Against phonologically-optimizing suppletive allomorphy (POSA) in Irish, Tiene, Katu, and Konni

Abstract
Suppletive allomorphs may be conditioned based on their phonological environment. When the allomorphy distribution is phonologically natural, this has motivated theoretical models supporting phonologically-optimizing suppletive allomorphy (POSA), whereby the phonological grammar selects the suppletive allomorph whose output is least marked. This paper re-examines four cases argued to support POSA in Irish, Tiene, Katu, and Konni, and for each provides counter-arguments against this position. In contrast to POSA, I assert that the most straightforward analysis is to formalize the conditioning phonological environment via subcategorization frames, and that the burden of proof falls on proponents of POSA to show otherwise. Subcategorization correctly predicts that subcategorized phonological material is the only phonological material which suppletion can be sensitive to. [An appendix is provided which argues against POSA in another language, Udihe, and instead posits a single underlying form with gradient representations.]

Keywords: suppletion, phonologically-conditioned allomorphy, optimization, subcategorization, phonological representations

1 Introduction[1]

This paper explores the intersection of suppletive allomorphy and phonological optimization. SUPPLETIVE ALLOMORPHY can be defined as two (or more) stored exponents in complementary distribution that realize the same morpho-syntactic features, where one exponent cannot be derived from the other based on the language's phonology. A prototypical example of suppletive allomorphy is English *good* /gʊd/ versus *bett-er* /bɛt/ (^{x}*good-er*). Specifically, this paper focus on phonologically-conditioned suppletive allomorphy, where the trigger of the alternation is a phonological property of the environment, as opposed to a morphological or syntactic feature.

We may contrast two types of phonologically-conditioned suppletive allomorphy. The first type shows a distribution which appears to have nothing to do with phonological markedness, and constitutes a showcase example of (phonological) 'arbitrariness' in suppletion. One often-cited example of a phonologically arbitrary distribution is perfective aspect in the Mayan language Tzeltal [tzh]. The perfective has two suppletive allomorphs, /-oh/ which appears with monosyllabic stems and /-ɛh/ which appears elsewhere.

(1) Tzeltal perfective allomorphy (Paster 2006, 171)

a.	j-al-**oh**	'he has told something'
	s-mah-**oh**	'he has hit something'
	s-kutʃ-**oh**	'she has carried it'
b.	s-tikun-**ɛh**	'he has sent something'
	s-mak'lin-**ɛh**	'he has fed someone'
	s-kutʃ-laj-**ɛh**	'she was carrying it repeatedly'

The two mid vowels /o/ and /ɛ/ show no active alternations, nor would such an alternation make sense based on syllable count. A common way to analyze such arbitrary distributions is through subcategorization frames. As analyzed by Paster (2006, 214), the /-oh/ suffix "left-subcategorizes

[1] I thank the following people for valuable feedback: Arto Anttila, Hossep Dolatian, Laura Downing, Brian Hsu, Larry M. Hyman, Laura Kalin, Shigeto Kawahara, Sam Zukoff, and two anonymous reviewers. Note that throughout, I exclusively use an asterisk * to indicate reconstructed forms and use a superscripted ^{x} to indicate ungrammaticality.

for a verb stem with only a single syllable", while /-ɛh/ "left-subcategorizes for a verb stem with no phonological requirements", and is therefore the elsewhere form. The subcategorized for material is in gray background in Figure 1.

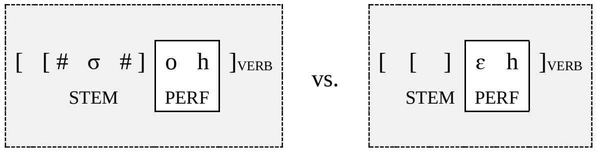

Figure 1: Tzeltal subcategorization frames of perfective allomorphs

In the second type of phonologically-conditioned suppletive allomorphy, the distribution is phonologically natural and therefore appears to be less arbitrary. This is seen in the also well-cited example of 3SG.M allomorphy in Moroccan Arabic [ary], where the enclitic /-h/ appears after vowels but /-u/ appears after consonants.

(2) Moroccan Arabic 3SG.M clitic /-h/ vs. /-u/ (Harrell 1962; Mascaró 2007, 717)

a.	xtˤa-**h**	'**his** error'	b.	ktab-**u**	'**his** book'
	ʃafu-**h**	'they saw **him**'		ʃaf-**u**	'he saw **him**'
	mʕa-**h**	'with **him**'		menn-**u**	'from **him**'

The distribution shows something of a conspiracy: both avoid adjacent vowels/consonants, which would constitute more marked patterns (i.e. ^{x}[xtˤa=u] and ^{x}[ktab=h]; note that throughout this paper, ^{x} = ungrammatical).

Case which show phonologically natural distributions suggest that the individual allomorphs are not arbitrarily indexed to their phonological environments, as under subcategorization. Rather, allomorph choice should be attributed directly to the general phonology, and as such constitutes the emergence of the unmarked (TETU). This interpretation entails that the morphology underdetermines their distribution and that both suppletive allomorphs enter the phonological input. As modeled by Mascaró (2007, a.o.), the allomorphs are "lexically organized as a partially ordered set" in the input and are subject to evaluation by the phonological grammar. The least marked output is chosen as optimal, as shown in Tableau 1.

		xtˤa + {-h, -u}	ONSET	NOCODA
a.	☞	xtˤa-**h**		*
b.		xtˤa-**u**	*!	

Tableau 1: Moroccan Arabic allomorph set in the input

In the literature, there emerge two primary ways to model these phonologically natural patterns. The first approach was exemplified immediately above: suppletive allomorphy with a phonologically natural distribution is modeled as being determined by the phonological grammar. I collectively refer to this approach as supporting PHONOLOGICALLY-OPTIMIZING SUPPLETIVE ALLOMORPHY (POSA), where phonological optimization is a goal rather than a by-product of allomorph selection.[2] Alternative models which "refuse to countenance a role for surface optimization in allomorph selection therefore fall short on explanatory grounds" (Bennett 2017,

[2] As stated in Yu (2017, 5), POSA models support "the conclusion that global optimization, which crucially references the [prosodic] well-formedness of output structures, is needed in allomorph selection". The 'output' here can refer to the surface output (what is typically implied), or an intermediate output in a cyclic model of phonology (e.g. distinguishing outputs in lexical vs. post-lexical stages – Bennett 2017, 259).

270), such as “suffer[ing] from a version of the Duplication Problem … where the same phonological condition is enforced both in allomorph selection and in the language’s phonotactics” (Wolf 2008, 424). Literature in support of POSA start with the so called 'P>>M' models *à la* McCarthy & Prince (1993a, 1993b), and thereafter include an extensive group, e.g. Mester (1994), Tranel (1996), Kager (1996), Mascaró (1996; 2007), Hyman & Inkelas (1997), Booij (1998), Plag (1999), Bonet (2004), González (2005), Elías-Ulloa (2006), Bonet, Lloret, & Mascaró (2007), Wolf (2008; 2015), Anderson (2011), Henderson (2012), Bermúdez-Otero (2012; 2016), Smith (2015), Yu (2017), Bennett (2017), and de Belder (2020).

In contrast, the second approach rejects direct reference to phonological optimization in suppletive allomorph selection, and instead both phonologically arbitrary and phonologically natural distributions are modeled via a central morphological mechanism, such as subcategorization. The core assertion is that (suppletive) allomorph selection takes place in a pre-phonological stage rather than by the phonological grammar, with phonologically-optimal outputs being incidental products of other pressures. Proponents in this camp include Paster (2006; 2009; 2015), Bye (2008), Embick (2010), Pak (2016a; 2016b), and Kalin (2020).

This paper provides evidence for this second approach and against direct appeal to optimization in allomorphy choice. I re-examine four case studies from Irish, Tiene, Katu, and Konni said to support POSA, and for each I provide counter-arguments against this position. The first involves Irish plural allomorphy, where a POSA interpretation is undermined by the fact that *ad hoc* phonological constraints must be posited to actually induce optimization. Second, in Tiene the relevant stems supporting POSA are extremely limited, and I argue that there is no synchronically separable affix. Third, in Katu I argue that the surface allomorphs are derived from a single underlying representation, and therefore there is no suppletion. Finally, in Konni I argue that the allomorphs in question are not actually in competition, and if they were it would predict many more instances of POSA in Konni than are found.

This paper is organized as follows. Section 2 examines Irish, based on Bennett (2017). Section 3 examines Tiene and section 4 to Katu, both based on Yu (2017). Section 5 examines Konni, based on Wolf (2008). For all case studies, I supplement the presentation with data from that language’s literature to support my positions. Section 6 provides a discussion of these reanalyses, and section 7 provides a brief summary. An Appendix provides a supplemental case study from Udihe, where supposed suppletive allomorphy in support of POSA is reanalyzed as a single gradient representation.

2 Irish

The first case study is on Irish [gle] (Celtic, Indo-European: Ireland). The presentation of Irish allomorphy as phonologically-optimizing follows argumentation in Bennett (2017), abbreviated as [B17] in the examples. The empirical focus is on plural marking in nouns, looking at several modern dialects. A sample of plural marking is in Table 1, exponed as a suffix ([-ə], [-ənə] in a.-b.), some change in the stem (palatalization in c.), or some combination (d.).

	Noun	Singular	Plural	Gloss
a.	*cloch*	klox	klox-ə	‘stone(s)’
b.	*deoch*	d^{j}ox	d^{j}ox-ənə	‘drink(s)’
c.	*bád*	bɑːd	bɑːd^{j}	‘boat(s)’
d.	*capall*	kɑpəl	kap^{j}l^{j}-ə	‘horse(s)’

Table 1: Sample of plural marking in Irish (B17, 230)

Bennett demonstrates that despite Irish plural marking being notoriously ‘erratic’ – there are at least 26 ways to form plurals (Ó Siadhail 1991, 159) – there is evidence for a productive subpattern involving two suffixes.[3] One suffix is -(*e*)*anna* [-ənə] or -(*e*)*annaí* [-ənɪ]~[-əni] depending on the dialect, and the other is -(*e*)*acha* [-axə]~[-ɑxə]. Bennett takes on the difficult task of normalizing patterns and surface forms across numerous Irish dialects and authors, resulting in the multiple orthographic/phonological variants seen. Because of this, I shall refer these two plural suffixes as the N-form and the X-form in what follows so as to abstract away from these details. When dialect differences become important, this is noted overtly.

The N-form and X-form are mostly in complementary distribution, shown in (3). The N-form appears after 1σ roots (a), while the X-form appears elsewhere, such as the vast majority of 2σ roots (b). However, after a 2σ root with irregular final stress, Bennett shows that the N-form occurs (c). This reveals that the conditioning property is the location of stress rather than syllable count *per se*, at least in the dialects of focus.[4]

(3) Irish plural suppletion conditioned by stress in the stem

a.	ˈσ	*loch*	[ˈlox]	→	*loch**annaí***	[ˈlox-**əni**]	'lake(s)'	(B17, 231)
b.	ˈσσ	*gráinnín*	[ˈgrɑːnʲiːnʲ]	→	*gráinnín**eacha***	[ˈgrɑːnʲiːnʲ-**axə**]	'grain(s)'	(B17, 232)
c.	σˈσ	*meaisín*	[mʲæːˈʃiːnʲ]	→	*meaisín**eanna***	[mʲæːˈʃiːnʲ-**ənə**]	'machine(s)'	(B17, 232)

While there are exceptions (*uibheacha* [ˈɨvʲ-ɑxə] 'eggs', where we expect the N-form), one generalization holds across all dialects: the N-form never appears with [ˈσσ] stress patterns. In other words, the N-form *must* be adjacent to stress. Bennett emphasizes that the N-form and X-form are suppletive with no common underlying representation: no n~x alternation exists in Irish, nor would such an alternation make phonological sense based on the stress or syllable count of the stem.

In order to understand Bennett's argument that this is phonologically-optimizing, a brief excursion into the Irish stress and weight system is required, and its dialectal distribution. One set of Irish dialects have quantity-insensitive stress, including West Ulster (in the North) and Achill (in the West). In these dialects, default stress is always on the first syllable of the word. This holds even if it results in a non-optimal trochee, e.g. *gabáiste* 'cabbage' /gɤbɑːʃtʲə/ which maps to [(ˈ**gɤ**.bɑːʃ).tʲə]. There exist a handful of exceptional forms with pre-specified stress on a non-initial position, e.g. *meaisín* [mʲæː.(ˈ**ʃiːnʲ**)] in (3) above.

In contrast to these dialects, Munster Irish (in the South) is quantity-sensitive, and does *not* show a uniform and default initial stress. This is exemplified in (4), somewhat simplifying for our purposes.[5] Essentially, long vowels and diphthongs are heavy and attract stress (a.). Otherwise, stress appears initially, such as when there are only light syllables (b.).

(4) Irish quantity sensitive stress in Munster dialect in the South

a.	*marcaraer*	'mackerel'	[mar.kə.ˈ**reːr**]	LLˈ**H**	(cf. Western dialects: [ˈ**mar**.kə.reːr])
b.	*anagal*	'corrupt matter'	[ˈ**a**.nə.gəl]	ˈ**L**LL	(B17, 240)

[3] See Bennett (2017, 234) for sources discussing their productiveness. Some representative quotations are from Hickey (1985): "now the vast majority of monosyllabic loan-words also have the /əniː/...in the plural" (p. 157, citing de Bhaldraithe 1953a, 42f.), and "where these are disyllabic the infix /əx/ is always found...seen clearly with loan-words" (p. 158, citing de Bhaldraithe 1953b, 22).

[4] As Bennett reminds the reader, Irish plural formation is subject to extensive variation. In the original source (Hickey 1985, 159), there is in fact variation between an N-form and X-form for the plural of 'machine', /ma's'iːn**əniː**/~ /ma's'iːn**əxiː**/ (in original transcription). Moreover, in Carnie's (2008, 227) reference guide to Irish nouns the plural form is *meaisín-**í*** with a suffix /-iː/ rather than either an N- or X-form.

[5] Munster Irish stress is notoriously complex and without consensus even descriptively (see in particular findings contradictory to the general literature in Blum 2018).

Closed syllables are light in Munster Irish, such as [gəl] in b. above. There is one exception: sequences of /ax/ pattern as heavy, demonstrated in (5) below. These exceptionally attract stress if they appear in the second position of the word (a.-b.). Sequences of /ax/, however, only have 'intermediate' prosodic weight. They do not attract stress if they appear in the third position (c.), nor do they attract stress if a long vowel/diphthong is present (d.).

(5) Munster Irish quantity sensitive stress with /ax/ sequences

a.	*bacach*	'lame'	[bə.ˈ**kax**]	L.ˈ**ax**	(cf. other dialects: [ˈ**L**.ax])
b.	*slisneacha*	'chips'	[sliʃ.ˈ**nʲax**.ə]	L.ˈ**ax**.L	
c.	*Sasanach*	'English person'	[ˈ**sa**.sə.nəx]	ˈ**L**.L.ax	
d.	*léimeacha*	'jumps'	[ˈ**lʲeː**.mʲə.xə]	ˈ**H**.ax.L	(B17, 240-241,253)

To capture this behavior of /ax/ sequences, Bennett analyzes them as a quasi-diphthong where /x/ is moraic and syllabified with the preceding vowel, i.e. a representation [ax$_{\mu}$]. One important assumption is that although the other dialects are quantity-insensitive (e.g. West Ulster and Achill, above), /ax/ sequences in *all* dialects are uniformly represented as [ax$_{\mu}$]. We will see the importance of this assumption momentarily.

Having established these phonological properties, we are now prepared to see the argument for Irish plural allomorphy as phonologically-optimizing. As stated, the N-form of the plural appears after stressed syllables. This is an optimizing pattern because if an X-form were to appear there, this would constitute a (semi-)heavy syllable in a weak position, i.e. a marked structure [ˈσ.H]. To exemplify, consider the noun *loch* [ˈlox] 'lake' in (6) below. Keep in mind that the forms below are from quantity-*in*sensitive Irish varieties, and *not* from quantity-sensitive Munster.

(6) Plural *loch* → *loch-annaí* 'lake(s)' avoids non-optimal trochee [ˈσ.H]

a. N-form: more optimal (ˈL.L) trochee [(ˈlo.xə).nɪ]

b. X-form: less optimal (ˈL.H) trochee ˣ[(ˈlo.xax$_{\mu}$).ə]

As a monosyllabic and therefore stress-final noun, *loch* [ˈlox] 'lake' takes the N-form for its plural, i.e. *lochannaí* 'lakes' [(ˈlo.xə).nɪ]. If the form were to take the X-form, it would be parsed as ungrammatical ˣ[(ˈlo.xax$_{\mu}$).ə] by the stress algorithm, resulting in the marked [ˈσ.H] sequence. Here we see the importance of /x/ being moraic even in quantity-insensitive dialects. If it were not moraic, then /ax/ sequences would not be considered (semi-)heavy and consequently optimization would not play a role in allomorph selection.

Having established the core of Bennett's argumentation, we can now ask: does Irish support a model where phonological optimization is the primary motivation in choosing the plural allomorph? I argue that does is not, based on four counter-arguments. First, an analysis as optimization rests on the assumption that /ax/ constitutes a (semi-)heavy syllable [ax$_{\mu}$] in all Irish dialects. This position has been challenged even in the quantity-sensitive dialects like Munster Irish which justified this representation in the first place. Recently, Kukhto (2019) re-examines words in Munster Irish like *bacach* 'lame' [bə.ˈ**kax**], where the rime /ax/ exceptionally 'attracts' stress away from its expected initial position. His central claim is that "in words with exceptional stress on /ax/ in the second syllable, the first syllable contains a phonologically reduced vowel /ə/, which blocks the stress and makes it shift to the second syllable" (p. 1566). This reorients the interpretation of words like *bacach*: /ax/ does not attract stress but rather the initial /ə/ repels it.

Kukhto provides numerous supporting arguments which I briefly recap. From phonetic measurements, he shows that before stressed /a/ (which includes words containing /ax/), only [ə] appears. That this is underlying /ə/ is supported by several phonological arguments. For example, if /ax/ is preceded by schwa then it cannot undergo stress retraction. Compare *corcán* [kərˈkɑːn] ‘pot’ in the phrase *corcán mór* [ˌkɔrkɑːn ˈmuːər] ‘big pot’ where it shows stress shift, to *bodach* [bəˈdax] in *bodach mór* ˣ[ˌbɔdəx ˈmuːər] ‘bigwig’ where stress shift is *not* possible. If Kukhto’s arguments hold, then evidence for optimization based on /ax/ as heavy is essentially nullified.

Further, a second counter-argument comes from an unexpected fact under the optimization model: there are many exceptional X-forms which appear after a stressed syllable, but no exceptional N-forms which appear after an unstressed syllable. This is summarized below:

	Normal	Exceptional
N-form	(ˈ**σ**-ə)nə	ˣ(ˈ**σ**σ)-ənə
X-form	(ˈ**σ**σ)-axə	(ˈ**σ**-ax)ə

Table 2: Irish exceptional patterns with N- and X-forms

This is surprising from an optimization perspective because the exceptional X-forms of the shape [(ˈσ-ax)ə] are examples of non-optimal feet [ˈσ.H]. In contrast, N-forms of the shape ˣ[(ˈσσ)-ənə] are not attested, even though they would *not* result in non-optimal feet. We might expect this situation to be reversed if phonological optimization played a central role in allomorph choice.

A third counter-argument against Bennett is that subcategorization is required to account for a great deal of the Irish plural system, even if we were to accept a small role for a POSA analysis. This is seen in the numerous strategies to form plurals in the language, which have to be arbitrarily indexed to certain lexical, morphological, or phonological environments. Even among the productive areas of the plural system (e.g. as seen in loanwords), it is certainly not the case that only /ənə/~/axə/ optimizing patterns occur. Numerous patterns with loanwords are documented as in (7), many occurring with plural /-iː/ (a.-c.), with or without other changes such as [t]-epenthesis. Particularly interesting are the three loans in d.-e., which correspond to words with final stress in English. From Carnie (2008), one word is exceptionally pluralized with an X-form (d.) while another shows internal palatalization marking (e.). Neither shows the expected N-form after the stressed syllable.[6]

(7) Sample of plural strategies for loanwords in Irish

a.	*seó*	s’oː	→	s’oː**t’iː**	‘show(s)’	(Hickey 1985, 148; cf. *seónna* – Carnie 2008, 255)
b.	*tornapa*	tʌrnɪpɨ	→	tʌrnɪp**iː**	‘turnip(s)’	(Hickey 1985, 154)
c.	*draein*	dreːn’	→	dreːn**təxi:**	‘drain(s)’	(Hickey 1985, 149; cf. *draenacha* – Carnie 2008, 101)
d.	*canáil*	[kəˈnɑːlʲ]	→	*canál**acha***	‘canal(s)’	(Carnie 2008, 89; teanglann.ie)
e.	*patról*	[pəˈtroːl]	→	*patr**ó**il*	‘patrol(s)’	(Carnie 2008, 238; teanglann.ie)

Bennett in fact concedes that in certain dialects *only* the subcategorization approach is available, due to internal changes in the pronunciation of plural markers (p. 261). As established, in West Ulster, Achill, and Munster Irish, the X-form has the shape /axə/. In the former two, both stressed and unstressed /ax/ sequences surface as [ax], whereas in Munster unstressed /ax/ surfaces as [əx]. It is for these dialects that the optimization argument holds, based around moraic [ax_{μ}]. However, in other dialects such as Connacht (in the West) and East Ulster (in the North), the cognate sequences are always pronounced /əx/, whether stressed or unstressed. In these dialects, there is no evidence that /əx/ is anything but a regular light syllable and therefore no optimization argument is possible. This is summarized in Table 3 below.

[6] Pronunciations are transcribed by me, based on recordings at teanglann.ie.

	West Ulster (N)	Achill (W)	Munster (S)	Connacht (W)	East Ulster (N)
Stressed pronunciation:	ˈaxə	ˈaxə	ˈaxə	ˈəxə~ˈəxiː	ˈəxə~ˈəhə
Unstressed pronunciation:	axə	axə	əxə	əxə~əxiː	əxə~əhə
	‘Optimizing’ dialects			‘Non-optimizing’ dialects	

Table 3: Realizations of /ax/ sequences across dialects

Regardless, even in these ‘non-optimizing’ dialects with uniform [əx], the principal conditioning factor for the N-form vs. X-form is syllable count, just as in ‘optimizing’ dialects. If we use subcategorization frames of the type ‘[PL] ↔ N-form / 1σ __’ exclusively, this would allow us to generalize a single subcategorization analysis across Irish dialects (*modulo* dialects like Achill where the N-form is also found after a stressed σ).

The fourth and final counter-argument involves dissecting the phonological grammar itself, and determining what counts as evidence for the emergence of optimization. The explanatory power of the POSA analysis of Irish is that it can reduce plural allomorph selection to the “general properties of the phonology of Irish”, whereas subcategorization theories “must recapitulate the same phonological generalization(s) in distinct components of the grammar” (Bennett 2017, 266). At issue is exactly which ‘general properties’ of the phonology are charged with differentiating allomorph candidates. I contend that Bennett’s claim falls short, as the exact constraints which differentiate between allomorphs must be introduced *solely* to account for the distributional quirk of N- and X-forms. In other words, the constraints which optimize one allomorph over the other are not actually independently needed by the phonology.

To expand on this counter-argument, let us return to the general properties of Irish phonology. As established, in the quantity-insensitive Irish dialects stress is uniformly realized at the left edge regardless of weight. Bennett captures this in a grammar where constraints enforcing binary trochees (FTBIN and TROCHEE) and aligning all feet to the left edge (ALLFTL) are ranked high. Other constraints are ranked low, such as PARSE(σ) enforcing exhaustively parsing syllables into feet, and the Weight-to-Stress Principle (WSP) stating that heavy syllables be stressed. A Optimality Theoretic tableau is provided below, with a light-heavy-light word /gɤbɑːʃtʲə/ ‘cabbage’.

/ gɤbɑːʃtʲə / ‘cabbage’	FTBIN	TROCHEE	ALLFTL	PARSE(σ)	WSP
a. ☞ (ˈ**gɤ**.bɑːʃ).tʲə				*	*
b. gɤ.(ˈ**bɑːʃ**).tʲə			*!	**	
c. (gɤ.ˈ**bɑːʃ**).tʲə		*!		*	
d. (ˈ**gɤ**).bɑːʃ.tʲə	*!			**	*

Tableau 2: Irish quantity insensitive stress grammar (B17, 249)

Building on the phonological grammar from Tableau 2, next consider the amalgamated Tableau 3 below with four kinds of inputs labeled A-D. Each of these inputs has a different stem shape plus two potential plural forms, an X-form and an N-form. This competition is indicated by the notation {-axə > -ənɪ}, which conventionalizes that all else being equal the X-form is preferred over the N-form, enforced by the constraint PRIORITY (Mascaró 2007). All outputs which have the N-form therefore violate PRIORITY by choosing the less preferred allomorph.

For input A – a non-exceptional 2σ root – we see that PRIORITY solely differentiates between the X-form (chosen) and the N-form (not chosen), which are otherwise equally optimal with respect to higher ranked phonological constraints. However, the use of a PRIORITY constraint undermines a POSA analysis. Because the sole function of PRIORITY is to rank otherwise equivalent morphological forms, this constraint plays no role in the ambient phonological grammar. Therefore, it is not strictly speaking true that phonology alone chooses between candidates. PRIORITY shares with subcategorization approaches that certain arbitrary distributions must be encoded directly which do not fall out of any phonological principle (Paster 2006, 86 fn 30).

Input A: / rɨlʲikʲ / + {-axə > -ənɪ}	TROCHEE	ALLFTL	PARSE(σ)	WSP$_{FT}$	**PRIORITY**	WSP
a. ☞ (ˈ**rɨ**.lʲi).kʲax$_{\mu}$.ə **X-form**			**			*
b. (ˈ**rɨ**.lʲi).kʲə.nɪ N-form			**		*!	
Input B: / lox / + {-axə > -ənɪ}	TROCHEE	ALLFTL	PARSE(σ)	**WSP$_{FT}$**	PRIORITY	WSP
a. ☞ (ˈ**lo**.xə).nɪ **N-form**			*		*	
b. (ˈ**lo**.xax$_{\mu}$).ə X-form			*	*!		*
Input C: / ʃɪːg / + {-axə > -ənɪ}	TROCHEE	ALLFTL	PARSE(σ)	**WSP$_{FT}$**	PRIORITY	WSP
a. ☞ (ˈ**ʃɪ**ː.gə).nɪ **N-form**			*		*	
b. (ˈ**ʃɪ**ː.gax$_{\mu}$).ə X-form			*	*!		*
c. (ˈ**ʃɪ**ː).gax$_{\mu}$.ə			**!			*
Input D: / də.ˈ**gʲrʲi**ː / + {-axə > -ənə}	TROCHEE	ALLFTL	PARSE(σ)	**WSP$_{FT}$**	PRIORITY	WSP
a. ☞ də.(ˈ**gʲrʲi**ː.ə).nə **N-form**		*	**		*	
b. də.(ˈ**gʲrʲi**ː.ax$_{\mu}$).ə X-form		*	**	*!		*
c. (də.ˈ**gʲrʲi**ː).ax$_{\mu}$.ə	*!		**			*

Tableau 3: Irish constraint grammar (quantity-insensitive Achill and West Ulster dialects)

Moreover, inputs B-D also demonstrate that the ambient phonological grammar falls short of selecting the correct forms by itself. Consider Input B with a 1σ root. Based on PRIORITY, the X-form would be chosen here because it dominates the constraint WSP. However, this is not the case: the surface form is [(ˈ**lo**.xə).nɪ]. To solve this paradox, Bennett clones a WSP constraint which only applies to footed heavy syllables (WSP$_{FT}$). With this ranked higher than PRIORITY, it rules out the X-form. This equally applies to heavy 1σ roots (Input C) and 2σ roots with exceptional (pre-specified) final stress (Input D). However like with PRIORITY, the constraint WSP$_{FT}$ plays no role in the Irish phonological grammar otherwise (cf. Tableau 2). This is in fact tacitly admitted (Bennett 2017, 248): the WSP$_{FT}$ constraint is only independently active in the phonology of Conamara Irish (Bennett 2012), a dialect group outside of those studied in Bennett (2017). In other words, in the dialects which justify the optimization analysis, the constraint WSP$_{FT}$ is not otherwise phonologically active.

Under optimization, allomorph selection constitutes an instance of the "emergence of the unmarked" (TETU) where phonological constraints "PARSE(_) and WSP$_{FT}$ are mostly dormant in the language at large" , with "the pressures that they exert [being] generally too weak to materially affect prosodic structure" (Bennett 2017, 263). The result is an analytic schism: suppletion which looks non-optimizing is modeled as subcategorization, but suppletion which looks optimizing is modeled by adding low-ranked *ad hoc* constraints to the phonological grammar. I follow a common type of reasoning against this, as found in the subcategorization literature (e.g. Paster 2006): it is conceptually simpler to model both types as subcategorization (which is independently needed) rather than posit such constraints.

To recap, our four counter-arguments against the optimization/POSA interpretation are (i) [x] in [ax] sequences is not moraic and therefore does not constitute a heavy syllable, (ii) there are several unexpected exceptional forms if [ax] were heavy, (iii) subcategorization is independently required for plural allomorphy and for some dialects the only option, and (iv) an optimization account requires positing phonological constraints whose sole purpose appears to be to correctly adjudicate between allomorphs.

3 Tiene

The second case study is from Tiene [tii] (Bantu, Niger-Congo: The Democratic Republic of the Congo), which Yu (2017) showcases as a prime example of phonologically-optimizing suppletive allomorphy, building on previous publications where a POSA analysis of Tiene is implicated (Hyman & Inkelas 1997; Orgun & Sprouse 1999; Hyman 2010; Inkelas 2014). The relevant data involves so-called verb extensions – derivational affixes with common form-meaning pairings across the Bantu family. In Tiene, verb extensions have numerous surface allomorphs only some of which can be derived through general phonology. Examples are in (8) of the stative (a.), the causative (b.), and the applicative (c.), where the relevant portion of the form is in bold. The source for the data is Ellington (1977), supplemented by Hyman (2010) with a few data points from Guthrie (1953; 1960). In (8), the surface form is at the right, appearing with a (harmonizing) Bantu final vowel.

(8) Tiene verbal extension allomorphy

a.	Stative	yaat-	‘split’	yat-**ak**-	‘be split’	[yatak-a]
		kab-	‘divide’	ka-**la**-b-	‘be divided’	[kalab-a]
		nyak-	‘tear’	nya-**la**-k	‘be torn’	[nyalak-a]
b.	Causative	mat-	‘go away’	ma-**as**-	‘cause to go away’	[maas-a]
		lab-	‘walk’	la-**sa**-b-	‘cause to walk’	[lasab-a]
		lók-	‘vomit’	ló-**se**-k-	‘cause to vomit’	[lósek-ɛ]
c.	Applicative	bót-	‘give birth’	bó-**o**-t-	‘give birth for’	[bóot-ɛ]
		yɔb-	‘bathe’	yɔ-**lɔ**-b-	‘bathe for’	[yɔlɔb-ɔ]
		yók-	‘hear’	yó-**le**-k-	‘listen to’	[yólek-ɛ]

Although the surface allomorphs are distinct in each case – suffixal -Vk vs. infixal -lV- (with an underspecified vowel), -Vs vs. -sV-, and -V- vs. -lV- – their conditioning environment is the same: whether the stem ends in a coronal or non-coronal consonant.

This distribution is completely predictable and, within the context of Tiene, phonologically natural. To see why, let us turn to the general Tiene phonology. The relevant phonological domain is what can be called the ‘prosodic stem’ (Hyman 2010), which consists of the root plus any derivational extensions (ignoring the Bantu final vowel, which is not relevant for our purposes).[7] There are three important templatic features of the prosodic stem: the limited number of CV shapes (a.), restrictions on coronal/non-coronal consonants (b.), and agreement in nasality (c.).

(9) Tiene prosodic stem template restrictions

a.	Shapes:	CVVC ~ $C_1VC_2VC_3$
b.	Coronality:	C_2 = [+CORONAL] , C_3 = [-CORONAL]
c.	Nasality:	C_2 and C_3 must agree for [±NASAL]

Both derived and non-derived stems fit this template. For example, Proto-Bantu *CVCVC stems underwent metathesis to fit this template (Hyman 2010, citing Guthrie’s reconstructed forms), e.g. *kótok*- ‘gnaw’ (from PB *kó**k**o**t**), *tóleb*- ‘pierce’ (from PB *tó**b**o**d**), *etc*.

Relevant for this paper, Yu argues that allomorphy choice for derivational suffixes is determined by this template as well. Consider in Table 4 below causative forms (a. and b.) and applicative forms (c. and d.), taken form (8). Both the causative and applicative affixes contain a coronal consonant. If it appears with a coronal-final root (a. and c. below), the template cannot be

[7] The ‘prosodic stem’ is the term used in Hyman (2010), and is equivalent for our purposes to what Hyman & Inkelas (1997) call the ‘derivational stem’ (DStem).

satisfied as there would be coronals in both C_2 and C_3 positions. Instead, only the obstruent coronal surfaces in a CVVC stem, and the other coronal is deleted. In contrast, if the root ends in a non-coronal (b. and d.), the affix straightforwardly infixes to fit the template. All other possible outputs (marked with an x, and greyed out) violate the stem template (or show egregious deletion, e.g. ˣyɔɔl-).

	Root	Suffix -VC	Infix -CV-	Infix -VC-		
a.	mat-	ˣmat-**as**-	ˣma-**sa**-t-	ˣma-**as**-t-	ma-**as**-	ˣma-**a**-t-
b.	lab-	ˣlab-**as**-	la-**sa**-b-	ˣla-**as**-b-	ˣla-**as**-	ˣla-**a**-b
c.	bót-	ˣbót-**ol**-	ˣbó-**lo**-t-	ˣbó-**o**l-t-	ˣbó-**o**l-	bó-**o**-t-
d.	yɔb-	ˣyɔb-**ɔl**-	yɔ-**lɔ**-b-	ˣyɔ-**ɔ**l-b-	ˣyɔ-**ɔ**l-	ˣyɔ-**ɔ**-b-

Table 4: Tiene causative and applicative allomorphs

With these two derivational types, the position and shape of the affix is entirely predictable based on the general template. Given the similar forms of the surface allomorphs here, it is reasonable to conclude there is only one underlying representation for the suffix, and therefore no suppletion. Straightforward representations are /-sV-/ and /-lV-/ with underspecified vowels, which are subject to metathesis and/or deletion depending on the phonological environment.

The same cannot be said for the stative, shown in Table 5 below. Here, the two stative forms -Vk and -lV- are also distributed according to the prosodic stem template: the velar suffix occurs with coronal-final roots (a.), and the coronal infix occurs with non-coronal-final roots (b.-c.). However, these forms cannot be derived from a common form: there is no natural operation which derives k from l or vice versa. All of the works on Tiene cited above treat the stative affixes as listed allomorphs.[8]

	Root	suffix -Vk	infix -lV-
a.	yaat-	yat-**ak**-	ˣya-**la**-t-
b.	kab-	ˣkab-**ak**-	ka-**la**-b-
c.	nyak-	ˣnyak-**ak**-	nya-**la**-k-

Table 5: Tiene proposed suppletive allomorphs for stative

Because the distribution is predictable from independent phonological constraints (i.e. the prosodic stem template) and because it constitutes suppletion, it meets the definition of POSA. Following Yu's logic, this undermines the necessity and utility for subcategorization.

Where I disagree with this Yu's analysis is that there is a dedicated stative morpheme in the language (let alone suppletive allomorphs). Rather, I claim that the root has frozen morphology (e.g. of the type *tru-**th***, ***for**-give*, *etc*.). Returning to the original source for Tiene, Ellington (1977, 115) states that the stative is quite limited, occurring "with only a relatively small number of simplex radicals". Examining all available sources, there appear to be at most ten stative stems. Six of these forms appear with -Vk, what I refer to as the K-form. Historically, these derive from Proto-Bantu stative suffix *-ɪk, and are therefore the diachronically expected forms.[9] In contrast, only four occur with the -lV- infix, which I refer to as the L-form (in Table 6).

[8] To quote Hyman & Inkelas (1997), "both the stative and reversive have two lexically listed allomorphs, one coronal (the /L/, which alternates between [l] and [n] according to nasal harmony context) and one velar (the /K/, which alternates between [k] and [ŋ])". Yu adopts this wholesale: "both the stative and reversive have two suppletive allomorphs, one coronal … and one velar" (p. 10). We treat the reversive shortly.

[9] The six K-forms are *bóle**k**-* 'be broken' (< *ból-* 'break'), *fasa**k**-* 'be driven through' (< *faas-* 'drive through'), *kóte**k*** 'be untied' (*kóót-* 'untie'), *yata**k**-* 'be split' (*yaat-* 'split'), *sɔ́nɔ**ŋ**-* 'be written' (*sɔ́n-* 'write'), and *vwunye**ŋ**-* 'be mixed' (*vwuny-* 'mix'). Recall that nasal harmony in the prosodic stem changes /k/ to [ŋ].

	Root		Prosodic stem		Cf. Proto-Bantu (Zones)[10]
a.	kaa-	'fasten'	ka-**al**-	'be fastened'	*gàng- 'tie up' (B,C) *kàng-/*kàang- (B)
b.	kab-	'divide'	ka-**la**-b-	'be divided'	*gàb- 'divide' (B,C) *gàbɪd 'give away' (B) *gàbʊd 'divide' (C)
c.	nyak-	'tear'	nya-**la**-k-	'be torn'	*nʊ̀kʊd 'tear off' (C)
d.	kam-	'twist'	ka-**na**-m-	'be turned over'	*kám- 'squeeze, wring' (B,C) *kámʊd- 'wring' (B,C) *gàdam 'lie on back' (C)

Table 6: Tiene compete set of stative L-forms

Several of these may in fact be retentions of Proto-Bantu words which underwent semantic drift. For example, the longer stem *kalab-* in b. is relatable to reconstructed forms *gàbɪd 'give away' (Bantu Zone B) or *gàbʊd 'divide' (Zone C), and the form in c. to *nʊ̀kʊd 'tear off' (Zone C), *modulo* metathesis of C_2 and C_3, introduced above. The form in d. is straightforwardly relatable to *gàdam 'lie on back' (Zone C), even without metathesis. While Tiene itself is classified as Zone B, it lies at the intersection of Bantu Zones B and C which suggests one should find features of both zones (Ellington 1977, *x*).

The common canon of Bantu stem-extending affixes are severely restricted across Tiene and closely related languages. This is an observation going back at least to Guthrie's (1953) discussion of the Tende-Yanzi subgroup (B.80) to which Tiene belongs ("a characteristic of this whole group is the absence of regular types of extended radical" – p. 84). Larry Hyman (p.c.) brings up that in their correspondence, Ellington stated that only the causative (-sV- ~ -Vs) and applicative (-lV- ~ -V-) are plausibly productive. Importantly, it is these two derivations that can be derived from a single UR (interacting with the prosodic stem template), whereas the unproductive stative cannot.

As alluded to, another derivational stem is the 'reversive', which is even more limited. Yu takes the reversive as also showing evidence for POSA, which has the same underlying suppletive allomorphs as the stative and are likewise distributed to fit the prosodic stem template. However, Ellington is very clear on the marginality of reversive forms, stating that "the number of obviously related pairs of opposites presently used in the language is quite limited" (p. 123). The complete list of forms is in (10), only two of which are K-forms.

(10) Tiene complete list of reversive forms

a.	kót-	'tie'	kó**ó**t-	'untie'	
			kót**ek**-	'be untied'	cf. PB *gáagʊd- 'untie' (C)
b.	yal-	'spread'	ya**a**l-	'roll up'	
c.	vuol-	'open'	vuo**k**-	'close'	
d.	sook-	'put in'	so**le**k-	'take out'	cf. PB *cokʊd- 'pull out' (B,C)
e.	sum-	'stick in ground'	su**ne**m-	'pull out of ground'	cf. PB *cum- 'pull' (C), *cumi- 'stick into ground' (C)

The distribution and semantics of the reversive forms is messier than the stative (e.g. the mixed distribution of forms with coronal-final roots in a.-c.). Like with the stative, several are relatable to Proto-Bantu forms directly, e.g. *solek-* 'take out' (d.) to PB *cokʊd- 'pull out' (Zones B and C,

[10] Proto-Bantu forms come from Bastin *et al.*'s (2002) *Bantu lexical reconstructions 3* online database.

again *modulo* regular metathesis). Taken all together, the paucity of stative and reversive forms negates Tiene's support for POSA and essentially renders it irrelevant to the larger debate.

4 Katu

Another case study presented by Yu (2017) is nominalization allomorphy in (Western) Katu [kuf] (Katuic, Austroasiatic: Laos; data from Costello 1998). Katu has a number of affixes which derive nouns from verbs, summarized in Table 7. The majority of these affixes must be lexically specified as to which roots they attach to, and there is no predictable phonological distribution. This holds for all of the prefixes, of which there are at least six (a.). Of these, *phar-* appears to be productive as it applies to loanwords, e.g. *phar-hiên* 'study, education' (< *hiên* 'to study', a loan from Lao – Costello 1998, 37).

	Form:		Distribution:			Derived nominalization:	
a.	Prefixes		Lexically determined				
	phar-	+	cha	'eat'	→	**phar**-cha	'something eaten'
	ar-	+	kâl	'exchange'	→	**ar**-kâl	'goods exchanged'
	aN-	+	kuôt	'tie knot'	→	**ang**-kuôt	'a knot'
	tar-	+	nil	'make a pattern'	→	**tar**-nil	'a pattern'
	tri-	+	trơs	'chase spirits'	→	**tri**-trơs	'chasing away of spirits'
	i-	+	lêh	'(to) free'	→	**i**-lêh	'the freeing'
b.	ARN-infix		*Irregular*				
	-arn-	+	tôôp	'begin'	→	t-**arn**-ôôp	'beginning'
	-arn-	+	teh	'(to) hammer'	→	t-**arn**-eh	'hammer'
c.	R-infix		2σ root				
	-r-	+	katas	'(to) name'	→	ka-**r**-tas	'name'
	-r-	+	alôôm	'offer gift'	→	a-**r**-lôôm	'gift offered'
d.	A-infix		(CC…)σ				
	-a-	+	plah	'divide'	→	p-**a**-lah	'division'
	-a-	+	kroong	'make fence'	→	k-**a**-roong	'fence'
e.	AN-infix		(CV…)σ				
	-an-	+	tôl	'put post in'	→	t-**an**-ôl	'post'
	-an-	+	kui	'carry on back'	→	k-**an**-ui	'something carried on back'

Table 7: Katu nominalization – Prefixes (unpredictable) vs. infixes (largely predictable)

The remaining nominalization strategies involve infixes (rows b.-e.). Yu (2017) states that the distribution of infixes is fully predictable (except for the two irregular forms in b.). Rows c.-e. show three infix types: -r-, -a-, and -an-. Yu argues that these reduce to two suppletive allomorphs: /-r-/ and /-an-/. The /-r-/ infix occurs with 2σ roots and appears between the two syllables (c.), while /-an-/ appears with 1σ roots and appears after the first consonant. If the /n/ portion ends up before a sonorant consonant, it is deleted (d.), otherwise it becomes the onset of a second syllable (e.).

Yu claims these two infix allomorphs have subcategorization frames which state that /-an-/ be placed after the first consonant, while /-r-/ be placed after the first vowel. Importantly for Yu, although these affixes subcategorize for *where* they should be placed, they do not subcategorize for *whether* they should appear in the phonological input in the first place. Rather, "the ultimate choice between the allomorphs is determined by global considerations, namely, the size of the output" (p. 22). Let us demonstrate Yu's position with the input-output mappings in (11), which are given as in Yu. The three relevant types of roots are provided: 2σ (a.), 1σ with an initial CC cluster (b.), and simplex 1σ roots (c.). Each is accompanied by the two suppletive infixes which the phonological grammar must choose from.

(11) Katu infix competition (based on Yu)

a.	2σ root	/katas, {-**r**-, -**an**-}/	→	[ka-**r**-tas]	'name'	(cf. ^{x}[k-**an**-atas])
b.	1σ (CC)	/plah, {-**r**-, -**an**-}/	→	[p-**a**-lah]	'division'	(cf. ^{x}[pla-**r**] ~ ^{x}[pla-**r**-h])
c.	1σ	/pɒ, {-**r**-, -**an**-}/	→	[p-**an**-ɒ]	'dream'	(cf. ^{x}[pɒ-**r**])

Notice that the output in all three is a form with exactly two well-formed syllables, a conspiracy to produce a disyllabic word. In a., 2σ roots combine with the smaller infix /-r-/ because they already have two syllables. Adding the /-an-/ form would result in either a three syllable output (dispreferred), or require other manipulations such as egregious segment deletion. In contrast, 1σ roots combine with the larger infix /-an-/ in order to meet this disyllabic word preference. Notice in b. that the output [p-**a**-lah] deletes the n which is not licensed in coda position before sonorants, as stated above. This is still better than its competitors [pla-**r**] or [pla-**r**-h]. Importantly for Yu, outputs must obey all subcategorization requirements and can only place an infix after the pre-designated pivot (ruling out forms like ^{x}[k-**r**-atas] or ^{x}[pl-**an**-ah], where the infix would be mispositioned).

For Yu, the constraint driving word-formation is WORD=FT$_{\sigma\sigma}$, which states that "a lexical word must constitute an exact disyllabic foot" (p. 20). This condition is not just a quirk of nominalization infixation, but rather is a pervasive restriction in (Western) Katu. For example in (12), it can result in truncation to accommodate prefixes, such as nominalizing prefixes (a.-b.) or a verbalizing prefix (c.). In all cases, the initial syllable of the root is truncated to comply with the disyllabic foot constraint.

(12) Katu truncation triggered by WORD=FT$_{\sigma\sigma}$ constraint

a.	mamông	'be alive'	→	phar-mông	'livelihood'	(cf. ^{x}phar-**ma**mông)
b.	mimưưl	'perform ritual'	→	ar-mưưl	'ritual w/ rice and sword'	(cf. ^{x}ar-**mi**mưưl)
c.	pharhôôm	'breath'	→	pi-hôôm	'to breathe'	(cf. ^{x}pi-**phar**hôôm)

Under Yu's analysis, there is infix suppletion (/-r-/ vs. /-an-/) whose distribution is determined from the general phonological grammar (the WORD=FT$_{\sigma\sigma}$ constraint). This would meet the definition of POSA. Where I disagree with Yu is that the two forms are suppletive. Instead, I posit only a single UR /-rn-/, composed of a rhotic and a nasal.[11] Under my counter-analysis, the input-to-output mappings for the three root types are as follows:

(13)

		Input (one UR)		Infix placement		Surface		
a.	2σ	**-rn-** + katas	→	ka-**rn**-tas	→	[ka**r**.tas]	'name'	(the R-infix)
b.	CC	**-rn-** + plah	→	p-**rn**-lah	→	[p**a**.lah]	'division'	(the A-infix)
c.	1σ	**-rn-** + pɒ	→	p-**rn**-ɒ	→	[p**a**.**n**ɒ]	'dream'	(the AN-infix)

Like in Yu's analysis, the placement of the infix is not uniform across environments. It appears after the first vowel in the 2σ roots (a.), but after the first consonant in 1σ roots (b.-c.). The subcategorization frame of the single UR /-rn-/ thus must be flexible enough to capture this distribution. We can exploit the commonality between the infix placements, which is always after

[11] I thank the two anonymous reviewers here for construction criticism on the (proposed) single underlying form of this infix. An analysis as underlying /-rn-/ is in the spirit of Horwood's (2008) analysis of Katu allomorphy, who collapses the prefix [ar-] and the infixes [-r-] and [-a-] into a single affix /ar/. As Yu points out, however, Horwood does not discuss the AN-infix forms, and thus any direct comparison of the analyses would be incomplete.

an initial segment but before the final vowel. I take this final vowel to bear word stress in an iambic foot. Such an iambic structure is a pervasive pattern of this family and area (Sidwell 2005; Gehrmann 2018, 133), and stressed vowels are also well-known to be pivots for infixation (Yu 2007).

The proposed subcategorization frame for /-rn-/ is in Figure 2. The black ● nodes represent segmental root nodes, one for the rhotic portion (●$_1$) and one for the nasal portion (●$_2$). The structure in gray background is what is subcategorized for, i.e. the requirement that the infix be after one or more segmental roots nodes (i.e. ●*) but directly before the stressed syllable (i.e. (●́)σ).

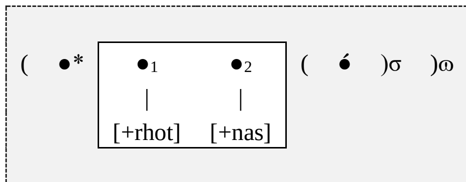

Figure 2: Subcategorization frame of Katu infix /-rn-/

That this subcategorization frame can be satisfied (and violated) in multiple ways is demonstrated in the tables below. Each of the three roots types are input with same infix, /-**r**$_1$**n**$_2$-/ (in bold throughout). Let us walk through these tables, starting with a 2σ root (Table 8). There are four possible infix positions, labeled a.-d. From these possible infix locations, various processes sensitive to syllabification and the subcategorization frame take place (in lower case roman numerals), resulting in the surface forms given. Forms which fatally violate some constraint are in gray and marked with superscripted ‘x’, followed by the precise violation in parentheses. To remind the reader, the stressed syllable is marked with an acute accent.

	Infixation			Syllabification	Surface	Violation
a.	k-**r**$_1$**n**$_2$-atas	→	i.	k**r**$_1$**n**$_2$a.tás	^{x}[k**rn**a.tás]	(Onset)
			ii.	k**ṛ**$_1$**n**$_2$.tás	^{x}[k**ṛn**.tás]	(No syllabic [ṛ])
			iii.	k**r**$_1$a.tás	^{x}[k**r**a.tás]	(Be before stressed σ)
			iv.	k**a**$_1$**n**$_2$.tás	^{x}[k**an**.tás]	(Faith to root)
			v.	k**a**$_1$.**n**$_2$a.tás	^{x}[k**a**.**n**a.tás]	(No 3σ output)
b.	ka-**r**$_1$**n**$_2$-tas	→	i.	ka**r**$_1$.tás	[ka**r**.tás]	
			ii.	ka**n**$_2$.tás	^{x}[ka**n**.tás]	($\bullet_1 > \bullet_2$)
			iii.	ka**r**$_1$**n**$_2$.tás	^{x}[ka**rn**.tás]	(Coda)
			iv.	k**a**$_1$**n**$_2$.tás	^{x}[k**an**.tás]	(Faith to root)
			v.	ka**r**$_1$.**n**$_2$tás	^{x}[ka**r**.**n**tás]	(Onset)
			vi.	ka.**r**$_1$**ṇ**$_2$.tás	^{x}[ka.**rṇ**.tás]	(No 3σ output)
c.	kat-**r**$_1$**n**$_2$-as	→	i.	ka.t**r**$_1$ás	^{x}[ka.t**r**ás]	(Be before stressed σ)
			ii.	ka.t**ṛ**$_1$.**n**$_2$ás	^{x}[ka.tṛ.**n**ás]	(No 3σ output)
			iii.	ka.t**a**$_1$.**n**$_2$ás	^{x}[ka.t**a**.**n**ás]	(No 3σ output)
d.	kata-**r**$_1$**n**$_2$-s	→	i.	[ka.tá**a**$_1$s]	^{x}[ka.tá**a**s]	(Be before stressed σ)
			ii.	[ka.tá**r**$_1$s]	^{x}[ka.tá**r**s]	(Coda)
			iii.	[ka.tá**n**$_2$s]	^{x}[ka.tá**n**s]	(Coda)

Table 8: Katu – input with 2σ root /-**r**$_1$**n**$_2$- + katas/ → [ka**r**.tás]

In a., infixation happens directly after the first consonant. All of these outputs are ungrammatical for one or more reasons. In a.i., the /-rn-/ sequence forms a complex onset [krn], which is ungrammatical based on the phonotactics of the language. Before stressed syllables in the so-called ‘presyllable’, the types of syllable structure is very limited. In the Laos dialect studied here, the complete list of shapes are /Cra/ (pra, tra), /Car/ (bar, kar, mar, par, phar, sar, tar, thar, ʔar), /ʔaN/ (ʔam, ʔan, ʔaŋ), /Ca/ (ba, cha, ka, la, ma, sa, ta, ya, ʔa), /Ci/ (chi, li, mi, ni, pi, ri, si, ʔi), and ʔu (Costello and Sulavan 1996, 235). This rules out [krna] here (and as we shall see, several other possible outputs as well).

Moving to a.ii., this avoids a violation of onset phonotactics by converting the rhotic of /-rn-/ to a syllabic [r̩]. However, syllabic [r̩] is unattested in Katu and we take it to be banned. Further, a.iii. violates the subcategorization frame from Figure 2, which stated that the infix be directly before the stressed syllable. Here, it remains separated by the stressed syllable by the pre-stress vowel [a] from the root. Next, the forms in a.iv. and a.v. both retain the two segmental nodes of the infix /-rn-/, albeit changing /r/ to [a]. These are both ungrammatical, as the former deletes a vowel of the root while the latter results in a three syllable output, which as we pointed out above is systematically avoided in this variety of Katu (recall the WORD=$FT_{σσ}$ constraint, from Yu).

In the b. set, the infixed position is after the first vowel. This is directly before the stressed syllable and therefore satisfies the subcategorization frame. Several of the potential outputs violate the constraints just introduced, such as deleting a root segment (b.iv.), having an onset violation (b.v.), or having a 3σ output (b.vi.). Looking next at b.iii., this preserves all input segments but violates coda phonotactics by outputting a banned complex coda [rn]. The result is that one of the two infix segments must delete, resulting in either [ka**r**.tás] (b.i.) or ˣ[ka**n**.tás] (b.ii.). The actual attested form is i. which preserves the /r/ over /n/, for which I posit a place-holder constraint $●_1>●_2$. This may ultimately derive from restrictions on coda [n] in 'presyllables', but I leave the precise characterization aside for our purposes. The final sets in c. and d. place the infix after the second consonant and after the second vowel, respectively. Each possible output violates some constraint already established, such as resulting in a 3σ output, not being before the stressed syllabic, or being a complex coda.

Above, the infix /-rn-/ maps only to [-r-] in the output. With the other two root contexts, there are also changes to underlying /-rn-/. Table 9 shows this infix /-rn-/ with a CC root /plah/. There are two infix sites considered: after the first consonant (a.) or after the second consonant (b.).

	Infixation			Syllabification	Surface	Violation
a.	p-$\mathbf{r}_1\mathbf{n}_2$-lah	→	i.	p$\mathbf{a}_1$.láh	[p**a**.láh]	
			ii.	p$\mathbf{r̩}_1\mathbf{n}_2$.láh	ˣ[p**r̩n**.láh]	(No syllabic [r̩])
			iii.	p$\mathbf{a}_1\mathbf{r}_1$.láh	ˣ[p**ar**.láh]	(No breaking)
			iv.	pa$\mathbf{r}_1$.láh	ˣ[pa**r**.láh]	(No epenthesis)
			v.	p$\mathbf{a}_1\mathbf{r}_2$.láh	ˣ[p**ar**.láh]	(No rhoticization)
			vi.	p$\mathbf{a}_2\mathbf{r}_1$.láh	ˣ[p**ar**.láh]	(No metathesis)
			vii.	p$\mathbf{a}_1\mathbf{n}_2$.láh	ˣ[p**an**.láh]	(No nasal before [l/r])
b.	pl-$\mathbf{r}_1\mathbf{n}_2$-ah	→	i.	pl$\mathbf{a}_1$.$\mathbf{n}_2$áh	ˣ[pl**a**.**n**áh]	(Be before stressed σ)
			ii.	pl$\mathbf{á}_1$ah	ˣ[pl**á**ah]	(Be before stressed σ)

Table 9: Katu – input with CC root /-$\mathbf{r}_1\mathbf{n}_2$- + plah/ → [p**a**.láh]

Many of these possible outputs violate constraints already introduced, e.g. a ban on syllabic [r̩] (a.ii.) and the requirement to be directly before the stressed syllable (b.i.-ii.). The other outputs require new constraints. The forms in a.iii.-vi. are all [par.láh], which is phonotactically permitted. However, a.iii. breaks the /r$_1$/ into two segments a$_1$r$_1$, a.iv. inserts an epenthetic [a] before /r$_1$/, a.v. converts the /n/ of the infix /-rn-/ into [r] via rhoticization, and a.vi. metathesizes /n/ and /r/ and vocalizes /n/ to [a]. We can assume each of these processes is prohibited. Further, a.vii. maintains both segments but places the /n/ before a liquid which is not permitted. The remaining candidate is [p**a**.láh] (a.i.), which deletes the /n/ portion and vocalizes the underlying /r/ to [a]. We may assume here that the [+rhot] feature from Figure 2 is deleted and a [+syll] feature is inserted, which is realized as [a] (recall that only three vowels are allowed in the 'presyllable' position – [a] and [i], and marginally [u]).

The last context involves 1σ roots (with a simplex onset), shown in Table 10. Here, there is only one infixation position, between the consonant and the vowel.

Infixation			Syllabification	Surface	Violation
p-**r$_1$n$_2$**-ɒ	→	i.	p**a$_1$.n$_2$**ɒ́	[p**a.n**ɒ́]	(Be before stressed σ)
		ii.	p**a$_1$n$_2$**.ɒ́	x[p**an**.ɒ́]	(Syllabification)
		iii.	p**r̩$_1$.n$_2$**ɒ́	x[p**r̩.n**ɒ́]	(No syllabic [r̩])
		iv.	p**r$_1$**ɒ́	x[p**r**ɒ́]	(Be before stressed σ)

Table 10: Katu – input with 1σ root /-**r$_1$n$_2$**- + pɒ/ → [p**a.n**ɒ́]

The form in ii. violates syllabification by not maximizing the onset, while iii. violates the ban on [r̩]. Although the remaining candidates (i. and iv.) violate the subcategorization frame to be directly before the stressed syllable, this is permitted in this context (an Optimality Theoretic analysis could model this, outside of the scope of this paper). The output which preserves both infix segments is the attested form (i.). Like with the CC roots (Table 9), the underlying /r/ becomes [a] in this context. In total, the underlying infix /-rn-/ surfaces as [-r-], [-a-], and [-an-] in the three tables above, whose surface position and surface form are dictated based on the phonological grammar. This counter-analysis shows that it is possible to have a single underlying form /-rn-/ without suppletion, while still recognizing the role of Katu phonology in shaping the output of this infix (TETU effects).

One objection to this counter-analysis is that the underling form /-rn-/ is never found on the surface. However, there are several reasons to think this is not an unreasonable UR in Katu. First, in the sister language (Eastern) Katu [ktv] (spoken in Vietnam, not Laos), the [-an-] form of the infix actually shows variation with [-rn-] in some dialects, e.g. [t-**an**-ʊʊt]~[t-**rn**-ʊʊt] 'stool' (Costello 1966, 67). In these dialects, vocalization of /r/ to [a] is optional and/or incomplete, while in the dialect of focus from Laos, vocalization is complete in this context. Second, Gehrmann (2018) reconstructs a number of nominalizing affixes in Proto-Katuic, which includes four infixes relevant to our discussion: *-r- and *-n- (for 1σ-CC and 2σ roots), and *-an- and *-rn- (for other 1σ roots). This last reconstructed form provides clear diachronic precedence for synchronic /-rn-/.

Gehrmann in fact provides many examples of modern-day reflexes of each proto-infix across Katuic languages, and describes the semantic and phonological contexts where these infixes are found. However, the precise differentiation of these proto-infixes is tenuous given (i) inexact and overlapping nominal meanings, (ii) their similarity in shape, and (iii) numerous phonological changes in individual Katuic languages which blur a clear diachronic origin (e.g. vocalization of r/n, r-dissimilation, and segment deletions are all attested). In his discussion of the "variability between *a, *r and *n in the presyllable rime part" of these infixes, Gehrmann even states that they all may have been "available to use, if not actually interchangeable, in [Proto-Katuic]" (p. 141).

All of this suggests that it is indeed credible that (Western) Katu collapsed this system into a single /-rn-/ morph with conditioned surface variants [-r-], [-a-], and [-an-].

The ultimate result is that *all* nominalization is reduced to lexically-specified affix selection, i.e. the list /phar-/, /ar-/, /aN-/, /tar-/, /tri-/, /i-/, /-arn-/, and now /-rn-/. There is no phonologically-conditioned selection because there is no suppletive allomorphy, and therefore no support for POSA from Katu.

5 **Konni**

The final case I discuss is Konni [kma] (Gur, Niger-Congo: Ghana), which is argued to support POSA in Wolf (2008). All data presented below come from the original source (Cahill 1999), and focus on morphological patterns demonstrating the avoidance of local rhotic flaps (i.e. ^{x}[ɾɾ] and ^{x}[ɾVɾ]). These are categorically banned by the phonological grammar.

The relevant data involve the noun class system of Konni. There are five noun classes in Konni, of which we shall discuss the first four (the fifth is not directly relevant). These classes are distinguished based on the shape of accompanying suffixes on the noun; there is no concord/agreement. While the singular is identical for all four classes (/-ŋ́/), the classes differ with respect to the singular definite and the plural. This is shown in (14), where the noun class suffixes are in bold. The capital letters indicate vowels underlyingly unspecified for an [ATR] harmony value, and a vowel between dashes is epenthetic. Noun class membership is not predictable based on the stem's segments.

(14)	Konni – noun classes		SG	SG.DEF	PL
a.	Class 1		/-**ŋ́**/	/-**ɾÍ**/	/-**A**/
	wíí-	'problem'	wíí-**ŋ**	wíí-**ɾí**	wí-**à**
	bììs-	'breast'	bììs-í-**ŋ**	bììs-ì-**ɾí**	bììs-**á**
b.	Class 2		/-**ŋ́**/	/-**kÚ**/	/-**tÍ**/
	dàà-	'wood'	dàá-**ŋ**	dàà-**kʊ́**	dàà-**tí**
	gàɾ-	'clothes'	gàɾ-í-**ŋ**	gàɾ-ʊ̀-**kʊ́**	gàt-**tí**
c.	Class 3		/-**ŋ́**/	/-**kÁ**/	/-**sÍ**/
	gbàà-	'dog'	gbàá-**ŋ**	gbàà-**ká**	gbàà-**sí**
	kpáɾ-	'basket'	kpáɾ-í-**ŋ**	kpáɾ-í-**ká**	kpáɾ-í-**sí**
d.	Class 4		/-**ŋ́**/	/-**bÚ**/	/-**tÍ**/
	dáá-	'alcohol'	dáá-**ŋ**	dáá-**bʊ́**	dáá-**tí**
	chʊ́áɾ-	'taboo'	chʊ́áɾ-í-**ŋ**	chʊ́áɾ-í-**bʊ́**	-

The relevant morph for our discussion is the class 1 singular definite /-ɾÍ/ (row a.). Wolf highlights two facts from Cahill. The first is that there are no [ɾ]-final roots in noun class 1, unlike the other three (demonstrated in (14) above). This pre-emptively avoids any ^{x}[ɾVɾ] violation. Second, there are many roots which show 'mixed class' behavior (≈ 11% of nouns). These select one class affix in the plural, but a different class for the singular definitive. Several of these mixed class roots are ɾ-final and all avoid a ^{x}[ɾVɾ] violation. For example, /wáɾ-/ 'block' has a class 1 plural form [wáɾ-à], but takes a class 2 singular definite form [wáɾ-í-kʊ́] rather than the expected class 1 suffix /-ɾÍ/. There is no case showing the opposite, i.e. a hypothetical ɾ-final root with class 1 singular definitive ^{x}/…ɾ-ɾÍ/ but class 2 plural ^{x}/…ɾ-tÍ/.

Following Wolf, this constitutes support for POSA if the morphological selection of the noun class suffix is analyzed as constrained by the ^{x}[ɾVɾ] phonological constraint. However, I contend that in actuality there is no suppletive allomorphy here, for several reasons. First, the different affixes belong to distinct morphological classes and therefore are not realizations of the same feature set. In other words, there is never true morphological competition between the set of singular definitive suffixes, and if there is no competition there can be no phonological grammar acting as judge. It may be plausible that the ^{x}[ɾVɾ] constraint played a role diachronically in shaping this system, but it plays no synchronic role in morphological exponence.

One might counter that we should identify the mixed class ɾ-final roots introduced above as actually belonging to class 1, but having the 'wrong form' chosen to avoid ^{x}[ɾVɾ] in the synchronic grammar. The problem with this counter-argument is that among the many cases of mixed classes, the vast majority have no relation to the constraint ^{x}[ɾVɾ]. Consider the data in (15). While each of the mixed classes here – SG.DEF/PL class pairs 2/1, 3/1, and 2/3 – can be exemplified with a ɾ-final root, this is an incident aspect of the noun class system rather than a fundamental pattern. Most roots selecting mixed classes do not end in /ɾ/, and in those cases there is no role for phonological markedness of any sort.

(15)	Konni mixed noun classes			SG.DEF	PL
a.	Mixed 2/1	wáɾ-	'block'	wáɾ-í-**kʊ́**	wáɾ-**à**
		nìì-	'rain'	nìì-**kʊ́**	nì-**á**
b.	Mixed 3/1	nììɾ-	'shoe'	nììɾ-ì-**ká**	nììɾ-**á**
		yɛ́s-	'potato'	yɛ́ꜜs-í-**ká**	yɛ́s-**à**
c.	Mixed 2/3	sàŋkpàɾ-	'navel'	sàŋkpàɾ-ì-**kʊ́**	sàŋkpàɾ-ì-**sí**
		kpììl-	'thigh'	kpììl-ì-**kʊ́**	kpììl-ì-**sí**

There are two additional problems with Wolf's approach to these Konni facts. First, even if the constraint ^{x}[ɾVɾ] were to drive mixed class membership, this creates a new problem: the many independently needed phonological constraints which do *not* override morphological class. Cahill identifies several highly-ranked phonological constraints in the language, such as ^{x}VVV banning super-long vowels and $C_{iPL}C_{iPL}$ requiring adjacent consonants to have the same place value (pp. 108, 191-193). Unlike ^{x}[ɾVɾ], these constraints do not trigger noun class reorganization. This is shown in Table 11.

	CL 1 root	CL 1 SG.DEF /-ɾÍ/			CL 1 PL /-A/			Constraint violated	Non-existent repair
a.	/dàà-/	/dàà-ɾÍ/	→	[dàà-ɾí]	**/dàà-A/**	→	**[dà-ɾ-á]**	^{x}VVV	^{x}dàà-**tí** ~ ^{x}dàà-**sí**
	'day'								(CL 2~3 PL)
	/wíí-/	/wíí-ɾÍ/	→	[wíí-ɾí]	**/wíí-A/**	→	**[wí-à]**	^{x}VVV	^{x}wíí-**tí** ~ ^{x}wíí-**sí**
	'problem'								(CL 2~3 PL)
b.	/sààm-/	**/sààm-ɾÍ/**	→	**[sààn-ní]**	/sààm-A/	→	[sààm-á]	$C_{iPL}C_{iPL}$	^{x}sààm-**bʊ́**
	'porcupine'								(CL 4 SG.DEF)
	/tíg-/	**/tíg-ɾÍ/**	→	**[tíg-í-ɾí]**	/tíg-A/	→	[tíg-è]	$C_{iPL}C_{iPL}$	^{x}tík-**kú** ~ ^{x}tík-**ké**
	'house'								(CL 2~3 SG.DEF)

Table 11: Unattested morphological repairs to avoid phonological constraint violations

In a., class 1 roots with a long vowel combine with the regular class 1 plural marker /-A/, even though this is in violation of a constraint ^{x}VVV. A plausible repair would be to combine with a class 2 or 3 equivalent affix, but this is unattested. Instead, the ^{x}VVV violation is resolved either through /a/-to-[ɾ] rhoticization or root shortening. Similarly in b., class 1 roots which end in labials or velars still combine with the coronal-initial singular definite /-ɾÍ/ in violation of $C_{iPL}C_{iPL}$, even though alternative labial and velar initial suffixes of class 2, 3, or 4 are available. Instead, the marked structure is resolved through assimilation or epenthesis. In total, any system where morphology and phonology are fully integrated and conspire to pre-emptively avoid marked structures runs into this problem: there will always be more possible morphological repairs to avoid phonological markedness than are actually attested.

Second and finally, Wolf mentions that it is in fact *not* the case that all potential [ɾɾ]/[ɾVɾ] sequences across morpheme boundaries are pre-emptively avoided by the morphology. Several ɾ-initial suffixes exist, e.g. /-ɾÚ/ AGENTIVE 'X-er' and /-ɾàáŋ/ 'male'. Rather than avoiding a ˣ[ɾVɾ] violation by simply not concatenating, instead the suffix dissimilates to [d] or [t] in the context of a ɾ-final root. This is seen in (16).

(16) Konni ɾ-initial suffixes exhibiting dissimilation

a.	/-**ɾÚ**/ AGENTIVE	/gùù-/	'bury'	[gù-gùù-**ɾú**]	'burier'
		/bʊ̀ɾ-/	'sow'	[bʊ̀-bʊ̀ɾ-ì-**tʊ́**]	'sower'
b.	/-**ɾàáŋ**/ 'male'	/dù-/	'horse'	[dù-**ɾàáŋ**]	'stallion'
		/ŋmáɾ-/	'dove'	[ŋmáɾ-í-**dá**ꜜ**áŋ**]	'male dove'

These data demonstrate that there are actually phonological means to repair [ɾ] locality violations, which undermines and underdetermines the role of phonology in preventing morphological combination in the first place.

6 Discussion

I have presented four case studies of languages which appear to support phonologically-optimizing suppletive allomorphy (POSA), and for each I have presented a counter-analysis which negates its support for that position. I summarize the core aspects of my counter-analyses in Table 12.

	Originally proposed suppletive allomorphs	Originally proposed optimizing phonological trigger(s)	Counter-analysis of this paper
§2 Irish	**-axə** vs. **-ənə** [PLURAL]	PRIORITY and WSP_{FT} (i.e. don't create non-optimal foot [ˈσ.H])	**Subcategorization, not optimization**: Suppletive allomorphs subcategorize for σ-count (or stress position)
§3 Tiene	-**Vk** vs. -**lV**- [STATIVE]	Strict CVC_2VC_3 template (where C_2 = [+COR], C_3 = [-COR])	**Frozen morphology**: Relevant stems are mono-morphemic and do not (synchronically) contain independent affixes
§4 Katu	-**an**- vs. -**r**- [NOMINALIZER]	WORD=FTσσ (i.e. words are optimally two syllables)	**No suppletion (one UR)**: Surface allomorphs have single underlying representation (/-**rn**-/)
§5 Konni	-**ɾÍ** vs. -**kÚ**/-**kÁ**/-**bÚ** [NOUN CLASS]	ˣ[ɾVɾ] (i.e. [ɾ] cannot be local to another [ɾ])	**No suppletion (no competition)**: The relevant morphs are not in morphological competition

Table 12: Summary of reanalyses for four case studies

We can divide these counter-analyses into three types. The first type is exemplified by Irish, referred to in bold above as 'subcategorization, not optimization'. This type concludes that while there are suppletive allomorphs, phonological optimization does not account for their distribution. For Irish, the original POSA interpretation is undermined by the fact that *ad hoc* phonological constraints must be posited to account for the morphological patterns, which are not independently needed by the phonological grammar. Instead, the Irish dialects can be unified by adopting widespread subcategorization frames, which are independently needed and widespread in the Irish plural system.

The second type is exemplified by Tiene, referred to as 'frozen morphology'. For this type, I presented evidence that the relevant stems are not actually multi-morphemic, i.e. they do not contain any synchronically separable stative affix. Support came from the paucity of relevant forms, e.g. there were only four -lV- stative forms to support the original proposal. If there are no distinct morphemes here, then POSA by its very definition is not a possible interpretation of the data.

The third type is exemplified by Katu and Konni, referred to as ‘no suppletion’. For Katu, I posited that there was only one UR from which all surface forms can be derived, namely /-rn-/ → [-r-], [-a-], and [-an-]. This UR is supported by dialect variations and diachrony, and the derivations involve straightforward and typologically well-grounded phonological alternations (phonotactically-conditioned segment deletion and [r]-vocalization). For Konni, the relevant morphs are not suppletive because they are not actually in morphological competition vying to realize the same morphosyntactic feature bundle. I argued that if we were to assume that they were in competition (required for a POSA interpretation), then this does not explain why only one phonological constraint plays a morphological role instead of *all* phonological constraints. Further, in the Appendix I reanalyze a case of a purported POSA in Udihe along the lines of the ‘no suppletion (one UR)’ in Katu.

These three types of reanalyses may apply to many purported cases of POSA in the literature. For example, several of the languages brought up in Mascaró (2007) can be reinterpreted as a single underlying representation without suppletion. Certain Basque [eus] morphemes undergo idiosyncratic voicing (e.g. the verbal participle {-tu, -du}), which can plausibly be reanalyzed as an archiphonemic form /-Tu/, underspecified for voicing. Likewise, the infinitive marker in Baix Empordà Catalan [cat] exceptionally shows assimilation (i.e. {ɾ > (n, l, t, s)}), which can also be reanalyzed as an underspecified coronal consonant. In general, impoverishing and/or enriching phonological representations is one prominent way to capture the exceptional effects of individual morphs.

Furthermore, POSA models make a faulty prediction by integrating phonological constraints with morphological exponence: we expect there to be alternations when one corner of an otherwise optimizing pattern turns out to actually be non-optimizing. Consider a representative example from Latin [lat]). Mester (1994) claims that in conjugation class II verbs, the perfect has two suppletive allomorphs: /-u/ occurs with metrically light stems while /-s/ occurs with heavy stems. Mester attributes this distribution to the avoidance of ‘medial trapping’, i.e. the avoidance of structures …[σ̄]σ̆<σ̄>, where an unparsed light syllable appears between a footed syllable and the final extrametrical syllable. An example with 1SG forms is in (17).

(17) Latin conjugation class II perfect suppletion – /-u/ with light stems, /-s/ with heavy stems

a.	Light stem	mon-ē-re ‘warn’	1SG	mon-**u**-ī	[mon**u**]<ī>	[σ̆σ̆]<σ̄>
b.	Heavy stem	aug-ē-re ‘increase’	1SG	aug-**s**-ī	[aug]<**s**ī>	[σ̄]<σ̄>
			cf.	^{x}aug-**u**-ī	^{x}[au]g**u**<ī>	^{x}[σ̄]σ̆<σ̄>

Arguing against Mester, Embick (2010, 172ff.) presents several places where such an analysis as optimization predicts the wrong forms. One place is with 1PL forms, in (18).

(18) Latin perfect suppletion – Wrong forms predicted under optimization (Embick 2010, 173)

a.	Light stem	1PL	mon-**u**-imus	mo[n**u**i]<mus>	σ̆[σ̆σ̆]<σ̄>
b.	Heavy stem	1PL	aug-**s**-imus	[aug]**s**i<mus>	[σ̄]σ̆<σ̄>
		cf.	^{x}aug-**u**-imus	^{x}[au][g**u**i]<mus>	^{x}[σ̄][σ̆σ̆]<σ̄>

As in (17), the /-u/ allomorph here appears with the light stem /mon-/ (a short vowel), while /-s/ appears with the heavy stem /aug-/ (a diphthong). However, the result is that the /-s/ allomorph (b.) is in a ‘trapped’ position which should be less optimal. The more optimal would be with /-u/, but this is ungrammatical. Embick concludes that proposals like Mester’s generally “apply only to a carefully selected set of forms and make incorrect predictions when extended beyond these” (p.

172).[12] Cases like Latin can straightforwardly be captured via subcategorization frames idiosyncratically linked to the suppletive allomorphs, shown in Figure 3 (modeled after Figure 1).

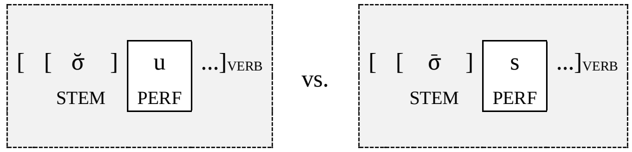

Figure 3: Latin subcategorization frames for class II perfect allomorphs

In total, subcategorization approaches are superior to phonologically-optimizing suppletive allomorphy approaches, as only the former correctly predicts that subcategorized phonological material is the only phonological material which morph selection can be sensitive to.

7 Summary

This paper has argued against phonologically-optimizing suppletive allomorphy (POSA), whereby the phonological grammar chooses the suppletive allomorph whose output is least phonologically marked. We examined four case studies which were said to support POSA. In Irish, I argued that a POSA interpretation is undermined by the fact that *ad hoc* phonological constraints must be posited to actually result in optimization, constraints which are not independently needed by the phonological grammar. For Tiene, I argued that the relevant stems are essentially limited to very small number of forms and are not actually multi-morphemic (i.e. there is no synchronically separable affix). For Katu, I posited that there is only one underlying representation from which all the surface forms can be derived, whose abstract form is supported by dialect variation and diachrony. Finally, for Konni I argued that the suppletive morphs in question are not actually in competition, and if they were it predicts many more instances of POSA than are found. In total, this paper asserts that the most straightforward analysis of these data is to formalize the conditioning phonological environment via subcategorization frames. This correctly predicts that subcategorized phonological material is the only phonological material which suppletion is sensitive to. In total, while phonological optimization may alter the surface form of morphs, it cannot choose among suppletive allomorphs in the first place.

8 References

Anderson, Stephen R. 2011. Stress-conditioned allomorphy in Surmiran (Rumantsch). In M. Maiden, M. Goldbach, J. C. Smith, and M.-O. Hinzelin (eds.), Morphological autonomy: Perspectives from Romance inflectional morphology. Oxford: Oxford University Press. 13-35.

[12] A parallel case is recently discussed in Stanton (2020) for Yindjibarndi [yij] (Pama-Nyungan: Australia, citing Wordick 1982). The relevant suppletive allomorphs are locative /-ŋka/ vs. /-la/ and instrumental /-ŋku/ vs. /-lu/, which are distributed according to mora count. Briefly, the ŋk-form appears when the root is bimoraic and vowel-final, while the l-form is elsewhere. Although the patterns may in principle be captured via a POSA analysis (with PRIORITY and ^{x}CCC constraints), it fails to account for an important subset of patterns where the *more* marked allomorph is chosen. This involves sequences of two pre-nasalized consonants which are categorically banned (^{xN}CV^{N}C) and generally resolved via dissimilation, e.g. /mu**nt**i+**mp**a/ → [mu**nt**i-**p**a] 'really-TOP'. In the suppletive cases, however, Stanton shows that instead of avoiding this marked pattern by choosing the l-form, the ŋk-form is still chosen if its conditioning phonological context is met. It then undergoes regular dissimilation, e.g. /wu**nt**u-**ŋk**a/ → [wu**nt**u-**w**a] 'river-LOC'. Stanton concludes that "if we allow the grammar to treat suppletion as a potential repair to a phonotactic problem that can be prioritized over other repairs, like deletion, then we expect the hierarchy among these possible repairs to hold in all cases where both repairs are in principle available". Yindjibarndi, like Latin, does not meet these expectations.

Bastin, Yvonne, André Coupez, Evariste Mumba, and Thilo C. Schadeberg (Eds.). 2002. Bantu lexical reconstructions 3 / Reconstructions lexicales bantoues 3. https://www.africamuseum.be/en/research/discover/human_sciences/culture_society/blr (accessed: 2020-12-21)

Bennett, Ryan. 2012. Foot-conditioned phonotactics and prosodic constituency. Doctoral dissertation. University of California Santa Cruz.

Bennett, Ryan. 2017. Output optimization in the Irish plural system. Journal of Linguistics 53. 229-277.

Bermúdez-Otero, Ricardo. 2012. The architecture of grammar and the division of labour in exponence. In J. Trommer (ed.), The morphology and phonology of exponence. Oxford: Oxford University Press. 8-83.

Bermúdez-Otero, Ricardo. 2016. We do not need structuralist morphemes, but we do need constituent structure. In D. Siddiqi and H. Harley (eds.), Morphological Metatheory. Amsterdam & Philadelphia: John Benjamins. 387-429.

Blum, Eileen. 2018. Allophony-driven stress in Munster Irish. Ms. Rutgers University.

Bonet, Eulàlia. 2004. Morph insertion and allomorphy in Optimality Theory. International Journal of English Studies 4.2. 73-104.

Bonet, Eulalia, Maria-Rosa Lloret, and Joan Mascaró. 2007. Allomorph selection and lexical preferences: Two case studies. Lingua 117. 903-927.

Booij, Geert. 1998. Prosodic output constraints in morphology. In W. Kehrein and R. Wiese (eds.), Phonology and morphology of the Germanic languages. Tübingen: Niemeyer. 143-163.

Bye, Patrik. 2008. Allomorphy – Selection, not optimization. In S. Blaho, P. Bye and K. Kramer (eds.), Freedom of Analysis? Berlin: Mouton de Gruyter. 63-92.

Cahill, Michael Clark. 1999. Aspects of the morphology and phonology of Konni. Doctoral dissertation. The Ohio State University.

Carnie, Andrew. 2008. Irish nouns: A reference guide. Oxford: Oxford University Press.

Costello, Nancy A. 1966. Affixes in Katu. Mon-Khmer Studies 2. 63-86.

Costello, Nancy A. 1998. Affixes in Katu of the Lao P.D.R. Mon-Khmer Studies 28. 31-42.

Costello, Nancy A., and Khamluan Sulavan. 1996. Preliminary statement of Katu orthography in Lao script. Mon-Khmer Studies 26. 233-244.

de Belder, Marijke. 2020. A split approach to the selection of allomorphs: Vowel length alternating allomorphy in Dutch. Glossa 5.1.

de Bhaldraithe, Tomás. 1953a. Gaeilge Chois Fhairrge: An Deilbhíocht. Dublin: Dublin Institute for Advanced Studies.

de Bhaldraithe, Tomás. 1953b. Nua-Iasachtaí i n'Gaeilge Chois Fhairrge. Éigse 7.1. 1-34.

Elías-Ulloa, José. 2006. Theoretical aspects of Panoan metrical phonology: Disyllabic footing and contextual syllable weight. Doctoral dissertation. Rutgers University.

Ellington, John. 1977. Aspects of the Tiene language. Doctoral dissertation. University of Wisconsin, Madison.

Embick, David. 2010. Localism versus Globalism in Morphology and Phonology. Cambridge, MA.: MIT Press.

Gehrmann, Ryan. 2018. Katuic presyllables and derivational morphology in diachronic perspective. In H. Ring and F. Rau (eds.), Papers from the Seventh International Conference on Austroasiatic Linguistics. Honolulu: University of Hawai'i Press. 132-156.

González, Carolina. 2005. Phonologically-conditioned allomorphy in Panoan: Towards an analysis. In J. Heinz, A. Martin, and K. Pertsova (eds.), Papers in Phonology 6 (UCLA Working Papers in Linguistics 11). Los Angeles: University of California. 39-56.
Guthrie, Malcolm. 1953. The Bantu Languages of Western Equatorial Africa. London & New York: Oxford University Press.
Guthrie, Malcolm. 1960. Teke radical structure and common Bantu. African Language Studies 1. 1-15.
Harrell, Richard S. 1962. A short reference grammar of Moroccan Arabic. Washington, D.C.: Georgetown University Press.
Henderson, Robert. 2012. Morphological alternations at the intonational phrase edge: The case of K'ichee'. Natural Language & Linguistic Theory 30. 741-787.
Hickey, Raymond. 1985. Reduction of allomorphy and the plural in Irish. Ériu 36. 143-162.
Horwood, Graham. 2008. Implications of Katu nominalization for infixation typology. Manuscript. Thammasat University. http://roa.rutgers.edu/files/969-0508/969-HORWOOD-0-0.PDF
Hyman, Larry M. 2010. Affixation by place of articulation: The case of Tiene. In J. Wohlgemuth and M. Cysouw (eds.), Rara & Rarissima: Documenting the fringes of linguistic diversity. Berlin: Mouton de Gruyter. 145-184.
Hyman, Larry M. and Sharon Inkelas. 1997. Emergent templates: The unusual case of Tiene. University of Maryland Working Papers in Linguistics 5. 92-116.
Inkelas, Sharon. 2014. The interplay of morphology and phonology. Oxford: Oxford University Press.
Kager, René. 1996. On affix allomorphy and syllable counting. In U. Kleinhenz (ed.), Interfaces in Phonology. Berlin: Akademie-Verlag. 155-171.
Kalin, Laura. 2020. Morphology before phonology: A case study of Turoyo (Neo-Aramaic). Morphology 30. 135-184.
Kim, Yuni. 2010. Phonological and morphological conditions on affix order in Huave. Morphology 20. 133-163.
Ko, Seongyeon. 2012. Tongue root harmony and vowel contrast in Northeast Asian languages. Doctoral dissertation. Cornell University.
Kukhto, Anton. 2019. Exceptional stress and reduced vowels in Munster Irish. In S. Calhoun, P. Escudero, M. Tabain, and P. Warren (eds.), Proceedings of the 19th International Congress of Phonetic Sciences, Melbourne, Australia 2019. Canberra, Australia: Australasian Speech Science and Technology Association Inc. 1565-1569.
Mascaró, Joan. 1996. External allomorphy as emergence of the unmarked. In J. Durand and B. Laks (eds.), Current trends in phonology: Models and methods. Salford, Manchester: University of Salford, European Studies Research Institute. 473-483.
Mascaró, Joan. 2007. External allomorphy and lexical representation. Linguistic Inquiry 38. 715-735.
McCarthy, John, and Alan Prince. 1993a. Generalized alignment. Yearbook of Morphology 12. 79-153.
McCarthy, John, and Alan Prince. 1993b. Prosodic morphology: Constraint interaction and satisfaction. Manuscript. University of Massachusetts, Amherst and Rutgers University.
Mester, Armin R. 1994. The quantitative trochee in Latin. Natural Language and Linguistic Theory 12. 1-61.

Nevins, Andrew. 2011. Phonologically conditioned allomorph selection. In M. van Oostendorp, C. J. Ewen, E. Hume, and K. Rice (eds.), The Blackwell companion to phonology. Oxford: Blackwell. 2357-2382.

Nikolaeva, Irina, and Maria Tolskaya. 2001. A Grammar of Udihe. Berlin: Mouton de Gruyter.

Ó Siadhail, Mícheál. 1991. Modern Irish: Grammatical structure and dialectal variation. Cambridge: Cambridge University Press.

Orgun, Cemil Orhan and Ronald L. Sprouse. 1999. From "MParse" to "Control": Deriving Ungrammaticality. Phonology 16.2. 191-224.

Pak, Marjorie. 2016a. Optimizing by accident: A/an allomorphy and glottal stop. Proceedings of the Linguistic Society of America 1. 1-13.

Pak, Marjorie. 2016b. How allomorphic is English article allomorphy? Glossa 1.1.20. 1-27.

Paradis, Carole, and Darlene LaCharité. 2001. Guttural deletion in loanwords. Phonology 18. 255-300.

Paster, Mary. 2006. Phonological conditions on affixation. Doctoral dissertation. University of California, Berkeley.

Paster, Mary. 2009. Explaining phonological conditions on affixation: Evidence from suppletive allomorphy and affix ordering. Word structure 2.1. 18-37.

Paster, Mary. 2015. Phonologically conditioned suppletive allomorphy: Cross-linguistic results and theoretical consequences. In E. Bonet, M-R. Lloret, and J. Mascaró (eds.), Understanding Allomorphy: Perspectives from Optimality Theory. Equinox: London. 218-253.

Plag, Ingo. 1999. Morphological Productivity: Structural Constraints in English Derivation. Berlin & New York: Mouton de Gruyter.

Rose, Sharon. 1996. Variable laryngeals and vowel lowering. Phonology 13. 73-117.

Scheer, Tobias. 2016. Melody-free syntax and phonologically conditioned allomorphy. Morphology 26. 341-378.

Sidwell, Paul. 2005. The Katuic languages: Classification, reconstruction and comparative lexicon. Munich: Lincom Europa.

Smith, Brian W. 2015. Phonologically Conditioned Allomorphy and UR Constraints. Doctoral dissertation. University of Massachusetts, Amherst.

Smolensky, Paul and Matthew Goldrick. 2016. Gradient symbolic representations in grammar: The case of French liaison. Manuscript. Johns Hopkins University and Northwestern University. ROA 1286.

Stanton, Juliet. 2020. Allomorph selection precedes phonology: Evidence from the Yindjibarndi locative. Manuscript. New York University. https://ling.auf.net/lingbuzz/005587

Tranel, Bernard. 1996. French liaison and elision revisited: A unified account within Optimality Theory. In C. Parodi, C. Quicoli, M. Saltarelli and M. L. Zubizaretta (eds.), Aspects of Romance linguistics: Selected papers from the Linguistic Symposium on Romance Languages XXIV. Washington, DC: Georgetown University Press. 433-455.

Wolf, Matthew. 2008. Optimal interleaving: Serial phonology-morphology interaction in a constraint-based model. Doctoral dissertation. University of Massachusetts, Amherst.

Wolf, Matthew. 2015. Lexical insertion occurs in the phonological component. In E. Bonet, M-R. Lloret, and J. Mascaró (eds.), Understanding Allomorphy: Perspectives from Optimality Theory. Equinox: London. 361-407.

Wordick, F. J. F. 1982. The Yindjibarndi Language. Canberra: Pacific Linguistics.

Yu, Alan C. L. 2007. A natural history of infixation. Oxford: Oxford University Press.

Yu, Alan C. L. 2017. Global optimization in allomorph selection: Two case studies. In V. Gribanova and S. Shih (eds.), The morphosyntax-phonology connection: Locality and directionality at the interface. Oxford: Oxford University Press. 1-27.
Zhang, Paiyu. 2013. The Kilen language of Manchuria: Grammar of a moribund Tungusic language. Doctoral dissertation. University of Hong Kong.
Zimmermann, Eva. 2019. Gradient Symbolic Representations and the Typology of Ghost Segments. In K. Hout, A. Mai, A. McCollum, S. Rose, and M. Zaslansky (eds.), Proceedings of the 2018 Annual Meeting on Phonology. Washington, DC: Linguistic Society of America. https://journals.linguisticsociety.org/proceedings/index.php/amphonology/article/view/4576.

9 Appendix: Gradient representations in Udihe

In this appendix I discuss a case study of Udihe [ude], a critically endangered Tungusic language of Russia's Far East. This involves what at first glance appears to be suppletive allomorphy in a phonologically-optimizing distribution, but under closer examination turns out not to involve suppletion at all. The discussion of Udihe is based on data from Nikolaeva & Tolskaya's (2001) grammar and its incorporation into studies of allomorphy in Bye (2008, 72-73), Nevins (2011, 2361-2362), and Scheer (2016, 365-367). Although Scheer and I both reject suppletion for Udihe (based on similar reasoning), we differ starkly in our phonological representations. All data come from the Bikin dialect. This differs in some crucial ways from Northern dialects, which will be pointed out.

To understand the patterns, let us establish some basic facts of Udihe. Its vowel system consists of three series: short vowels, long vowels, and creaky vowels. The orthographic form is in < >.

a. Short series								b. Long series									c. Creaky series			
i	(y)	u	ø	ə	o	æ	a	i:	(y:)	u:	ie	ø:	ə:	o:	æ:	a:	ə̰:	o̰:	æ̰:	a̰:
	< ü >		< ö >	< e >		< ä >			< ü: >			< ö: >	< e: >		< ä: >		< 'e >	< 'o >	< 'ä >	< 'a >

Table 13: Udihe vowel system

The vowel quality /y/ <ü> is marginal and placed in parentheses. Likewise, underlying /ø/ <ö> and /æ/ <ä> are more restricted than other vowels and subject to differing interpretations (see Ko 2012, 289ff.). The diphthong /ie/ occupies the long front mid vowel slot in the long series, and has no short counterpart. What is transcribed as <e> actually represents /ə/ across the Udihe linguistic literature (Nikolaeva & Tolskaya 2001, 36). Most important for the allomorphy discussion are the creaky vowels, which may also be called laryngealized or pharyngealized vowels. Although they are written as a single vowel preceded by an apostrophe <'V>, phonologically they are bimoraic based on evidence from stress placement, and thus should be regarded as long vowels as well (Nikolaeva & Tolskaya 2001, 39). There is no short creaky series.

The inventory of creaky vowels is smaller than its non-creaky counterparts, and entirely lacks high vowels (as well as /ie/ and /ø/). In the Russian phonetic literature, it is classified as an 'interrupted' vowel with a (brief) medial stop (e.g. [aˀa]) or as involving special 'tense' articulation of the pharynx. I follow Nikolaeva & Tolskaya in treating creakiness as an additional feature of the vowel, and not a separate segment /ʔ/. Hereafter, I refer to Nikolaeva & Tolskaya (2001) as simply NT.

With this in mind, let us examine the allomorphy in question, presented along the lines of Nevins (2011). Example (19) shows allomorphy in marking perfect aspect on verbs. It is primarily marked by adding creaky voice to the final vowel (a.), a type of suprasegmental morphological marking which following Nevins we refer to as [+constricted glottis] ([+cg]). Recall that all creaky vowels are bimoraic, hence transcribed with two vowels. In contrast, creakiness is not added to high vowels (b.), because these are not possible creaky vowels (Table 13 above). If the root ends in a high vowel, the suffix <-ge> is added instead.

(19) Udihe perfect allomorphy [+cg] vs. <-ge> (NT, 207, 210-211)

a.	<etete>	/ətətə/	→	<etet'e>	ətət**ə̰ə̰**	'work\PERF'
	<zawa>	/zawa/	→	<zaw'a>	zaw**a̰a̰**	'grab\PERF'
	<olokto>	/olokto/	→	<olokt'o>	olokt**o̰o̰**	'cook\PERF'
	<tukä>	/tukæ/	→	<tuk'ä>	tuk**æ̰æ̰**	'run\PERF'
b.	<dogdi>	/dogdi/	→	<dogdi-ge>	dogdi-**gə**	'hear-PERF'
	<bu>	/bu/	→	<bu-ge>	bu-**gə**	'give-PERF'

Nevins interprets [+cg] vs. <-ge> allomorphy as exemplifying "a feature co-occurrence phonotactic (banning [+high] together with [+constricted glottis]) driv[ing] allomorph selection: the ordinary exponence process is overridden by a phonotactic, and another allomorph is chosen instead". Although he does not frame this as POSA *per se*, it meets the definition of it: it is implied that they are suppletive, and chosen on the basis of a general phonological constraint.

As with the Katu case study, I reject this as a *bona fide* case of POSA and instead collapse the allomorphs into a single underlying representation. One additional data point crucial to these efforts involves a small class of roots which end in the consonant /n/, called 'Class II' roots. With these roots, the perfect is realized as -kə, whose final vowel harmonizes with non-high vowels (an independent process). The final nasal of the root assimilates to [ŋ].

(20) Udihe perfect form -kə after /n/-final roots

a.	/dian/	diaŋ-**ka**	'say-PERF'	(NT, 211)
b.	/ŋələwən/	ŋələwəŋ-**kə**	'frighten-PERF'	(NT, 211)
c.	/gun/	guŋ-**kə**	'say-PERF'	(NT, 669)

Looking at the three allomorphs now – [+cg] (with regular lengthening), *-ge* (/-gə/), and *-ke* (/-kə/) – they have in common (i) the addition of a vocalic node with a mora, and (ii) the addition of some [+back] place feature (whether dorsal or laryngeal). The vowel /ə/ is the minimal vowel in the language as evidenced from epenthesis and vowel harmony patterns and I therefore take it to be the minimal unspecified vowel. Note as well that in intervocalic position /g/ regularly spirantizes to [ɣ] (NT, 57), and therefore the perfect surfaces as [ɣə].

With this in mind, I posit the following counter-analysis: the three surface forms are collapsed into a single underlying representation /-kə/, but the segmental root node of /k/ is weak. This weakness can be formalized via Gradient Symbolic Representations (Smolensky & Goldrick 2016), wherein all contrastive segments have a degree of activation between [0] and [1]. Such representations are particularly useful in modeling exceptional behavior not shared with other morphs (Zimmermann 2019). In Figure 4, the perfect marker is represented as /-k$_{[0.5]}$ə$_{[1.0]}$/, with a weak /k/ of half strength and a vowel /ə/ with full strength (hereafter simply given as /-k$_{[0.5]}$ə/).

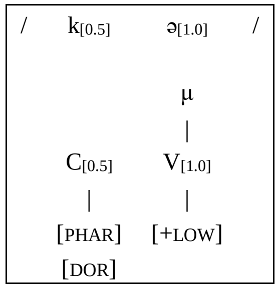

Figure 4: Udihe underlying representation of /-k$_{[0.5]}$ə/ PERF with gradient structure

In this figure, the vowel is classified as [+LOW] following Ko's (2012, 291) analysis of the Udihe vowel system. Because this is the minimal vowel, it has no other features (cf. /o/ which for Ko additionally has a [LABIAL] feature). All [+LOW] vowels must be identical within a word unless an opaque vowel intervenes. One result is that in "bivocalic clusters only one non-high vowel may be present" (NT, 66). I return to this point below. In this figure, the consonant's root node is labeled 'C' and only has a strength of [0.5], rendering it susceptible to phonological operations that its full counterpart is not.

An important desideratum of our underlying representation is to unite the velar segments with morphological creaky voice. This can be accomplished using the feature [PHARYNGEAL] ([PHAR]). In Figure 4, the segment /k/ is represented with two features: [PHAR], dominating a feature [DORSAL] ([DOR]). Using a feature [PHAR] to unite post-palatal places of articulation loosely follows Paradis & LaCharité (2001), who use it to explain patterns of loanword adaptation (see also Rose 1996).[13] All members of the velar series /g k x ŋ/ have this [PHAR]—[DOR] configuration in Udihe.

With this in mind, let us see how perfect /-k$_{[0.5]}$ə/ differs from other suffixes that have velar consonants of full strength, such as those in (21). Note a special kind of affix with a floating [PHAR] feature is also shown (f. below). In Table 14, these suffixes are shown in context with the three types of roots: with [+LOW] vowels, with [-LOW], and /n/-final. Certain cells of this table are denoted 'n/a' indicating data was not available from the grammar.

(21) Udihe suffixes with consonants of full strength

a.	-kə	INT	INTENSIVE/expressive, describing sudden action	(NT, 321-322)
b.	-kči	DP	DESTINATIVE, 'designed for', 'meant for'	(NT, 277)
c.	-xi	PROP	PROPRIETIVE, adjectivizer, 'characteristic of'	(NT, 142-145,192, 627-628)
d.	-gi	REP	REPETITIVE/regressive, 'again', 'back'	(NT, 317-319)
e.	-ŋie	IC	IMPERFECTIVE converb, 'when X was doing'	(NT, 237)
f.	-$^{[PHAR]}$usə	ADJ	ADJECTIVAL (negative qualities), deviance from norm	(NT, 195)

[13] Technically, there are two differences that the representation here has compared to that of Paradis & LaCharité (2001, 267). First, in Paradis & LaCharité the relevant velars have two sets of place features, one being [ORAL] dominating [DORSAL] (an [ORAL] node it shares with labials and coronals), and the other being [PHARYNGEAL] dominating [DORSAL]. Second, only velar *fricatives* have this latter representation with [PHAR]; velar stops have only the configuration [ORAL]—[DORSAL]. An alternative representation more in line with Paradis & LaCharité would be /-x$_{[0.5]}$ə/ rather than /-k$_{[0.5]}$ə/. Such a representation would actually be closer to the surface realization of intervocalic /g/, which is [ɣ] (as stated above). We could invoke an independently needed constraint ^{x}[NASAL][FRICATIVE] to get /…n-xə/ sequences to come out […. ŋke] (such sequences are banned other than in a few loanwords – NT, 65). It is noteworthy that in Kilen [Glottocode: kile1243], a Tungusic language closely related to Udihe, perfective aspect is in fact expressed morphologically by suffixes *-xə*, *-xəi*, and *-xən* (Zhang 2013, 124).

Affix \ Root		[+LOW] …a/ə/o-	[-LOW] …i/u	/n/-final
i.	**-k$_{[0.5]}$ə** PERF	zawa̰a̰ (< zawa-**kə**) grab-PERF (210)	umi-**gə** (< umi-**kə**) drink-PERF (211)	diaŋ-**ka** (< dian-**kə**) say-PERF (211)
ii.	**-kə** INT	koŋko-**ko**-zoŋo beat-INT-FUT 'will beat' (322)	*n/a*	*n/a*
iii.	**-kči** DP	wakca-**kči** hunt-DP 'meant for hunting' (277)	umi-**kči** drink-DP 'meant for drinking' (235)	dian-a-**kči** (< dian-**kči**) say-DP 'meant for saying' (235)
iv.	**-xi** PROP	saŋa-**xi** hole-PROP 'with holes' (192)	kəsi-**xi** luck-PROP 'lucky' (192)	*n/a*
v.	**-gi** REP	zawa-**gi** take-REP 'take back' (318)	tukti-**gi** climb.up-REP 'climb up again' (317)	xekti-**ŋi** (< xektin-**gi**) jump-REP 'jump back' (317)
vi.	**-ŋie** IC	wakca-**ŋie**-i hunt-IC-1SG 'When I was hunting' (237)	bi-**ŋie**-i be-IC-1SG 'when I was (…)' (237)	dia-**ŋie**-ni ~ dian-a-**ŋie**-ni (< dian-**ŋie**-ni) say-IC-3SG 'when he was speaking' (237)
vii.	-$^{[PHAR]}$**usə** ADJ	gænda̰a̰-**usə** be.lazy-ADJ 'lazy, idle' (195)	zomi-**usə** steal-ADJ 'being thief' (195)	*n/a*

Table 14: Udihe suffixes of full strength in comparison to weak /-k$_{[0.5]}$ə/ PERF (all data from NT)

This table shows that perfect /-k$_{[0.5]}$ə/ differs from the string-identical suffix /-kə/ INT, which can be interpreted as being of full strength, i.e. /-k$_{[1.0]}$ə$_{[1.0]}$/. Data is severely limited of this suffix and in general it has unclear semantics. It is transparently related to the expressive past suffix /-k/ EXPR.PST (a. below), though full-strength /-kə/ INT also appears in non-past environments (b.).

(22) Udihe expressive past /-k/ EXPR.PST and intensive /-kə/ INT

a. agdi sakinə-:-**k** tigdə-li-e-**k** wo:-ini
thunder clap-PST-**EXPR.PST** rain-INC-PST-**EXPR.PST** do-3SG
'(Suddenly) the thunder broke, and it started raining' (NT, 285)

b. si ŋənə-**kə**-zəŋə-i bu-də xaisi ŋənə-**kə**-zəŋə-u
you go-**INT**-FUT-1SG we-FOC also go-**INT**-FUT-1PL.EX
'You will leave and we will also leave' (NT, 322)

Regardless of semantics, the intensive (and expressive past) surfaces with [k] and does not make the preceding vowel creaky, unlike perfect /-k$_{[0.5]}$ə/. The same holds for the destinative particle /-kči/ in Table 14, which is one of many suffixes of the shape /-kCV/.[14]

[14] Suffixes of the shape /-kV/ are very rare in this dialect of Udihe. The only other case is past tense marking, which surfaces as vowel lengthening after [+low] vowels, diphthongization after [-low] vowels, and either [-ə] or [-ki] in 'free variation' after /n/-final-roots (NT, 209-210). I do not posit an underlying representation of the past tense marker in this appendix, and remain neutral as to whether this is suppletion or not, and if so whether it is surface-optimizing. Furthermore, note that there are several clitics of the shape /-kV/, e.g. the indefinite clitic /-kə/ IND, contrastive focus /-kə/ CONT, and constituent disjunction /-kə/ DISJ (p. 86-88). Clitics are different from suffixes with respect to stress, but in many other ways pattern like bound suffixes and not independent words (e.g. with respect to vowel harmony). Like with the intensive /-kə/, these show no alternation based on the stem they attach to. An example is in (i):

(i) da:-**ka** go:-**ko** bagdi-mi
short-DISJ long-DISJ live-INF
'they lived for a short time or for a long time' (658)

The next set of suffixes are those which begin with a different velar consonant, /x/, /g/, or /ŋ/. Like with the /k/-initial suffixes of full strength, there is no alternation with a creaky vowel depending on the preceding segment. The only change which takes place is the coalescence of /n/ and /g/ to [ŋ] with the suffix /-gi/, and the variation between coalescence and epenthesis with /-ŋie/. Finally, a particularly illuminating suffix is adjectival /-$^{[\text{PHAR}]}$usə/ ADJ. This suffix has a quirk that it makes a preceding [+LOW] vowel creaky, and in this way shares behavior with perfect /-$k_{[0.5]}$ə/. However, if /-$^{[\text{PHAR}]}$usə/ follows a [-LOW] vowel, no consonant surfaces between the root and initial vowel of the suffix, nor is there any lengthening. In Table 14, the form is [zomi-usə] rather than ^{x}[zomi-gusə] or ^{x}[zomi-kusə]. We therefore have a three-way suffixal contrast: creaky vowels alternating with nothing (e.g. /-$^{[\text{PHAR}]}$usə/ ADJ), creaky vowels alternating with a consonant (e.g. /-$k_{[0.5]}$ə/ PERF), and a non-alternating consonant (e.g. /-kči/ DP). To capture this contrast, I posit that in this suffix the [PHAR] place feature is floating and not linked to a consonantal root node.

Having established a range of contrasts in suffixes, let us examine how the gradient representation of the prefect morph (Figure 4) maps to its various surface forms in the three root contexts. The first is with [+LOW] vowels, in Figure 5.

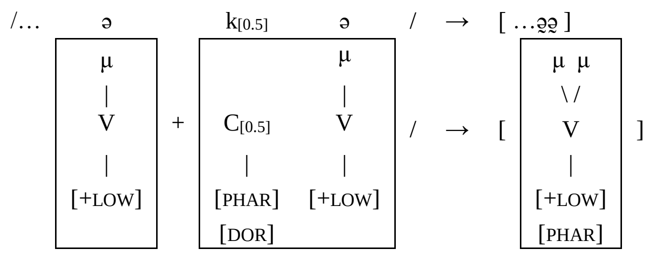

Figure 5: Roots with [+LOW] – Mapping from /-$k_{[0.5]}$ə/ → creaky voice

With a [+LOW] vowel, this [+LOW] feature and the [PHAR] feature of the affix combine to form a creaky vowel. The important assumption here is that creaky vowels are specified as [PHAR] which differentiates them from their non-creaky counterparts. It is by virtue of sharing this [PHAR] feature that velar consonants and creaky vowels may alternate. In the output of Figure 5, the two vocalic nodes coalesce resulting in two moras on the remaining vowel node. This is sufficient to license the [PHAR] feature (recall that all creaky vowels are bimoraic). Because the root node $C_{[0.5]}$ is weak it more liberally deletes in marked contexts (a constraint $^{x}V_iC_{[\text{PHAR}]}V_i$), whereas full segments do not.

In contrast, consider /-$k_{[0.5]}$ə/ with a [-LOW] root vowel, in Figure 6.

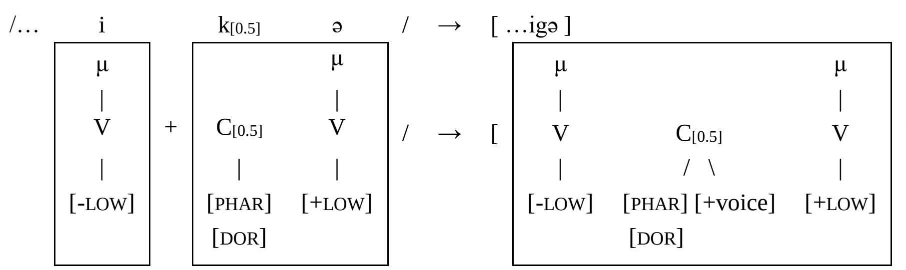

Figure 6: Roots with [-LOW] – Mapping from /-$k_{[0.5]}$ə/ → [gə]

Here, the [PHAR] feature is not able to combine with [-LOW] due to a ban on this feature combination in the phonological grammar (a constraint ^{x}[-LOW][PHAR]). Instead, [PHAR] is realized as a consonant. Due to its weak strength, it is subject to a constraint on intervocalic voiceless segments, which causes a [+voice] feature to be inserted (a constraint ${}^{x}VC_{[\text{-voice}]}V$). Strong consonants are not subject to this markedness constraint, and faithfully surface with their input voicing value (e.g. the other affixes in Table 14).

Finally, consider /-$k_{[0.5]}$ə/ with /n/-final roots in Figure 7, which result in a sequence [...ŋkə].

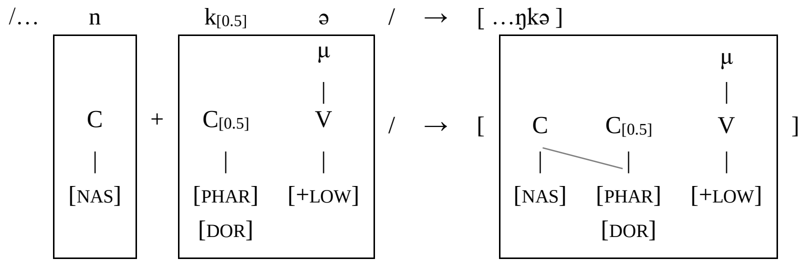

Figure 7: /n/-final roots – Mapping from /-$k_{[0.5]}$ə/ → [kə]

Here, the pharyngeal node shares its place feature with the preceding nasal, resulting in assimilation. The consonantal root node is not able to delete here, perhaps bolstered by the presence of the preceding root consonant. The result is an output where the weak /k/ surfaces. It is not between vowels and therefore not subject to ${}^{x}VC_{[\text{-voice}]}V$.

Just as we saw in Katu, there are clear historical grounds for a representation /-$k_{[0.5]}$ə/: it reconstructs to an earlier form *-kA with an unspecified low vowel (NT, 206). In the Bikin dialect studied here, creaky voice in general descends from intervocalic *-k-. Its consonantal origin is still seen in northern dialects of Udihe, where the perfect form is /-ʔə/ with a (consonantal) glottal stop (NT, 8). We can conclude that in Bikin, however, for the perfect morph the change from *-k- to creaky voice is incomplete, whose incomplete status can be captured via a gradient representation /-$k_{[0.5]}$ə/.

If a single underlying representation is accepted, then there is no suppletion here and therefore Udihe offers no support for phonologically-optimizing suppletive allomorphy.