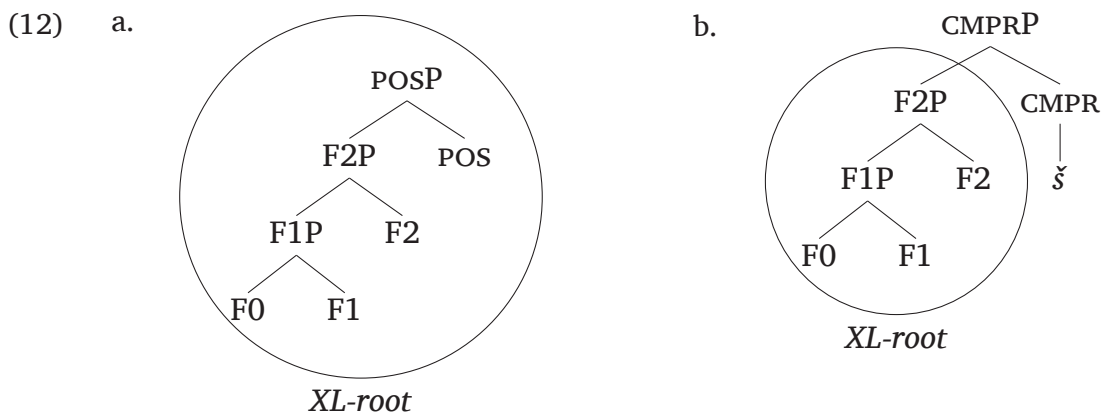
The second thing we need is phrasal spellout (Starke 2009). According to this proposal, roots as well as affixes may spell out phrasal constituents containing multiple heads. For example, an adjective that has no augment in the positive degree will be able to spell

⁵ An anonymous reviewer points out that these structures recall the proposal that there is a single DEG head in the projection line of the adjective, whose value is either positive or comparative (see, e.g., Corver 1997). This is certainly one way our proposal can be interpreted. However, we explore a different avenue in section 5.

out the full POSP in (11a) with all the heads it contains. This is an analytical option which, in a phrasal spellout model, replaces the traditional idea that POS is pronounced by a null marker, or that POS corresponds to a type-shifting rule (Neeleman et al. 2004; Kennedy 2007).

In this setting, the specific factor controlling the appearance and the disappearance of the augment is going to be *variable root size* (cf. Caha et al. 2019). This means that different roots can be associated to different sizes of structure in the decomposed AP, because of the arbitrary nature of lexical storage.

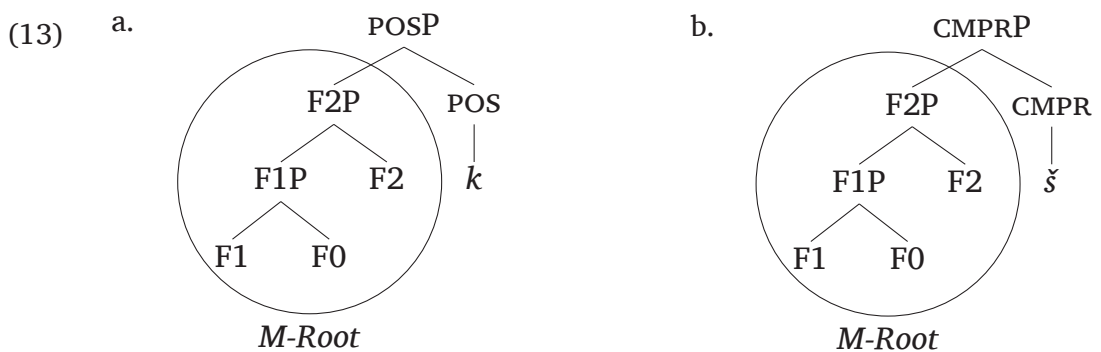
Specifically, in order to capture the three classes of adjectives in Table (4), we will distinguish three classes of roots that will differ by the number of heads they are able to spell out. Extra Large roots (henceforth XL-roots) are those of the *old* class: their lexical entry includes the complete structure of the positive degree, as shown in (12a). The circle represents the structure that the XL-root realises.



In the comparative (12b), the XL-root lexicalises the F2P. This structure corresponds to a subtree of its lexical entry, which is the full POSP. The possibility to spell out also proper subparts of the full lexical specification follows from an insertion principle that we shall adopt, namely the Superset Principle (Starke 2009). We will introduce this principle in much greater detail in section 6.

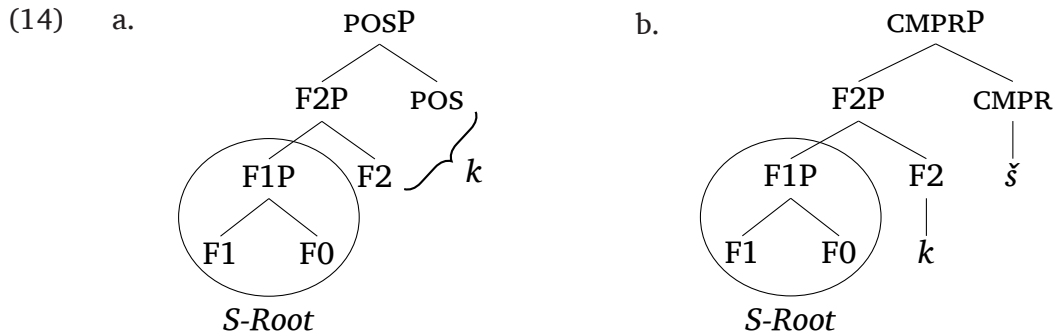
Since XL-roots are big, they do not need an augment, neither in the positive, nor in the comparative. These roots therefore give rise to a containment pattern without any augment.

Medium-sized roots (M-roots) are those of the *heavy* class, which featured the problematic truncation pattern in the comparative. Their lexical entry differs from XL-roots in that it lacks the POS head, i.e. their size corresponds to the F2P node. This means that they will not be able to spell out the POS head, and they will therefore need the augment in the positive to spell out POS, see (13a).



There is no need for an augment in the comparative, because the comparative does not include POS; the comparative marker will appear directly on top of the root spelling out F2P. This results in the truncation pattern.

Finally, adjectives of the *slimy* class have Small roots (S-roots). Their lexical entry corresponds to F1P, as shown in (14). In the positive (14a), F2 and POS will need lexicalisation, and this will be done by the augment.⁶



In the comparative (14b), the root alone is likewise insufficient to realise all the features. While the CMPR head is lexicalised by the comparative marker *-š*, and the root realises F1P, this still leaves F2 in need of lexicalisation. Because of this, *-k* is found also in the comparative with these roots. Therefore, S-roots exhibit a containment pattern, with an augment both in the positive and the comparative.

3 The Slovak data

This section discusses the Slovak patterns in more detail. We focus here in particular on those Slovak adjectives that have an augment in the positive degree. As we intend to show, they fall into two subclasses: one drops the augment in the comparative, giving rise to the truncation pattern, whereas the other keeps it, showing the containment pattern. We argue that the distinction between the truncation class and the containment class is an arbitrary property of the root. We do so by showing that the bifurcation cannot be captured by other (phonological, morphological or semantic) means.

To demonstrate this, we give here an exhaustive record of adjectives with the augment *-k* in the positive. Those that show truncation are shown in Table 1, while Table 2 lists those that follow the containment pattern. We shall introduce the tables in turn.⁷

The first column of both tables lists the positive degree, segmented into the root and the augment *-k*. That *-k* is indeed an independent morpheme (in both classes) can be demonstrated using diminutive adjectives. The diminutive forms are in the second column. They (usually) convey a positive attitude towards the addressee or the object with the relevant property. One example of their use would be parent-child interactions.

What is relevant for us is that the various diminutive markers *-un/-uč/-ulin* attach directly after the root (not after *-k*). This shows that the augment is a morpheme separate from the root (to which *-un* attaches). Not all adjectives have such a diminutive version;

⁶ To this end, F2 and POS need to form a constituent. How this happens is a matter that we address in section 6. We shall also argue that with M-roots in the positive, *-k* in fact spells out both F2 and POS. This issue is immaterial to the argument being made here.

⁷ The source of the positive/comparative forms is the Slovak Academy of Science webpage <http://slovníky.juls.savba.sk>, where the most authoritative dictionaries of the language are available in an electronically searchable format. The diminutive adjectives listed in the table are the ones we found in the Slovak National Corpus (<https://korpus.sk>). Since we consider it unlikely that the corpus contains all the possible diminutives, the gaps in the table should not necessarily be taken to indicate the absence of the diminutive forms.

Table 1: Slovak complex adjectives which drop *-k* in the comparative.

POSITIVE			DIMINUTIVE				COMPARATIVE			gloss
root	AUG	AGR	root	DIMIN	AUG	AGR	root	CMPR	AGR	
ľah	k	ý	ľah	un	k	ý	ľah	š	í	‘light’
mäk	k	ý	mäk	un	k	ý	mäk	š	í	‘soft’
ten	k	ý	ten	un	k	ý	ten	š	í	‘thin’
blíz	k	y	bliz	un	k	ý	bliž	š	í	‘close’
úz	k	y	uz	un	k	ý	už	š	í	‘narrow’
níz	k	y	niz	un	k	ý	niž	š	í	‘low’
krát	k	y	krat	un	k	ý	krat	š	í	‘short’
hlad	k	ý	hlad	un	k	ý	hlad	š	í	‘smooth’
slad	k	ý	slad	un	k	ý	slad	š	í	‘sweet’
vlh	k	ý	vlh	uč	k	ý	vlh	š	í	‘wet’
ried	k	y	ried	ulin	k	ý	red	š	í	‘thin’
ťaž	k	ý					ťaž	š	í	‘heavy’
krot	k	ý					krot	š	í	‘tame’
prud	k	ý					prud	š	í	‘steep’

Table 2: Slovak complex adjectives which keep *-k* in the comparative.

POSITIVE			DIMINUTIVE				COMPARATIVE				gloss
root	AUG	AGR	root	DIMIN	AUG	AGR	root	AUG	CMPR	AGR	
heb	k	ý	heb	un	k	ý	heb	k	ejš	í	‘smooth’
sliz	k	ý	sliz	un	k	ý	sliz	k	ejš	í	‘slimy’
kreh	k	ý	kreh	un	k	ý	kreh	k	ejš	í	‘fragile’
brit	k	ý					brit	k	ejš	iacute;	‘scathing’
hor	k	ý					hor	k	ejš	í	‘bitter’
hyb	k	ý					hyb	k	ejš	í	‘nimble’
krep	k	ý					krep	k	ejš	í	‘energetic’
mrz	k	ý					mrz	k	ejš	í	‘ugly’
trp	k	ý					trp	k	ejš	í	‘bitter’
syp	k	ý					syp	k	ejš	í	‘loose’
váz	k	ý					váz	k	ejš	í	‘sticky’
vrt	k	ý					vrt	k	ejš	í	‘nimble’
vlh	k	ý	vlh	uč	k	ý	vlh	k	ejš	í	‘wet’ ⁹

but crucially, in all cases where a diminutive adjective exists, the diminutive marker comes directly after the root.⁸

Let us now turn to the containment class in Table 2.

⁸ Note that in Table 1, we consider the *-k* that follows the various diminutive markers *-un/-uč/-ulin* to be the very same augment that is found with the non-diminutive adjective. This is not crucial for our point: the two *-ks* could also each be a different morpheme, and this would not affect our argument here. The only important thing at this point is that the non-diminutive adjectives in Table 1 are morphologically complex. We return to the derivation of the diminutive adjectives in section 6.4.

⁹ Observe that the adjective *vlh-k-ý* ‘wet’ occurs in both tables, forming the comparative with either truncation or containment. Other adjectives like this (according to dictionary searches) are *krot-k-ý* ‘tame’ and *prud-k-ý* ‘steep.’ We treat this as a case where either multiple roots must be stored, or where different speakers have different entries. Our goal here is not to capture the occasional variation, but to describe the patterns.

Here as well we see that the diminutive *-un* (where available) attaches directly after the root. This fact is crucial; it provides evidence that the base of the positive degree is to be segmented in two parts in this class as well. It is therefore impossible to say that, for instance, the comparative form *heb-k-ejš-í* ‘smoother’ on the first line in Table 2 exhibits *-k* in the comparative because the *-k* is not a suffix to begin with, but a part of the root. The diminutive *heb-un-k-ý* ‘smooth’ shows that *-k* is a suffix, yet with this root, it is preserved in the comparative.

4 Potential analyses

Let us now turn to the issue of what determines whether a particular adjective exhibits the containment or the truncation pattern. The first option to consider is that the distinction is to be explained in phonological terms, e.g., that *-k* drops after roots with a particular phonological shape. The second possibility we need to consider is that the difference between truncation and containment is semantic in nature, e.g., that adjectives with particular semantic properties keep the augment, while other types drop it. We discuss these in turn.

4.1 Phonology

A phonological analysis is made unlikely by the existence of near minimal pairs such as the ones in Table 3.

Here the members of each pair present similar phonological environments, yet behave differently with respect to the choice for truncation or containment in the comparative. Thus the first two roots end in *h*, whereas the latter two end in *t*, the final consonant in either case being preceded by a vowel. Yet the former member of each pair shows truncation, the latter containment, suggesting that the distribution of the augment in the comparative is not determined by phonological factors. Admittedly, the quality of the vowel preceding the consonant is different, yet this has generally no influence on the truncation/containment difference, as Tables 1 and 2 show.

As an anonymous reviewer points out, another phonological issue to consider is the following. In principle, it could be the case that the two classes of adjectives do not differ in the presence/absence of *-k* in the morphosyntactic structure, but only differ in what allomorph of the comparative they require. In particular, the suggestion is that the truncation class requires the comparative marker *-š*, whereas the containment class selects *-ejš*, as shown in (15a). In the truncation class, a CVC root is followed by the augment *-k* and the comparative *-š*, yielding a triconsonantal cluster *Ckš*. In the containment class, now characterised by the presence of the *-ejš* allomorph in the comparative, no such cluster arises. In the case of the truncation class, so the reviewer suggests, this would give rise to a phonologically triggered process of consonant cluster simplification through deletion of *k*, yielding the surface contrast in (15b).

Table 3: Similar phonological environments, different comparatives.

POSITIVE			DIMINUTIVE				COMPARATIVE				gloss
root	AUG	AGR	root	DIMIN	AUG	AGR	root	AUG	CMPR	AGR	
lah	k	ý	lah	un	k	ý	lah		š	í	‘light’
kreh	k	ý	kreh	un	k	ý	kreh	k	ejš	í	‘fragile’
krot	k	ý					krot		š	í	‘tame’
brit	k	ý					brit	k	ejš	í	‘sharp’ (humor)

- (15)
- | | | |
|----------------------------|------------|-------------|
| | TRUNCATION | CONTAINMENT |
| a. underlying comparative: | CVC-k-š | CVC-k-ejš |
| b. k-deletion: | CVC-š | CVC-k-ejš |

Under this analysis, the truncation of the positive would be a purely phonological, and not a morphosyntactic, effect.

There are two arguments against this approach. First of all, it is incompatible with the phonological account of the distribution of the -š and -ejš allomorphs, which states that -ejš occurs after clusters, and -š elsewhere (see note 3 above). Suppose now that we abandoned that account in order to allow for (15a), we expect there to be examples of simplex adjectives that end in a consonant cluster, and select the -š allomorph, as shown in (16a). Assuming a process of triconsonantal cluster simplification, we further expect to find this process at work in CCš clusters, as shown in (16b).

- (16)
- | | | |
|----------------------------|------------|-------------|
| | TRUNCATION | CONTAINMENT |
| a. underlying comparative: | CVCC-š | CVC-k-ejš |
| b. C-deletion: | CVC-š | CVC-k-ejš |

However, there are no cases that fit this description, as far as we are aware. While there are many adjectival roots which end in two consonants (e.g., *príkr-y* ‘steep’, *hust-ý* ‘dense’, *čistý* ‘clean’, *rýchl-y* ‘fast’), these all select the -ejš allomorph. Roots ending in three-consonant clusters also exist (e.g., *bystr-ý* ‘witty/smart’, *ostr-ý* ‘sharp’), but none of these feature the consonant cluster simplification that is allegedly at work with the truncating *k*-adjectives. Finally, we note that there is at least one case in the Slovak National Corpus that features the sequence *Ckš*, namely *jorkšírsky teriér* ‘Yorkshire terrier’, a fact which casts further doubt on the existence of the consonant cluster simplification rule supposedly responsible for the truncation pattern.

The second argument against (15) is that Slovak has also an augment with the phonological shape VC, namely -ok. This augment is found with four adjectives, three of which show a truncation pattern, while the fourth shows a containmentment pattern, as shown in Table 4.

In this case, it becomes difficult to derive the difference between the truncation and the containmentment class from a phonological truncation rule, since neither class has a triconsonantal cluster created by the addition of the comparative -š after -ok. One would moreover not only have to assume the deletion of -k but also of the vowel preceding it, a kind of deletion which lacks any plausible phonological motivation. Therefore, we do not consider the phonological account sketched in (15) as a plausible alternative to a morphosyntactic account that we pursue here.

For reasons of space, we will not pursue here the analysis of -ok in any detail. The conclusion we want to draw from Table 4 is that the truncation pattern is not a quirk of a single marker, or a single phonological environment; it looks like a structural property

Table 4: Complex adjectives in Slovak: the suffix -ok-.

	POSITIVE			COMPARATIVE				gloss	
	root	AUG	AGR	root	AUG	CMPR	AGR		
a.	hl’b	ok	ý	hl’b		š	í	‘deep’	TRUNCATION
b.	šir	ok	ý	šir		š	í	‘wide’	
c.	vys	ok	ý	vyš		š	í	‘tall’	
d.	div	ok	ý	div	ok	ejš	í	‘wild’	CONTAINMENT

of the Slovak grammar that shows at multiple places in the language. Moreover, the pattern is diachronically stable, going back at least a thousand years. Specifically, it has been present already in Old Church Slavonic, the language of the oldest Slavic manuscripts. As Lunt (2001: 78) notes, already back then “[t]he positive [showed] a derivational suffix in *-k* which is lost in the comparative.” A morphosyntactic truncation analysis has been also adopted in the reference grammar of Slovak (Dvonč et al. 1966: 211).

4.2 Semantics

Let us now turn to the possibility that the distribution of *-k* (including the distinction between the containment and the truncation pattern) is determined not by phonology, but by the abstract meaning of the adjective. Following this avenue, we find that there is indeed a semantic regularity that unifies all adjectives with *-k*. In particular, as we shall discuss in more detail below, all adjectives with *-k* are scalar. What we mean by this is that adjectives with *-k* are gradable, tend to have antonyms and their interpretation is context-dependent. For example, the adjective *ľah-k-ý* ‘light,’ seen in Table 3, has a synthetic comparative, it has an antonym (*ťaž-k-ý* ‘heavy’), and its meaning is context-dependent: a *light/heavy handbag* has a different comparison class (and consequently a different meaning) than a *light/heavy truck*. These facts confirm our initial decision to treat *-k* as a marker that spells out POS and other projections of gradable adjectives.

At the same time, the relationship between scalarity and morphology is imperfect. To show that, we list a representative sample of adjectives with the augment *-k* in the first column of Table 5. The first thing we want to focus on are their antonyms (horizontally in the same row).

What we see is that most of the time, the antonyms lack the augment despite the fact that they too are gradable, context-dependent and have an antonym. Hence we must conclude that the correlation between *-k* and scalarity is only a one way implication: *-k* entails scalarity, but scalarity does not necessarily lead to *-k*.¹⁰

Table 5: Semantic category does not predict distribution of *-k*.

	K-ADJECTIVE				ANTONYM				
1.	ťaž	k	ý	‘heavy’	ľah	k	ý	‘light’	truncation
2.	krát	k	y	‘short’	dlh		ý	‘long’	
3.	mäk	k	ý	‘soft’	tvrd		ý	‘hard’	
4.	vlh	k	ý	‘wet’	such		ý	‘dry’	
5.	slad	k	ý	‘sweet’	—				
6.	kreh	k	ý	‘fragile’	pev	n	ý	‘firm’	containment
7.	brit	k	ý	‘sharp’	tup		ý	‘blunt’	
8.	heb	k	ý	‘smooth’	hrub		ý	‘rough’	
9.	sliz	k	ý	‘slimy’	—				
10.	hor	k	ý	‘bitter’	—				

¹⁰ The adjective *pev-n-ý* ‘firm’ on line 6 of Table 5 has yet another augment in the antonym. This augment (*-n*) is a common adjectivizing morpheme in Slovak (e.g., *lac-n-ý* ‘cheap,’ *chut-n-ý* ‘tasty,’ *bezpeč-n-ý* ‘safe,’ *sil-n-ý* ‘strong,’ *pôvab-n-ý* ‘charming,’ *hovor-n-ý* ‘talkative,’ *čier-n-ý* ‘black,’ etc.). Perhaps it also doubles up as a passive participle morpheme (*unave-n-ý* ‘tired,’ *otvore-n-ý* ‘open,’ etc.) Unlike *-k* and *-ok*, this augment never drops in the comparative as far as we are aware. We do not discuss the augment *-n* in detail here (since this is orthogonal to our concerns), while nevertheless noting that such behaviour could be captured by attributing to this marker not only the high functional layers of the adjectival projection (POS and F2), but also its lower reaches (including F1 and possibly also F0).

Let us now turn to the division between truncation and containment, represented in the table by the horizontal line in the middle. The specific question we address is whether scale structure can be made responsible for the bifurcation between the two patterns. It turns out that it cannot. To show that, we have selected the adjectives in the first column from different sub-classes of scalar adjectives. Consider, for instance, the adjectives ‘heavy’ (line 1) and ‘short’ (line 2), both belonging in the truncation class. They represent the so-called open-scale adjectives in the terminology of Kennedy & McNally (2005). Both have antonyms and both are context-dependent (a short giraffe is a different kind of short than a short grasshopper). However, they differ in that ‘heavy’ is associated with the positive extent on the scale, while ‘short’ is a negative adjective (cf. *How heavy/#short is he?*). This shows that the augment *-k* is not associated with adjectives of a particular direction (positive or negative), and that both positive and negative adjectives may exhibit the truncation pattern.

A similar state of affairs is found in the containment class (lines 6–10). The adjective *kreh-k-ý* ‘fragile’ is a negative adjective with an open scale, while *brit-k-ý* ‘sharp’ is a positive open-scale adjective. The important conclusion is that both positive and negative open-scale adjectives may exhibit or fail to exhibit *k* in the positive degree, and may belong to either the truncation or the containment class in the comparative.

The adjective *vlh-k-ý* ‘wet’ on line 4 is a so-called minimum standard adjective (in the terminology by Kennedy & McNally 2005): it suffices that an object (like a chair) has a minimum amount of wetness for it to count as (*a*) *wet (chair)*. Another distinguishing property is that the comparative entails the positive: if *A is wetter than B*, it follows that *A is wet*. This is not the case for the open scale adjectives on line 1 and 2: for example, *A is heavier than B* does not entail that *A is heavy*. Despite the difference in scalar structure between ‘wet’ and ‘heavy,’ they both belong in the truncation class.

Moreover, we find minimum standard adjectives (associated to partially closed scales) in the containment class as well. To see that, consider the adjective *sliz-k-ý* ‘slim-y,’ which behaves semantically like ‘wet’: if *A is slimier than B*, it entails that *A is slimy*. The main difference with *wet* seems to be the viscosity of the material rather than the type of scale. Despite the fact that ‘slimy’ has abstractly the same type of scale as ‘wet,’ they pattern differently in the comparative.

Finally, lines 5 and 10 show two instances of taste adjectives. These adjectives do not have antonyms: being sweet does not, for instance, entail not being bitter (consider caramelised sugar). However, they are context dependent: *a sweet beer* is a different type of *sweet* than *a sweet cake*; a cake with the same degree of sweetness as beer would not count as sweet. The main point is, however, that one of the taste adjectives (‘sweet’) belongs in the truncation class, the other (‘bitter’) belongs in the containment class. So once again, it seems that the type of scale or even the type of an adjective do not, as far as we can see, allow us to distinguish what kind of morphological pattern the relevant adjective will show. The bifurcation between containment and truncation thus seems to be then best understood as an arbitrary property of the relevant root. This fact is reflected in our analysis sketched above, which relies on a lexically arbitrary property of the root, namely its size in the lexicon.

Summarising this section, we have seen that Slovak has complex adjectives in the positive, which are built up according to the template in (17):

(17) root-K-AGR

Such adjectives either drop the augment *-k* in the comparative, or they keep it. We have shown that this bifurcation is in large part arbitrary, and cannot be predicted on the basis

of phonology or semantics. While we did note that the adjectives with the augment are scalar, their scalar properties do not determine the particular pattern they belong in. It should be further noted that the appearance of an augment with a particular root is also in part arbitrary, simply because not all scalar adjectives have an augment, as becomes clear from observing the antonyms in Table 5.

Our goal in the next section will be to model this behaviour in nanosyntax. In this approach, lexical items are associated to syntactic constituents of various sizes, differing as to what features are contained in their lexical entry. In the next section, we present such an analysis and argue that it leads to interesting predictions for root suppletion, to be discussed in section 7.

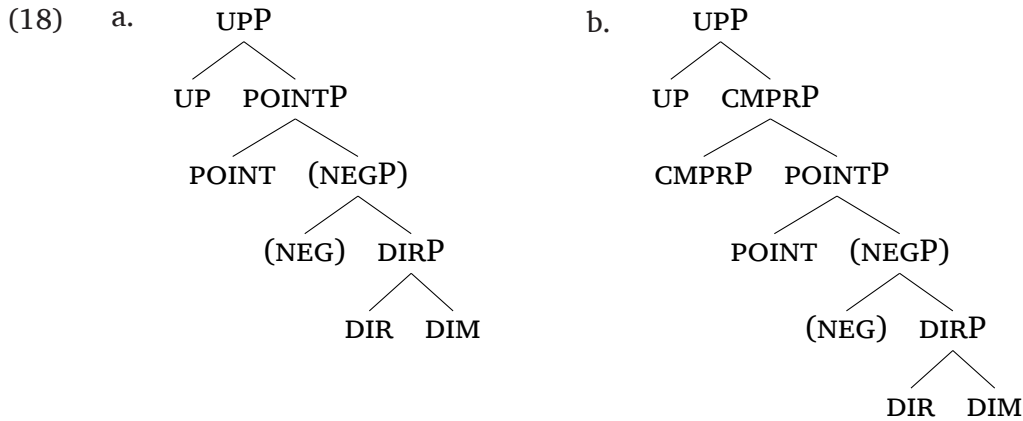
5 Decomposing the adjective

As the first step in our analysis, we provide labels for the features F0, F1, and F2, which we have been assuming in section 2 as an important part of our preliminary analysis. In general terms, these features correspond to independently needed ingredients of gradable adjectives. At the bottom of the hierarchy, there is a dimension, which could be size, velocity, height, color, etc. This means that $F0 = DIM$. Scalar adjectives come with an ordering on top of a dimension, which we represent by the feature DIR, i.e. $F1 = DIR$. Directions may be reversed by means of an optional reversal operator (called NEG in De Clercq & Vanden Wyngaerd 2019). The presence or absence of NEG distinguishes antonymic pairs of adjectives from one another (like *tall-short*, *wet-dry*, *heavy-light*, etc.). Such pairs of adjectives thus involve the same dimension, but the direction of the scale is different: positive for *tall*, negative for *short* (see De Clercq & Vanden Wyngaerd 2018 for a semantic analysis of this contrast).¹¹

This leaves us with F2 to provide a label for. We shall assume that F2 basically introduces a point on the scale, and we therefore label it as POINT. The precise position of this POINT on the scale may (in principle) be further specified by additional functional material. However, in the positive degree, the projection POINT is ‘underspecified;’ it does not introduce any specific point, but rather the fact that there is a point to begin with. As a result, the position of the point is determined by the context: it corresponds to the contextual standard.

The relevant point introduced on the scale by POINT will divide the scale into two parts, one which exceeds this point and another one, which does not. The argument that the adjective is predicated of will have a degree of the relevant property that falls within the part of the scale that exceeds the relevant POINT. Therefore, the final projection above POINT is the projection UP, which replaces our original POS (see Neeleman et al. 2004 for the UP component). Putting all of this together, we arrive at the structure in (18a) for the positive degree, with the optional NEG feature in brackets.

¹¹ Two anonymous reviewers ask about the status of non-gradable adjectives in our system. Our general take is that these adjectives correspond to a structural subset of the gradable adjectives, because they lack a scale. In the decomposition proposed here, this means that they have only the DIM projection (and possibly others lower down). A potential difficulty (brought to our attention by an anonymous reviewer) is that for some adjectives, e.g., *biological* or *presumed*, it does not seem to be clear as to what ‘dimension’ they apply to. One possibility for dealing with this would be to change the label of our DIM head into PROPERTY, so that non-gradable adjectives simply denote properties. Some of these properties can be arranged according to a single dimension, and these can become gradable by adding the DIR head on top of the PROPERTY, yielding an alternation between a non-gradable use (when DIR is absent) and a gradable use (when DIR is present). We do not deal here with these issues, as doing so would get us too far from the main narrative. See Kennedy & McNally (2010) for discussion of the gradable/non-gradable alternations in color adjectives.



In the comparative, the composition proceeds similarly, with the difference that the relevant POINT on the scale is not left unspecified, but it is provided by the standard of comparison in the *than*-phrase. As a reflection of this fact, we shall maintain the head CMGRP in the structure as a way of saying that the value of the POINT will be provided by the *than*-phrase, possibly (but not necessarily) located in the Spec of this projection. After the CMGRP head specifies the precise position of the relevant point on the scale, we still need to add the information that the argument of the adjective has a degree of the property that exceeds the CMGRP point. This means that we again place the head UP above the CMGRP head. The structure of the comparative then looks like (18b).

Note that what has happened now is that the POS head of our original *symmetric* structures has turned into UP, while our original CMGRP head corresponds to two heads, namely CMGRP and UP. The consequence is that we no longer have a structure where POS and CMGRP are two fully disjoint – and mutually incompatible – continuations of the shared POINTP. Rather, the relationship between the positive and the comparative is one that we shall label *gapped*. This is because the positive has a ‘gap’ in between POINT and UP, i.e., in a place where the comparative has the extra projection CMGRP.

The gapped relation shown in (18) is one of the possible interpretations of our symmetric structure introduced in (10). (The other interpretation is that POS and CMGRP of (10) are two values of a single head, recall footnote 5.) We consider the ‘gapped’ interpretation of the relation more interesting in that it allows us to consider all features privative and rigidly ordered, but beyond this conceptual motivation, we do not provide here any empirical facts that force the gapped interpretation over the symmetric one.¹²

As we shall see, the gapped structure will allow for the informal analysis given in section 2 to remain in essence the same. The reason for this is that we shall propose that the two projections above POINT in the comparative (i.e., CMGRP and UP) are actually spelled out by the comparative marker *-(ej)š*. Once this proposal is in place, the root (and any potential augments) still need to spell out just POINTP in the comparative, while they must spell out the full UPP in the positive, which yields the truncation pattern in exactly the same way as highlighted in section 2.

In particular, the distribution of the augment *-k* will still be explained in terms of different root sizes of the three different classes of adjectives. XL-roots can pronounce the entire structure in (18a), as well as the POINTP subtree that is found in the comparative below CMGRP and UP, the two projections spelled out by the comparative *-(ej)š* in

¹² This view on the relationship between the positive and the comparative degree is highly similar to what is proposed by Kennedy & Levin (2008) on semantic grounds, with a POS head (comparable to our UP) both in the positive and the comparative.

Slovak. With this XL class of adjectives, no augment is present in either the positive or the comparative.

At the other extreme, S-roots are of size DIRP (or NEGP, if they are negative). As a consequence, they need the augment *-k* both in the positive and the comparative. The augment helps them spell out the part of the sequence which they themselves are unable to spell out. In the positive, these are the heads POINT + UP, two heads which we take to be the lexical specification of the augment. In the comparative of S-roots, *-š* spells out CMPR + UP, the S-root spells out all the projections up to DIR/NEG, and *-k* is still needed to spell out the POINT projection.

Finally, M-roots are of size POINTP. This means that the augment is needed in the positive, but will disappear in the comparative, since the comparative morpheme comes directly on top of POINTP.

An informal schematic overview of the difference between the different types of roots is given in (19):

(19)

DIM	DIR	(NEG)	POINT	UP
XL-root				
M-root				k
S-root			k	

We provide a more detailed derivation of both the positive and comparative degrees of these three adjective classes in the next section. At this point, we want to point out two predictions made by our approach. The first is that the lexical specification of the augment as the spellout of POINT + UP correctly predicts that *-k* only appears with gradable adjectives, because it spells out projections that are irrelevant for non-gradable adjectives (these have only DIM, recall footnote 11). The second prediction is that all root sizes should include both positive and negative adjectives, as they can all optionally spell out NEG. Both of these predictions are confirmed (see the discussion of the semantic classes of the *k*-adjectives in section 4.2 above).

Finally, it is worth mentioning explicitly that there is no $\sqrt{\quad}$ node at the bottom of the tree, which thus consists of functional heads ‘all the way down.’ This means that on our approach, roots like *nice, kind, good, prett-*, etc. are not acategorical, but spell out functional heads (an approach pioneered for verbs by Ramchand 2008). On this approach, the way roots differ from functional morphemes is not in the type of a head that they spell out. Rather, roots are understood as lexical items that are associated to a concept in their lexical entry, while functional morphemes are not. The meaning of the latter consists solely of the grammatically relevant meaning (functional heads) that they spell out. When a root is inserted during spellout as the realisation of a particular set of functional heads, the associated concept is activated in the conceptual representation. The model of spellout we shall be assuming is the topic of the next section.

6 The formal derivation

6.1 Prerequisites

The analysis we shall present is couched in the framework of nanosyntax, a late-insertion model that has a postsyntactic lexicon, and a syntax where each feature is a syntactic head (Caha 2009; Starke 2009). The model is represented schematically in Figure 1.

The syntax creates syntactically well-formed objects, which are then matched against the lexicon for pronunciation. The lexicon plays the role of a translator between the syntactic representation on the one hand and phonology and concepts on the other. For

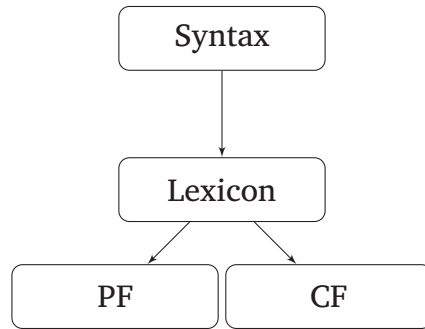
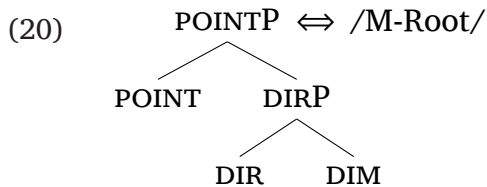


Figure 1: Nanosyntactic model of grammar.

content words, a lexical item links a syntactically well-formed tree with a well-formed phonological object at PF and a concept at CF (Starke 2014). Functional words only map syntax onto pronunciation at PF, but do not contribute any additional conceptual meaning beyond the grammatical meaning contributed by the set of functional heads the functional morpheme spells out. A model of spellout based on these assumptions leads to a restricted lexicon in the sense that only well-formed syntactic trees (rather than any haphazard set of features) can be linked to a phonology and/or concept inside a lexical entry.

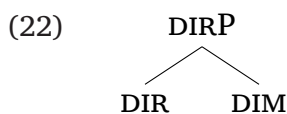
A crucial part of this model is the idea that linking syntactically well-formed objects to phonology is not restricted to terminals. Since phrases containing multiple terminals are also well-formed syntactic objects, they may be easily pronounced by a single piece of phonology (a single morpheme in the traditional sense), provided these terminals form a constituent (i.e., they correspond to a syntactic object). An example is provided in (20) by the entry for an M-root. It will become clear in the course of the discussion that in our model, spellout in fact has to target phrasal nodes and cannot target terminals.



Whether a particular syntactic tree is matched by a lexical item is determined by the Superset Principle (Starke 2009):

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

As a consequence of the Superset Principle, the M-root entry given in (20) is also applicable as the spellout of a DIRP in (22), since such a DIRP is contained inside the lexically stored tree.



Recall now that roots (which in our system means ‘morphemes associated to conceptual information’) come in various sizes. Therefore, it will sometimes be the case that multiple roots of different sizes match a particular structure. We shall be assuming that in such cases, there is Free Choice, and we may insert the lexical item that we ‘want to talk about’:

- (23) *Free Choice of the root*
When several roots match, the choice among them is free.

This statement is compatible with the idea that normal competition occurs between roots, but their choice is restricted by the concept they are attached to.

To see how this works, consider the lexical items in (24), where (24a) represents an M-root and (24b) an S-root:

- (24) a. POINTP \Leftrightarrow /M-Root/
 / \
 POINT DIRP
 / \
 DIR DIM
- b. DIRP \Leftrightarrow /S-Root/
 / \
 DIR DIM

If syntax produces a DIRP like the one in (22), then both of these roots are candidates per the Superset Principle (21), because DIRP is contained in both entries. What we do not want to happen is that some version of the Elsewhere Condition forces the insertion of the S-root (e.g., ‘slimy’) on the grounds that it is a ‘perfect match,’ since that would in effect prevent M-roots (e.g., ‘heavy’) from being usable as the spellout of DIRP at all. The problem with this would be that a set of concepts (associated to M-roots) would not be available at all in the given context, an unwanted result. In order not to run into a problem like this, we may simply avoid postulating the Elsewhere Condition for roots. Alternatively, we may say that the Elsewhere Condition does apply to roots, but that the set of competing roots is restricted only to those that are associated to the relevant concept in a way that ‘slimy’ and ‘heavy’ never compete. In either case, (23) will emerge as a consequence of such a setup (i.e., it is not an axiom).

Moving on to additional assumptions, we adopt here the cyclic spellout algorithm described in Starke (2018) (cf. Baunaz & Lander 2018; Caha et al. 2019). The gist of the algorithm is that structure building (Merge F) is intertwined with spellout, such that spellout applies after each application of Merge F. The way spellout applies is by targeting the FP (i.e. the topmost node) that has just been created by Merge F. The algorithm is phrased in such a way that the spellout of FP must actually succeed for Merge F to continue further. The simplest way for spellout to succeed is by finding a matching item for the whole FP. However, if that fails, the structure is rejected at the interface and returned to syntax. In order to save the structure, syntax must perform certain rescue operations, movement in particular. The movements happen in a pre-defined order, first trying to remove the Spec of FP out of FP, and then checking again if this helps with finding a spellout for the FP. The last step is moving the complement. These successive steps in the spellout algorithm are formulated in (25).

- (25) Merge F and
 a. Spell out FP
 b. If (a) fails, attempt movement of the spec of the complement of F, and retry (a)
 c. If (b) fails, move the complement of F, and retry (a)

It is important to stress that ‘Spell out FP’ in (25a) does not equal ‘Pronounce FP.’ Spellout can be intuitively understood as ‘finding a match’ in the lexicon. When a matching item is found, this is enough for Merge F to proceed, with actual pronunciation postponed.

Keeping this in mind, consider how cyclic derivations proceed. Suppose that syntax constructs FP and spells it out, i.e. it finds a match in the lexicon. The derivation then

continues by another step of Merge F, e.g., by merging F2 with FP, producing the constituent $[_{F2P} F2 FP]$. At this point, spellout applies again. Suppose that a matching item for the full F2P is found. This will lead to the previous match (at FP) being forgotten, and only the highest match survives. This is known as Cyclic Override:

- (26) *Cyclic Override*
 Lexicalisation at a node XP overrides any previous match at a phrase contained in XP.

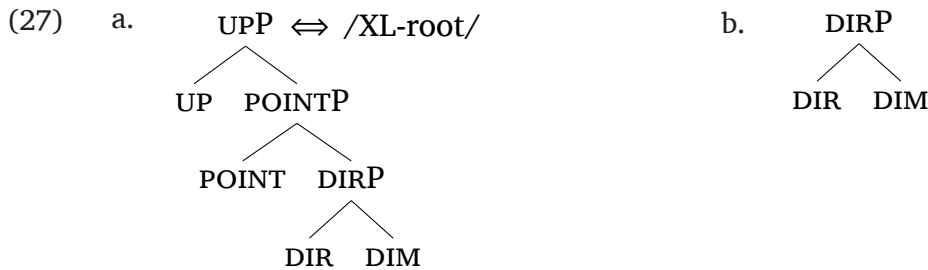
Note that (26) should not be considered a principle on its own, but rather a consequence of the architecture where spellout cyclically targets higher and higher nodes. Note, however, that roots associated to different concepts cannot override each other, recall (23) (see Caha et al. 2019 for discussion). For example, an XL-root like ‘old’ cannot override an M-root like ‘heavy.’

The final tool in our spellout toolbox is backtracking, which is a last resort operation that is activated when the derivation gets stuck following the algorithm described above. We will say more about backtracking at the relevant place in the discussion.

We shall illustrate the workings of the above mechanisms and principles as we proceed. While doing so, we demonstrate that the correct pairing of roots and augments, as well as their correct ordering, can be derived using the tools described above.

6.2 The positive degree

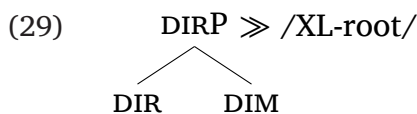
We start by considering the derivation of the positive degree of an XL-root (e.g., ‘old’). These lack augments both in the positive and in the comparative (recall (4)). An XL-root has a lexical entry like (27a). In the first step, the syntax merges DIRP as in (27b).



Recall now that the way the syntax interfaces with the lexicon is via the Spellout Algorithm, which we repeat in (28).

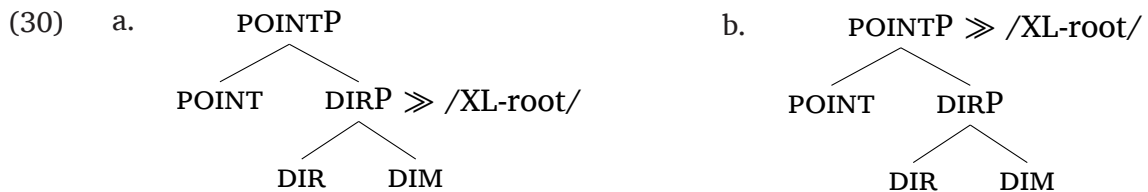
- (28) Merge F and
- a. Spell out FP
 - b. If (a) fails, attempt movement of the Spec of the complement of F, and retry (a)
 - c. If (b) fails, move the complement of F, and retry (a)

According to (28), the first thing we should do is try the spellout of DIRP without any movement (28a). Since DIRP is contained in the lexical tree of the XL-root, the XL-root can spell out DIRP. We indicate successful spellout with the \gg sign:

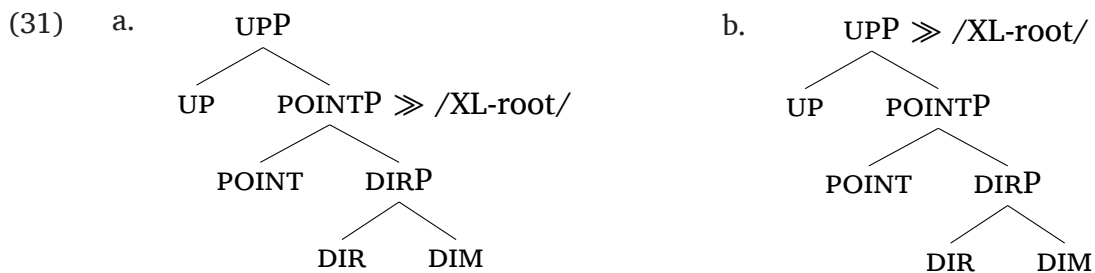


In the next step of the derivation, POINT will be merged on top of DIRP, producing POINTP as in (30a). The spellout algorithm is cyclic, and the lexicon will therefore be consulted

again in an attempt to spell out the newly formed POINTP. A match will be found in the same XL-root, so that spellout at POINTP is successful, and it will override the earlier spellout at DIRP, as shown in (30b).

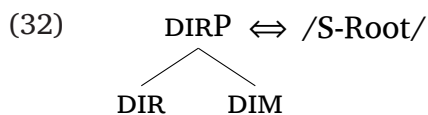


The same procedure will be repeated one more time, producing the whole UPP (corresponding to the positive degree), which is still spelled out as the XL-root.

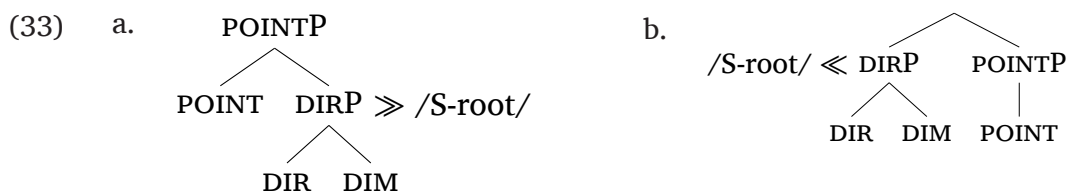


Derivations with augments in the positive work similarly in the initial stages, but they differ in that at some intermediate point in the derivation, the application of Merge F will result in a tree that is no longer contained in the lexical tree of the relevant root, i.e., the syntactic tree will become too big to be realised by the root. As a result, spellout will fail, and rescue strategies will be applied.

Let us see in more detail how this works with an S-root like *sliz-* ‘slime’ in *sliz-k-ý* ‘slimy’. An S-root has a lexical entry of the size DIRP, as shown in (24b) above, repeated below for convenience.



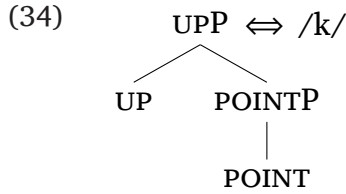
On the first step of the derivation, when DIR and DIM are merged, an S-root can spell out this constituent. However, if POINT is merged to DIRP, creating a POINTP shown in (33a), direct spellout fails. This is because the lexical tree of an S-root like *sliz-* no longer contains the syntactic tree.



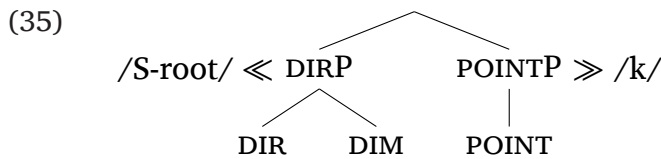
Note in addition that the POINT head cannot be spelled out as a terminal (without movement), because spellout (as per the spellout algorithm) only targets phrases. Since spellout fails, the structure is rejected at the interface and returned to syntax, which has to rescue the structure in accordance with the spellout algorithm. The first rescue strategy that should be tried is the movement of the Spec of the complement of POINT (see (28b)), but since the complement has no Spec, this

option is undefined. That leads to complement movement, as mandated by (28c), yielding (33b).

At this point, the lexicon will again be consulted, and it will find a match for POINTP in the augment *k*, whose lexical entry is given in (34). Recall that the specification of *-k* has already been introduced informally in (14a).



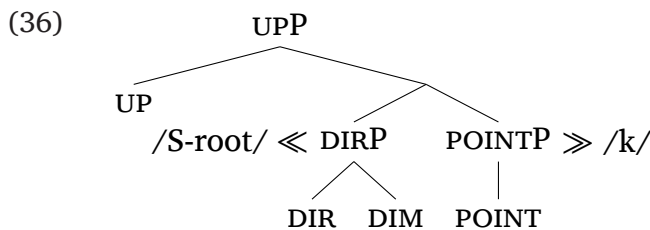
Observe that the syntactic tree POINTP of (33b) is contained in (34) as a subtree, so that spellout can occur:



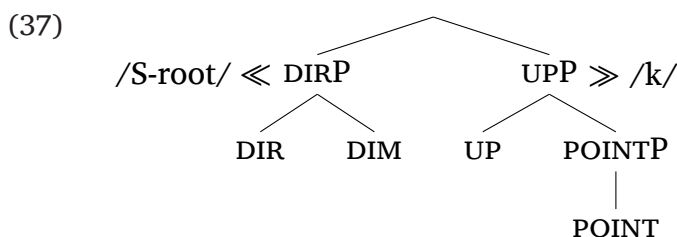
As a side effect, the underlying structure has been rearranged in a way that the correct linear order of the root and the suffix is derived.

Note also that spellout movement has simply removed the DIRP out of the POINTP, leaving no trace behind. In this property, spellout movement differs from standard feature-driven movement, which does leave a trace. The reason why spellout movement leaves no trace is the fact that unlike feature-driven movement, it does not lead to two interpretive positions, see Starke (2018) and Caha (2019: Chapter 4) for discussion. This also allows us to keep the spellout procedure matching syntactic trees with lexical ones maximally simple, since the trace does not enter into the computation of matching. We adopt this ‘traceless’ convention here, noting that it is not crucial for the system to work; the alternative would be for spellout to ignore such traces.

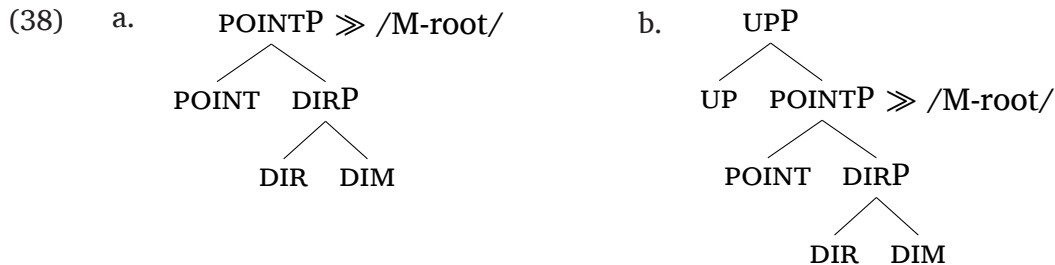
The derivation now continues by merging UP to (35), producing (36):



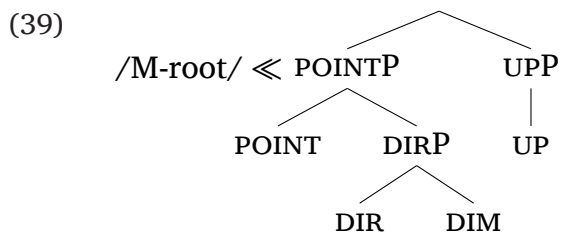
No lexical entry matches the UPP in (36), and movement of the Spec of the complement of UP applies. This moves the DIRP out of UPP, yielding (37). This derives, as the right hand member of the tree, an UPP that is identical to the lexical entry of *-k* in (34). The marker *-k* can therefore spell out the UPP in (37), overriding the earlier spellout of POINTP by the same *-k*.



Let us now turn to the derivation of M-roots, which is the most technically complex. To see why, consider first their lexical entry given in (24a). This entry will initially allow for a derivation where we merge features and spell out without movement, ultimately reaching the stage where POINTP is spelled out by the root, which exhausts its lexicalisation potential; see (38a). Once POINTP is spelled out by the root, the next feature (UP) is merged, yielding (38b).



Since the M-root cannot spell out (38b), rescue movements take place. The complement of UP has no Spec, so the movement of the complement of UP will apply, yielding (39):

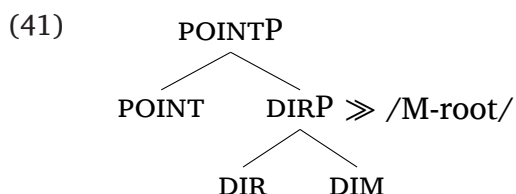


But now the right hand part of the tree (39), i.e., the UPP, cannot be realised by the augment, since the UPP of (39) is not a subtree of the augment's entry (34). In fact, there is no lexical entry in the Slovak lexicon that can apply to this structure, which leads to spellout getting stuck: no rescue operation produces a lexicalisable output, and Merge F cannot continue.

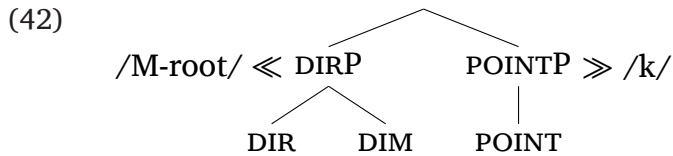
When a derivation gets stuck in this way, backtracking is set in motion. What backtracking does is that it undoes one Merge F operation and goes back to the previous stage in the derivation. Once there, it tries a different derivational option than the one which had previously applied – and ultimately led nowhere. This is formulated in (40):

- (40) *Backtracking*
When spellout fails, go back to the previous cycle, and try the next option for that cycle.

Reverting to the previous cycle brings us to POINTP, as in (41).



At the first pass through this cycle (38a), we have directly spelled out POINTP by the M-root (the first option of the spellout algorithm (28)). However, this has led to a dead end, so (40) instructs us to try the next option. This would be movement of the Spec of the complement of POINT. However, since this is undefined, we end up with the third option of (28), namely complement movement. This leads to the structure in (42). Here we POINTP can be spelled out by *-k*, since it is contained in the lexical item (34).

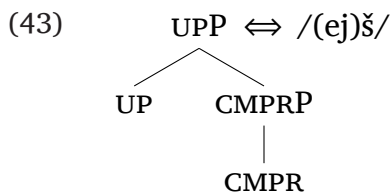


At this point, the derivation of M-roots runs exactly in parallel to the derivation of S-roots, see (35). Just like with S-roots, we merge UP to (42). The structure then looks as in (36), and fails to spell out without movement. We therefore move the DIRP out of UP, by Spec movement, yielding a structure identical to (37) above, except that DIRP is spelled out by the M-root. The positive degree of an S-root and an M-root therefore end up identical (both have an augment), even though their root sizes are different.

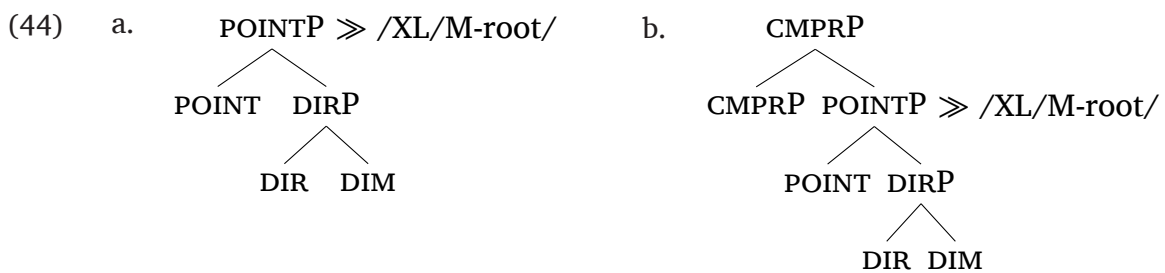
To sum up, this section showed how the derivation of the positive degree proceeds such that only XL-roots lack AUG. M-roots and S-roots need one.

6.3 The comparative

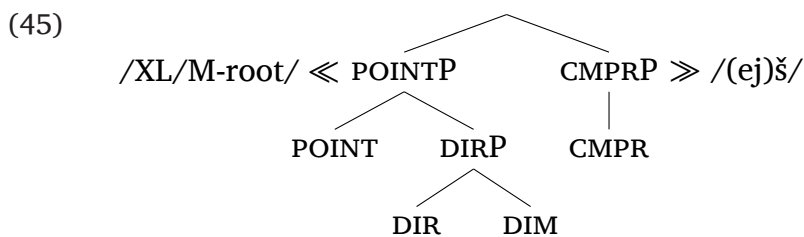
Let us start the discussion of comparatives by making explicit the lexical entry of the comparative morpheme we propose here, see (43).



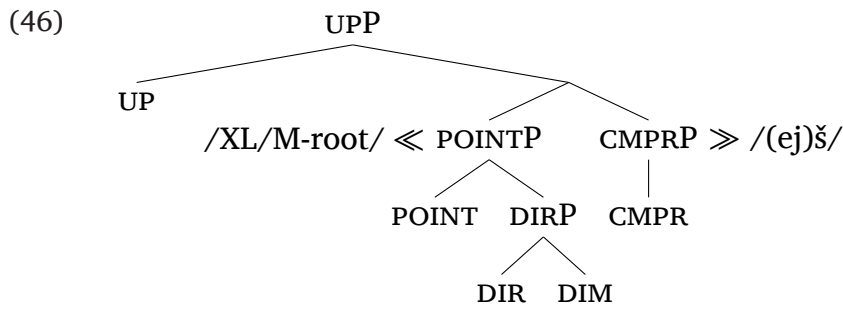
Let us now turn to the comparatives of XL-roots and M-roots, which have identical derivations. They both recursively Merge F and spell out without movement up to POINTP, see (44a), after which CMPRP is merged, see (44b).



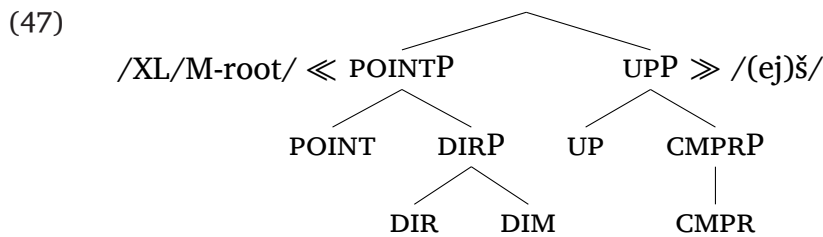
Since the lexicon contains no roots of this size, rescue movement must be applied, and this will move the complement of CMPR to the left, giving rise to (45). The right hand branch of this tree matches with the lexical entry for the comparative suffix, so that spellout is successful, and the correct linear order is derived.



Subsequently, the feature UP is merged to (45), producing (46).

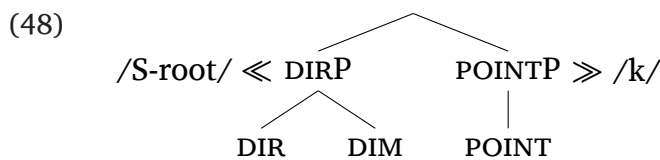


This structure fails to spell out, leading to rescue movements. Spec movement is tried first, producing (47), which spells out successfully.

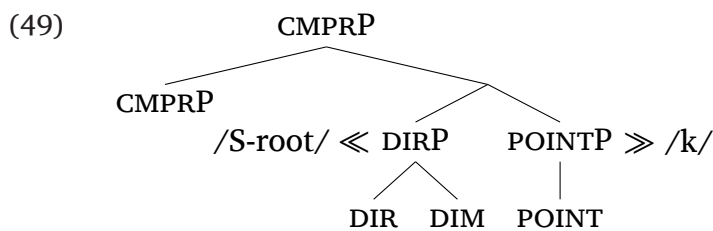


This is how the problematic truncation pattern is derived: M-roots are not large enough to spell out the positive degree (since they lack UP in their lexical entry), and so they need an augment in the positive. But since the comparative is built by adding CMPR on top of POINTP, and since M-roots can spell out POINTP, no augment is needed in the comparative.

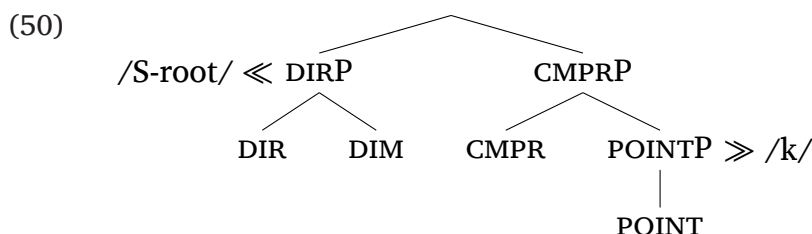
With S-roots, the derivation proceeds exactly as in the positive degree, up to the level of POINTP. This means that rescue movement will have to be applied at the merger of POINT, causing DIRP to be raised across POINT, leading to the structure in (48) (repeated from (35)).



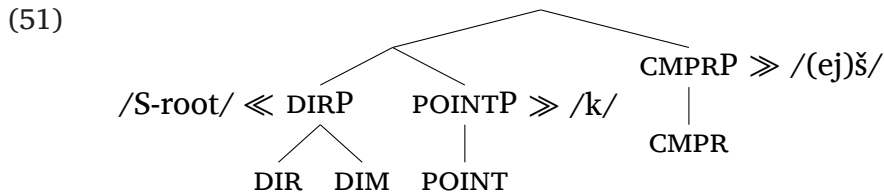
Next, CMPRP will be merged, yielding (49).



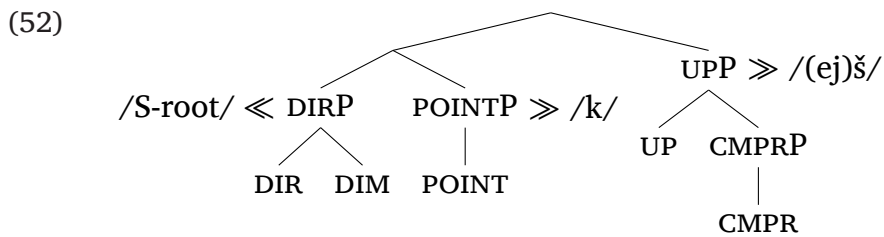
(49) does not spell out, so the Spec of its complement (i.e. DIRP) is raised across it, creating (50).



But spellout for CMPRP will fail because no lexical item contains this syntactic tree in the lexically stored tree. We therefore need to undo this movement, revert to (49), and apply the next rescue option of the spellout algorithm, which is movement of the complement of CMPR. This will result in the structure in (51), where CMPR can now spell out successfully as the comparative suffix after the evacuation of its complement.



The final step of the derivation is to add the UP element to the structure (51). This structure fails to be spelled out, and Spec movement is therefore tried. The output of Spec movement is in (52), where UPP correctly spells out as $-(ej)š$. This leads to the correct result, where the comparative form of S-roots contains the augment. We moreover derive the correct linear order of the suffixes, with the augment appearing between the root and the comparative marker.

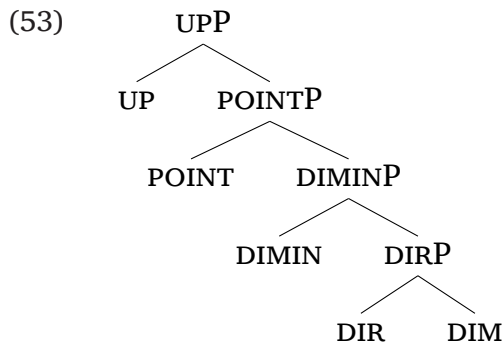


This concludes the discussion of the formal derivation of the positive and comparative degrees with the three different root types. We have shown how the derivations unfold on the basis of the different root sizes and the spellout algorithm, deriving the pattern of data discussed in the introduction: with XL-roots there is never any augment, with M-roots there is an augment in the positive but not in the comparative, whereas with S-roots, there is an augment both in the positive and the comparative.

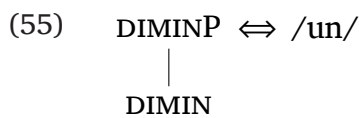
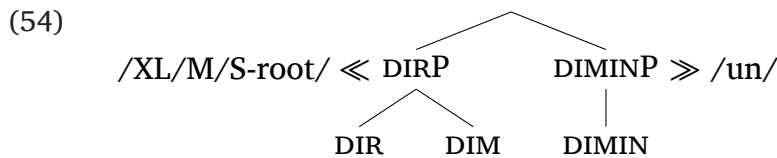
An essential aspect of our analysis are the non-containment/gapped structures we are proposing for the relation between the positive and the comparative. We believe that these are an improvement over any type of approach that would rely on containment structures. It is hard to see how a containment view on the positive and the comparative would be capable of delivering both the truncation pattern and the containment pattern, a result that our approach does achieve.

6.4 The diminutive

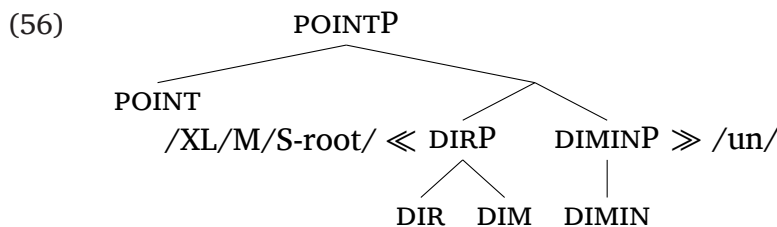
Finally, let us briefly address the issue of the derivation of the diminutive forms. Our goal is to show how they are derived for M-/S-roots, and what prediction this makes for the diminutives of XL-roots. Recall first from Tables 1 and 2 that all adjectives with augments pattern alike in that the diminutive marker *-un* always attaches to the root, and it is always followed by the augment *-k*. We can capture this pattern by proposing that the diminutive marker spells out an (optional) features DIMIN, which is just below POINT, i.e., on top of DIRP in the case of positive adjectives:



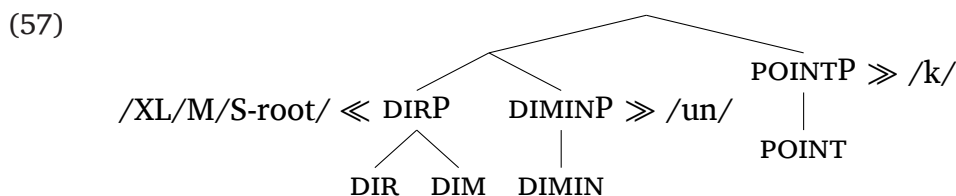
In this structure, we expect that all root sizes (including XL-roots) will maximally spell out DIRP. They cannot spell out the DIMINP, because none of the roots contains the DIMIN feature. Therefore, with all kinds of roots, the DIRP will have to move to the Spec of the DIMIN projection, as in (54). We are assuming that the lexical entry for the diminutive is as in (55).



When POINT is merged on top of (54), we get (56):



There is again no way to spell out without movement. Spec movement (of DIRP) also fails, because the resulting constituent containing POINT and DIMINP cannot be spelled out (there is no lexical entry that matches). Therefore, complement movement produces the structure in (57), where POINTP is spelled out by the augment, and the correct linear order is derived.



This account of diminutives predicts that all adjectives with a DIMIN morpheme must have the augment, including XL-roots. This prediction is borne out, and the diminutives of XL roots must indeed have the augment -k. This is shown in Table 6 for two XL-roots. A diminutive without the augment is ungrammatical.

Table 6: Diminutives of Slovak simplex adjectives.

POSITIVE		DIMINUTIVE				COMPARATIVE			gloss
root	AGR	root	DIMIN	AUG	AGR	root	CMPR	AGR	
mlad	ý	mlad	un	k	ý	mlad	š	í	'young'
čist	ý	čist	un	k	ý	čist	ejš	í	'clean'

7 Suppletion

We believe that our approach based on symmetric/gapped structures can also accommodate earlier results achieved by Bobaljik (2012) pertaining to the absence of ABA patterns in root suppletion in the triplet positive—comparative—superlative. This may come as a surprise, since Bobaljik's observations have traditionally been interpreted as evidence for containment between the positive and the comparative.¹³ Upon closer examination, however, it turns out that containment between the positive and the comparative is not needed. We discuss the issues relating to suppletion and symmetric structures in the current section.

7.1 *ABA

Let us first introduce the basic facts. As Bobaljik observes, root suppletion in the triplet positive—comparative—superlative is restricted. In particular, if the comparative is suppletive with respect to the positive degree (as in *good—bett-er*), then the superlative is suppletive as well (i.e., there is no triplet where *good—bett-er* would be followed by **good-est*). Bobaljik states this as in (58).

- (58) *The Comparative-Superlative Generalization, part I (CSG1):*
If the comparative is suppletive, then the superlative is also suppletive.

This generalisation also holds in Slovak, as the following table illustrates. First, in order to get some background on superlatives in Slovak, the topmost line shows a regular adjective where the superlative adds the prefix *naj-* to the comparative. This is a typical pattern, found with all comparative—superlative pairs in the language.

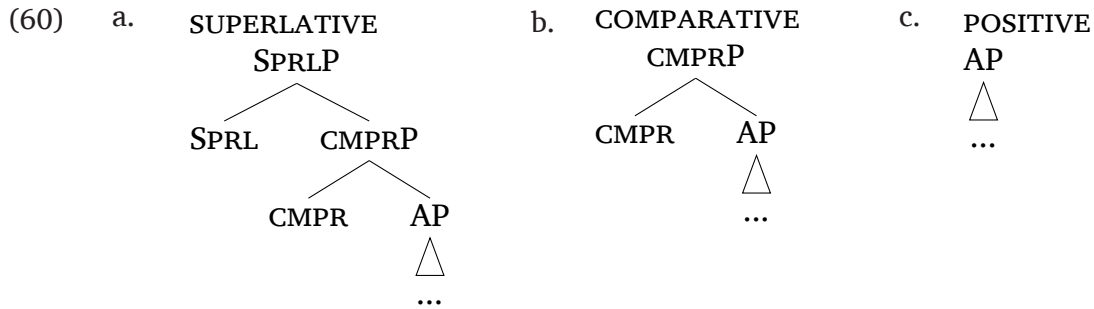
- (59) Superlatives and the *ABA in Slovak (Dvonč et al. 1966: 212)

POS	CMPR	SPRL	gloss
star-ý	star-š-í	naj-star-š-í	'old'
dobr-ý	lep-š-í	naj-lep-š-í	'good'
zl-ý	hor-š-í	naj-hor-š-í	'bad'
mal-ý	men-š-í	naj-men-š-í	'small'
A-ý	B-š-í	naj-A-š-í	not attested

Against this background, the middle part of the table illustrates the pattern found with suppletive adjectives. We see here first of all that the comparative has a suppletive root compared to the positive. The very same suppletive root is found in the superlative, which, as in the regular case, is still derived from the comparative by the prefix *naj-*. Such a pattern of root suppletion is called the ABB pattern by Bobaljik. The final line in the table makes it clear that there is no adjective in the language that would show the ABA pattern, with one root (A) found in the positive and in the superlative, and a different root (B) in the comparative.

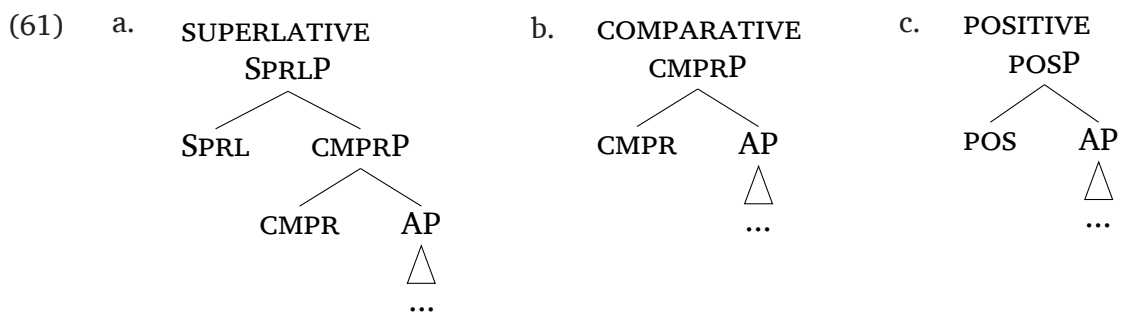
¹³ As far as we could determine, Bobaljik (2012) remains neutral on this issue, though he does draw trees where the comparative contains the positive, see Bobaljik (2012: 32).

These facts are usually interpreted in terms of structures shown in (60) (as suggested in Bobaljik 2012: 32).



Given these structures, Bobaljik excludes the ABA as follows. Suppose that we have an adjective with one root in the positive (A) and a different one in the comparative (B). For such an adjective, the comparative root B will be made sensitive to the presence of CMPR. The positive root A (with no particular specification) does not get to surface in the comparative, because it is less specific than the dedicated comparative root B. In this setup, it is impossible to insert the non-specific root A in the superlative, since the structure of the superlative contains the very same element that triggers the presence of the suppletive root B in the comparative (namely CMPR). This makes it impossible to fall back on the default (or elsewhere) root A. The root B will be a better match in the superlative than the non-specific root A for exactly the same reasons for which it is a better match in the comparative.¹⁴

However, note that the very same reasoning can be replicated for the non-containment structures we have been proposing here, as long as we stick to the hypothesis that the superlative contains the comparative. A simplified version of such a proposal is shown in (61). We are switching back to our original symmetric structures here, noting that they can be interpreted in multiple ways, one of which is that POS and CMPR are two different values of a single head, and another possible interpretation is the ‘gapped’ type of structure we have been investigating in the previous section.



To see how Bobaljik’s original reasoning applies to these structures, consider it once again. Suppose first that we have a pair of suppletive roots, one in the positive (A) and a different one in the comparative (B). One analysis says that the positive root (A) is the elsewhere case, and that the comparative root (B) is sensitive to CMPR. This derives the ABB pattern, and rules out the ABA pattern, for the same reason as before: the structure of the superlative contains the element CMPR, which triggers the appearance of B. This is so even if CMPR decomposes into CMPR + UP, as we have suggested in the previous section. As long as the superlative contains CMPR and the positive lacks it, the *ABA follows.

¹⁴ For an approach to the *ABA generalisation in terms of the phrasal spellout model adopted here, see De Clercq & Vanden Wyngaerd (2017).

It is interesting to note, in addition, that the non-containment structures open some new analytical possibilities. Specifically, if the trees are as in (61), we can consider the root in the comparative (B) to be an elsewhere form, while the root in the positive (A) is triggered by the POS head. Under such a scenario, the POS-specific root A will only appear in the positive, giving (again) rise to an ABB pattern, and not ABA. Under the structures in (61), this is because A is triggered by POS and neither the comparative or the superlative contain POS. Under the ‘gapped’ interpretation considered in (18) above, the positive and the comparative share a common feature (UP) at the top. In order to get an ABB in such a system, A (as the special form) must be triggered due to adjacency to UP. Such adjacency is available in the positive, but fails to obtain in the comparative, as well as the superlative. This makes A unavailable both in the comparative and the superlative. In other words, under both interpretations of the symmetric structures, *ABA follows. In sum, this means that both the scenario in (60) (suggested in Bobaljik’s work) and the one in (61) (which we are exploring here) are equal in their ability to derive the *ABA pattern.

We also wish to note that our proposal does not in fact contradict the core of what Bobaljik proposes. Specifically, he clearly states that what is at stake for *ABA to follow is the containment relation between the comparative and the superlative:

- (62) *The Containment Hypothesis* (Bobaljik 2012: 4):
 The representation of the superlative properly contains that of the comparative.

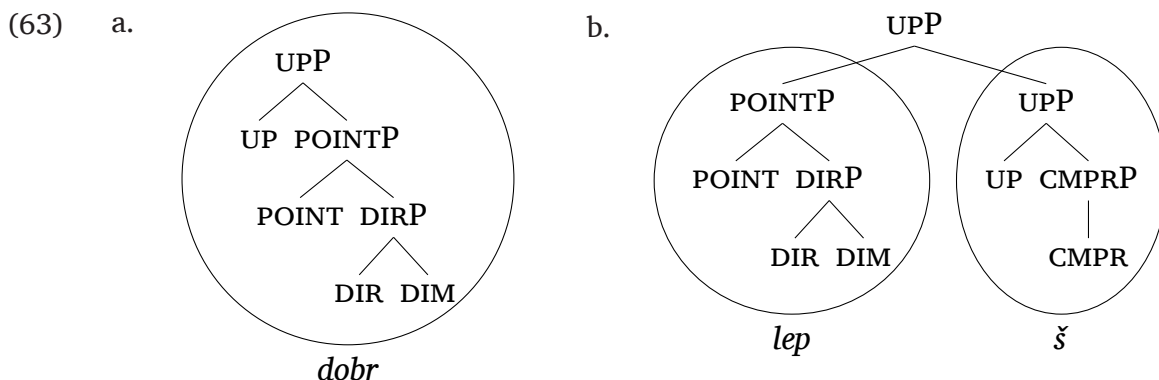
This statement is obviously as much in line with our (symmetric/gapped) proposal of how to be positive (depicted in (61)) as with the Russian-doll containment structures in (60).

In conclusion, we note that there seem to be a number of ways how *ABA patterns may arise in the grammar, as a growing number of works acknowledg (see, e.g., Caha 2017; Andersson 2018; Bobaljik & Sauerland 2018, for how the so-called ‘overlapping’ structures yield *ABA; for an approach to *ABA based on symmetric relation between the first two members like the one suggested here, see Christopoulos & Zompì 2019).

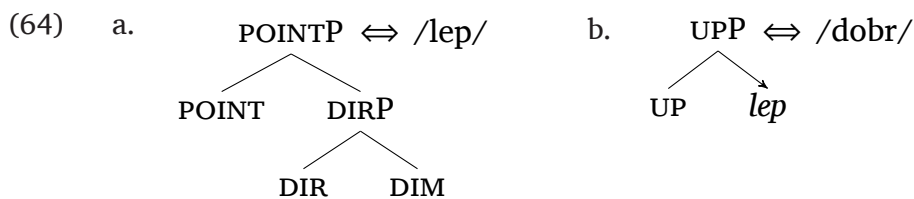
7.2 Suppletion as evidence for backtracking

In this section, we would like to elaborate in more detail on how suppletion is implemented in Nanosyntax, and we would like to use this as an additional evidence for the postulation of backtracking.

To have a specific example to work with, consider, first the suppletive relation between *dobr-ý* ‘good’ and *lep-š-í* ‘better.’ The starting point of our discussion is the fact that the positive degree *dobr-ý* ‘good’ has no augment, and therefore, the root *dobr* must spell out a structure of the size UPP. This is shown in (63a). The root *lep* has no augment either, and it therefore spells out the whole constituent that augment-less roots in the comparative spell out, i.e. POINTP. This is shown in (63b).

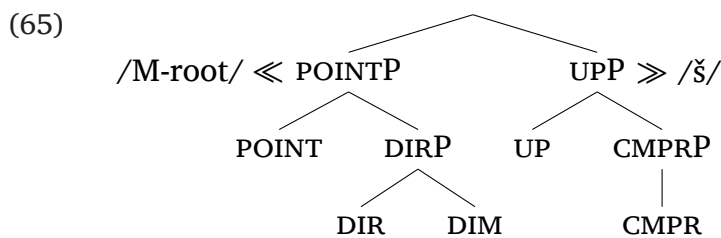


The interesting fact that can be observed in these structures is that we do not need context specification to express the distribution of these roots, because they are already differentiated by the size of the structure they spell out. Specifically, we may easily express their difference by storing the root *lep* ‘bett’ as a lexical item of the size POINTP (an M-root), as in (64a). The root *dobr* ‘good’ is of a different size, namely UPP (an XL-root). However, *dobr* differs from standard XL-roots in that it is the positive degree version of *lep*. An ordinary XL-root like ‘old’ does not stand in a suppletive relationship to another root. The way this special relationship of *dobr* to *lep* is expressed in nanosyntax is by using the so-called pointer (Starke 2014; Caha et al. 2019). In our particular case, the entry of the root *dobr* ‘good’ says that it is the spellout of a structure that includes the head UP as one of its daughters, and where the other daughter corresponds to a structure that has been spelled out by the lexical item *lep* ‘bett’ at the previous cycle. This is what the lexical entry (64b) says.

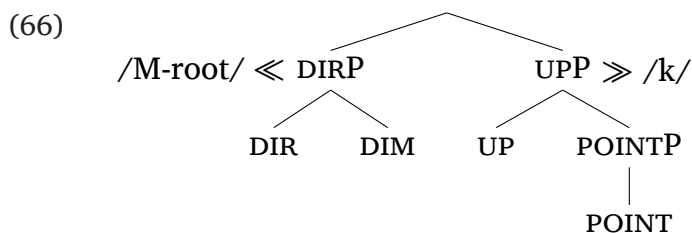


A crucial consequence of this approach is that suppletive lexical items always spell out constituents of different size. It is impossible to have one and the same constituent expressed by two roots with one suppletive for the other.

With the basic understanding of suppletion in place, we want to present a piece of empirical support for the backtracking analysis of the M-roots. Recall that these lack the augment in the comparative, but have it in the positive degree. Under the derivation that we developed earlier, M-roots (which are specified for POINTP) spell out the whole POINTP in the comparative. The relevant structure is given in (65) for convenience, repeated from (47).



This contrasts with the positive. Here (due to Backtracking) M-roots spell out only DIRP. This is shown in the structure (66), repeated from (37).



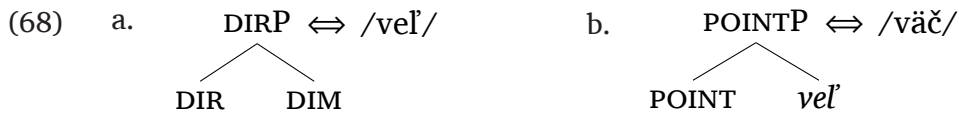
In the context of the theory of suppletion sketched above, this leads to a prediction. Specifically, the difference in the size of structure spelled out by the root may be reflected in a

different shape of the root. Specifically, we allow a situation where an M-sized root spells out POINTP in the comparative, and stands in a suppletive relation to a positive degree root (of the size DIRP), which must combine with an augment.

Slovak provides some evidence that bears out the prediction of the Backtracking derivation. The relevant adjective is the adjective *veľ-k-ý* ‘big’, which has an augment in the positive, loses it in the comparative and simultaneously changes to a suppletive root, as shown in (67) (data from Dvonč et al. 1966: 212).

(67)	POS	CMPR	SPRL	gloss
	veľ-k-ý	väč-š-í	naj-väč-š-í	‘big’

These adjectives thus support our claim that with truncating adjectives, the root spells out constituents of different root sizes in the positive and the comparative, which is a consequence of the backtracking derivation. The lexical items for *veľ-* ‘big, POS’ and *väč-* ‘big, CMPR’ are given below for completeness.



A further prediction that we make is that such suppletion will not arise with S-roots, which have an augment both in the positive and the comparative. These adjectives spell out DIRP in both cases, which makes it impossible to characterise such roots as differing in size. This prediction is also borne out, and we find no suppletion in the containment class of augmented adjectives.

8 The semantics of POS

In the semantics literature, a (silent) POS head is often assumed in the positive but not the comparative degree (e.g., Kennedy 2007). Our symmetric/gapped structures discussed in the previous sections make a rather similar assumption, albeit argued for on morphological grounds. The main commonality between the proposals is that the CMPR head does not apply to the full positive degree, but to something that is less than the positive. The question we wish to address in this section is whether *-k* can be taken to be a realisation of this semantically motivated POS head. We shall argue that the relationship between the augment and the POS head is not one-to-one, and that consequently the augment *-k* cannot be taken as an instantiation of POS.¹⁵

Let us say what the POS head does. The semantic POS head is responsible for the context-sensitivity of gradable adjectives, i.e. the fact that their interpretation depends on a contextual standard or comparison class (cf. Wheeler 1972; Klein 1980, and much subsequent literature). For example, Grano & Davis (2018: 133) provide the following semantics for POS (where g is a measure function, and d_c the degree of the contextual standard):

$$(69) \quad \llbracket \text{POS} \rrbracket = \lambda g_{\langle d, \langle e, t \rangle \rangle} \cdot \lambda x. \exists d [g(d)(x) \wedge d > d_c]$$

¹⁵ Chinese *hen* has been argued to be an overt positive degree morpheme (e.g., Sybesma 1999; Liu 2010), but see Huang (2006); Grano (2012); Zhang (2015) for some alternative views. Grano & Davis (2018) discuss a potential candidate for the realisation of POS in Arabic, but dismiss it as inconclusive.

Applied to an adjective like *tall*, this yields (70):

- (70) $[[\text{POS}]] ([[\text{tall}]]) ([[\text{John}]]) = \exists d[\text{height}(j) \geq d \wedge d > d_c]$
 ‘There is some degree *d* such that John’s height meets or exceeds *d* and *d* exceeds a contextually determined threshold *d_c*.’

The fact that the comparative lacks this reference to a contextual standard in its semantics is the main argument for assuming that this null degree head POS is restricted to the positive degree, and does not occur in the comparative. As stated earlier, such a semantic analysis agrees to some extent with our symmetric/gapped structures given above, where the CMPR head does not attach to the full positive.

However, it is clear from the above that the semantic contribution of *-k* cannot simply be equated with that of the POS head of the semantics literature. The first reason is that the semantics of the POS head encodes meaning that is distributed across two heads in our proposal: first, POS in (69) introduces a contextual standard, and second, it also says that the argument of the adjective has a degree that exceeds this standard. In our gapped proposal, these ingredients are split across two heads, where the lower head POINT introduces the contextual standard, and the higher head UP is the ingredient responsible for the ‘exceed’ component of meaning.

Yet another way in which *-k* is different from the traditional POS is that in the containment class of adjectives, *-k* also shows up in the comparative, where it clearly lacks the POS semantics of (69). This property of *-k* can easily be accounted for under the phrasal spellout theory that we assume. In particular, we have claimed that the lexical entry of *-k* contains both POINT and UP. What that means is that *-k* is a marker that spells out either POINT alone (as in the comparative), or POINT and UP (in the positive). There is, in the phrasal spellout theory, no one-to-one relation between syntactic heads and exponents. The UP/POS meaning is carried by the syntactic head, not by the marker, which may be pronouncing different heads in different environments.

Further support for the claim that *-k* does not correspond in a one-to-one fashion with the semantic POS comes from measure phrases. These may specify an extent, as in *Radek is 1.5m tall*, or ask for one (e.g., *How tall is Radek?*). Adjectives with such measure phrases do not carry positive degree semantics as in (69), yet in adjectives that have an augment, measure phrases do co-occur with *-k*. This is shown in (71):

- (71) a. Tank T-72 je ťaž-k-ý 42 ton.
 tank T-72 is heav-y 42 tons.
 ‘The T-72 tank is 42 tons heavy.’ [Slovak National Corpus]
- b. Aký ťaž-k-ý je tank T-72?
 how heav-y is tank T-72?
 ‘How heavy is the T-72 tank?’

This suggests that *-k* has further internal structure, and is able to realise extents of various types: a contextual extent (as in (69)), or an extent which is overtly specified, as in sentences without a measure phrase, or questioned, as in (71b). This raises intricate questions of the semantics and the distribution of measure phrases, which we cannot do full justice to in the present context, and which we therefore refer to future research. The take home message from this section is that in the phrasal spellout theory, syntactic heads (or features) provide the semantic atoms, whereas the exponents typically map onto these heads in a one-to-many fashion, i.e. a single exponent typically realises multiple semantic

atoms. The quest for a morphological instantiation of the semantic POS head may therefore well turn out to be illusory in the end.

9 Conclusion

We have shown that the distribution of the augment *-k* in Slovak adjectives shows a peculiar pattern, which challenges the candidate universal in Grano & Davis (2018) to the effect that the comparative is either identical to or contains the positive degree. We have argued that this pattern can be fruitfully analysed under the root size approach, where allomorph selection, and more specifically the distribution of zeroes (i.e. zero augments in our case), is a function of root size. Under this approach, there are no zero markers under terminal nodes, but instead roots may realise constituents of variable sizes, thus creating the impression of zero realisation of certain heads or features.

The distribution of the augment *-k* in Slovak also required that we postulate symmetric structures, where a common adjectival base is elaborated on in different directions in the positive and the comparative. We also showed how the root size model provides an elegant account of root suppletion, which maintains the *ABA generalisation of Bobaljik (2012), and which receives some confirmation from suppletive patterns found with certain *k*-adjectives. Finally, we showed how the phrasal spellout model explains the fact that the correlation between the augment *-k* and the semantic atoms of the positive degree is not one-to-one but one-to-many.

Abbreviations

ADJ = adjective, AGR = agreement, AUG = augment, CMPR = comparative, DIM = dimension, DIMIN = diminutive, DIR = direction, POS = positive, SPRL = superlative

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Competing Interests

The authors have no competing interests to declare.

Author Contributions

The four authors have made an equal contribution to this paper. They are listed in the reverse alphabetical order.

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