

# Polish yers revisited\*

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## Abstract

It is common in linguistic research to attempt a unified analysis for similar patterns in related languages. In this paper, I argue that to do so for Polish and Russian vowel alternations would be a mistake. Although they share some notable phonological properties, they differ in their prevalence and their extensibility. I present an account of Polish under which vowel alternations are unexceptional, and exceptional blocking of alternation is achieved with lexically indexed constraints. This is the complement of Gouskova's (2012) account of Russian, which I argue to be desirable on the basis of novel corpus statistics from the Polish lexicon and their divergences from the trends for analogous words in Russian.

**Keywords:** Polish; Slavic; yers; vowel alternations; lexical indexation

## Resum. *Un altre cop d'ull a les iers del polonès*

En la investigació lingüística és corrent buscar una anàlisi unificada per a fenòmens similars de llengües relacionades. En aquest treball, s'argumenta que fer-ho per a les alternances vocàliques del polonès i del rus seria un error. Encara que comparteixen propietats fonològiques notables, difereixen respecte a la seva prevalència i la seva extensibilitat. Es presenta una anàlisi del polonès en la qual les alternances vocàliques no són excepcionals i el blocatge excepcional de les alternances s'assoleix amb restriccions indexades lèxicament. Aquesta és una anàlisi complementària de la de Gouskova (2012) per al rus, que s'argumenta que és desitjable sobre la base d'una nova exploració estadística d'un corpus del lexicó polonès i les seves divergències respecte a les tendències per a mots anàlegs en rus.

**Paraules clau:** polonès; eslau; iers; alternances vocàliques; indexació lèxica

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## 1. Introduction

### 1.1. Vowel alternations

All modern Slavic languages display stem-internal vowel-zero alternations in the paradigms of some of their nouns. These alternating vowels are traditionally called ‘yers,’ and they derive from the same historical source: high front and back vowels that are no longer present in the modern languages. In Polish, there are near-minimal pairs of consonantal contexts that do and do not host vowel alternation, making straightforward phonological accounts of the phenomenon impossible. Examples of alternating vowels in Polish are given in (1), while non-alternating vowels in the same consonantal contexts are given in (2). Comparing (1a) with (2a), (1b) with (2b), and (1c) with (2c), it is evident that there is no way to describe the consonantal contexts of vowel alternation to the exclusion of the contexts of non-alternation.<sup>1</sup>

#### (1) Alternating vowels

- a. sfeter ~ sfetra ‘sweater’ nom. sg./gen. sg.
- b. idiotek ~ idiotka ‘female idiot’ gen. pl./nom. sg.
- c. kalek ~ kalka ‘carbon paper’ gen. pl./nom. sg.

#### (2) Non-alternating vowels

- a. seter ~ setera ‘setter’ (dog) nom. sg./gen. sg.
- b. diskotek ~ diskoteka ‘discotech’ gen. pl./nom. sg.
- c. kalek ~ kaleka ‘cripple’ gen. pl./nom. sg.

Prominent analyses of yer vowel alternations have relied on abstract underlying representations of alternating vowels (Lightner 1972, Rubach 1986, Kenstowicz and Rubach 1987, Czaykowska-Higgins 1988, Szpyra 1992, Yearley 1995, Zoll 1996, Hermans 2002, Matushansky 2002, Steriopolo 2007). Under these approaches, all Slavic languages have been analyzed in a unified way: a rule that repairs an underlyingly defective yer vowel acts on that yer, and so allows it to surface, only when it is followed later in the UR string by another yer. These analyses thus assume that every output yer vowel is followed by an unrealized underlyingly present yer vowel at the end of the UR, i.e. [sfeter]~[sfetra] is underlyingly /sfetYr-Y/~[sfetYr-a/], where the (bolded and underlined) last yer of the UR /sfetYr-Y/ that conditions output [sfeter] is never seen overtly in the language. For accounts cast in Government Phonology (GP; Kaye 1990), the utility of these abstract URs has been used to argue for the correctness of GP assumptions about syllable structure (Rowicka 1999, Scheer to appear, inter alia), and the impossibility of casting these analyses in Optimality Theory (Prince and Smolensky 1993/2004) has been used to argue against OT as a whole (Scheer 2010, inter alia). For accounts that have not employed GP assumptions about syllable structure (Kenstowicz and Rubach 1987, Rubach 1987, inter alia), the

1. Data are taken from Bethin (1992), Gussmann (1990), and my own work with native speakers of Polish.

generalization about the locus of vowel alternation in the final syllable of a stem, and the syllable well-formedness consequences of this position of alternation, have been treated as accidental, rather than central to the explanation of the yer alternation (with the notable exception of Jarosz 2006, who uses syllable structure constraints to compel yer realization; this analysis is discussed in §4.1). Abstract UR accounts of Slavic have argued that there is no alternative by which to analyze Polish.

In this paper, I advance three novel points. Firstly, my analysis diverges from previous accounts of Polish in that it treats non-alternation as the exceptional case in Polish; I argue that the lexical statistics of the language support this. Secondly, this account motivates Polish vowel alternation from syllable well-formedness pressures, and does not rely on underlyingly marked vowels. It thus incorporates generalizations that most previous analyses have not captured about the phonological shape of the stems which host alternations, avoids the need to posit phonologically arbitrary rules, and provides a proof of concept for a whole-morpheme lexical indexation approach to exceptionality for Polish (something argued to be infeasible by Rubach 2013). Thirdly, contra most of the earlier literature on Polish and Russian vowel alternations, I argue that Slavic languages should not all be analyzed in the same way, and present qualitative and quantitative comparisons of Polish and Russian to support this assertion.

### *1.2. Structure of the paper*

I begin by presenting the generalizations about words that do and do not host vowel alternations in Polish in §2. Next, in §2.1, I present my formal OT analysis of Polish, and compare it with Gouskova's (2012) analysis of Russian. The statistics of the Polish lexicon are then given in §3, where the statistics of Russian found by Gouskova and Becker (2013) are also given for comparison. I argue in §3 that Polish and Russian diverge significantly in their observable attributes, such that the separate analyses for each language recommended here are preferable to a unified account of the languages' vowel alternations. In §4, I discuss other analyses of Polish, and compare them with the one I advance here. §5 concludes.

## **2. Polish regular alternation with exceptional blocking**

In Polish, the vowel [e] alternates with zero in the stem-final syllables of some words but not others. Even though there are near-minimal pairs for these alternations, there are generalizations about morphemes that alternate, and contexts in which alternating vowels always or never occur. Words with alternating vowels like [sfeter]~[sfetr-i] are illustrated in (3b). As noted by Jarosz (2006), there are no cases in which a vowel alternates before a consonant cluster, i.e. \*[CeCC#]~[CCC-i#]. The vowel [e] always appears in the case form of a noun's paradigm that lacks an overt affix<sup>2</sup> before the final consonant of that noun's stem.

2. This is the nominative or accusative singular for masculine words, and the genitive plural for feminine or neuter words.

Words like [seter]~[seter-i] in (3a) have vowels that do not alternate, but which occur with the same front mid vowel quality within the same C\_C consonantal contexts as the alternating vowels of the words in (3b). This can be seen by comparing no vowel alternation in [seter] with vowel alternation in [sfeter], even though both [e] vowels occur within the consonantal context [t\_r].

Other nouns are vowelless throughout their declensions, even in what would be the expected cases to host a vowel. These words like [vʲatr]~[vʲatr-i] in (3c) contain stem-final consonant clusters that are not broken apart by a vowel in their unaffixed cases, as opposed to (3a) and (3b). Thus, in the example of the [t\_r] consonantal cluster, a mid front vowel does not alternate in [seter], does alternate in [sfeter], and does not even occur in the relevant form of [vʲatr]. As Hayes (2009: ch. 12) points out, whether the Polish vowel alternation is treated as deletion (Gussmann 1980, Bethin 1992, Jarosz 2008, Rubach 1986, 2013) or epenthesis (Czaykowska-Higgins 1988), there must be lexical exceptions: no phonological rule or constraint applying without restriction can pick out the words in (3b) to undergo alternation without also accidentally encompassing either those in (3a) or those in (3c).

(3) Non-alternating, epenthetic, and absent vowels in Polish

	UR	Unaffixed	Case Suffix	Diminutive	Gloss
a. Non-alternating	/seter/	seter	seter-i	seter-ek	‘setter’
	/kalek/	kalek	kalek-i	kaletʃ-ek	‘cripple’
b. Epenthesis >1σ	/sfetr/	sfeter	sfetr-i	sfeter-ek	‘sweater’
	/lalk/	lalek	lalk-i	laletʃ-ek	‘doll’
c. Blocking I	/vʲatr/	vʲatr	vʲatr-i	vʲater-ek	‘wind’
	/katedr/	katedr	katedr-i	kateder-ek	‘cathedral’

The generalization seen in the ‘Diminutive’ column in (3) is reliable: if the last consonant of a stem is a sonorant, a vowel appears between the last two consonants of that stem in the diminutive, even if insertion does not apply elsewhere<sup>3</sup>. Thus, the [t\_r] cluster that remains intact in [vʲatr] is separated by an [e] vowel in the noun’s diminutive forms [vʲaterek]~[vʲaterk-a] (nom.~gen. sg.). In contrast to clusters that end with a sonorant, others that do not host vowel alternation with regular case morphology remain unbroken in the diminutive cases of the nouns in which they occur. This is shown in (4), in which the potential context [s\_t] lacks a vowel across all of unaffixed [most], case suffixed [most-i], and diminutive [mostek].

3. Other examples of a vowel breaking up a word-finally preserved obstruent-sonorant cluster under diminutive suffixing include [blizn]~[blizna] but [bliznka] ‘scar,’ [bubr]~[bobra] but [boberek], ‘beaver,’ [tefikwa]~[tefikw] but [tefikwɛlka] ‘beetroot,’ [flandr]~[flandra] but [flanderka] ‘flounder,’ [jawmuʒn]~[jawmuʒna] but [jawmuʒenka] ‘alms,’ [kilometr]~[kilometra] but [kilometrek] ‘kilometer.’

## (4) No alternation in obstruent-obstruent clusters

	UR	Unaffixed	Case Suffix	Diminutive	Gloss
Blocking II	/most/	most	most-i	most-ek	‘bridge’
	/swuʒb/	swuʒp	swuʒb-i	swuʒb-ek	‘service’

There are also words in which the occurrence of vowel alternation appears to be variable. It is unclear whether this variation is across or within speakers of Polish, but I observe that words with such optional alternations usually contain the same Slavic suffixes  $(-)(e)v$ ,  $(-)(e)n$ , as in (5). My analysis does not seek to provide an account for the alternations and variation in these cases.

## (5) Contexts of variation in Polish alternations

	UR	Unaffixed	Case Suffix	Diminutive	Gloss
Variation	/bit-v/	bitf, bitef	bitv-i	bitev-ek	‘battle’
	/vew-n/	vewn, vewen	vewn-i	vewen-ek	‘wool’

The contents of examples (3), (4), and (5) are summarized in (6), with a novel row, (6b), that illustrates alternations in monosyllabic nominal stems.

## (6) Six types of patterns in Polish

	UR	Unaffixed	Case Suffix	Diminutive	Gloss
a. Non-alternating	/seter/	seter	seter-i	seter-ek	‘setter’
	/kalek/	kalek	kalek-i	kalef-ek	‘cripple’
b. Epenthesis $1\sigma$	/dɲ/	dzeɲ	dɲ-i	dzon-ek	‘day’
	/mgw/	mgiew	mgw-i	mgiew-ek	‘fog’
c. Epenthesis $>1\sigma$	/sfetr/	sfeter	sfetr-i	sfeter-ek	‘sweater’
	/lalk/	lalek	lalk-i	lalef-ek	‘doll’
d. Variation	/bit-v/	bit(e)f	bitv-i	bitev-ek	‘battle’
	/vew-n/	vew(e)n	vewn-i	vewen-ek	‘wool’
e. Blocking I	/viatr/	viatr	viatr-i	viameter-ek	‘wind’
	/katedr/	katedr	katedr-i	kateder-ek	‘cathedral’
f. Blocking II	/most/	most	most-i	most-ek	‘bridge’
	/swuʒb/	swuʒp	swuʒb-i	swuʒb-ek	‘service’

### 2.1. A whole-morpheme analysis of Polish

In this section, I argue that Polish vowel-zero alternations should be analyzed as regular epenthesis with exceptional blocking captured by using lexically indexed constraints (Pater 2010; *inter alia*). This account of Polish alternations is the complement of Gouskova's (2012) analysis of Russian, discussed in §2.2, in which the regular pattern of the language is to maintain mid vowels in the stem-final syllables of the null affix cases of nouns, and vowel alternation is the result of exceptional deletion.

In Polish words that contain non-alternating vowels such as [seter]~[seter-i] in (6a), the ever-present vowel is a part of the underlying representation of a noun's stem. In alternating words such as [mgiew]~[mgw-a] in (6b) and [sfeter]~[sfetr-i] in (6c), the constraint that triggers epenthesis depends on the phonological size of the noun's stem, for reasons discussed after the relevant constraint rankings are laid out. In polysyllabic stems that host alternating vowels, the vowels break up a word final consonant cluster (CC#). Two constraints that cannot be ranked with respect to each other serve to motivate the position of vowel epenthesis inside the disconsantal cluster; these are \*COMPLEXCODA and \*FINALAPPENDIX, defined in (7) and (8). Together, these constraints are referred to as \*CC# (9), and must outrank DEP-V (McCarthy and Prince 1995), the constraint against vowel epenthesis defined in (10). This is illustrated in (11a), where the insertion of a vowel is compelled by the ranking \*CC#>>DEP-V in order to avoid a word-final consonant cluster. Epenthesis into non-coda stem-final consonant clusters is prevented in grammatical cases with overt suffixes by DEP-V, as is shown in (11b).

(7) \*COMPLEXCODA - 'assign a violation for every instance of a branching coda'

(8) \*FINALAPPENDIX - 'assign a violation for every instance of an unsyllabified word-final consonant'

(9) \*CC# - a cover constraint for the combined action of (7) and (8)

(10) DEP-V - 'assign a violation for every vowel present in the output that is not present in the input'

(11) Polysyllabic words with alternations

a.	/sfetr/ 'sweater'	*CC#	DEP-V
	→ sfeter		*
	sfetr	*W	L
b.	/sfetr-i/ 'sweaters'	*CC#	DEP-V
	→ sfetri		
	sfeteri		*W

In monosyllabic alternating words like [mg<sup>j</sup>ew]~[mgw-a], HEADEDNESS, the pressure to have a syllable nucleus, drives insertion when the word would otherwise lack a vowel (Szpyra 1992, Hayes 2009). HEADEDNESS is undominated in the language, so some insertion is obligatory, but \*CC# determines the site of epenthesis in /CCC/ words with underlying triconsonantal clusters: insertion must place a vowel before the last consonant of the stem, breaking up the potential final cluster. Insertion in monosyllables is demonstrated in (13)<sup>4</sup>.

(12) HEADEDNESS - ‘assign a violation for every word that lacks a full syllable’

(13) Monosyllabic words with alternations

/mgw/ ‘mist’	HEADEDNESS	*CC#	DEP-V
→ mg <sup>j</sup> ew			*
mgw	*W	*W	L
megw		*W	L

The instances in which there are no alternations between unaffixed and case forms such as [v<sup>j</sup>atr]~[v<sup>j</sup>atr-i] and [most]~[most-i] are specified as exceptions to epenthesis via lexical indexation. Lexically indexed CONTIGUITY<sub>Ex</sub> (McCarthy and Prince 1995), defined in (14), is ranked above \*CC# and so prevents vowel insertion in unaffixed cases, as illustrated for sonorant-final words in (15a) and obstruent-obstruent-final words in (15b)<sup>5</sup>. CONTIGUITY<sub>Ex</sub> protects all stem-final sonority profiles in the words to which it is indexed.

(14) CONTIGUITY<sub>Ex</sub> (CONTIG<sub>Ex</sub>) - ‘assign one violation for every instance of two segments that are contiguous in the input but not contiguous in the output’

(15) Words without alternations in null affix cases

a.	/v <sup>j</sup> atr <sub>Ex</sub> / ‘wind’	CONTIGUITY <sub>Ex</sub>	*CC#	DEP-V
	→ v <sup>j</sup> atr		*	
	v <sup>j</sup> ater	*W	L	*W
b.	/most <sub>Ex</sub> / ‘bridge’	CONTIGUITY <sub>Ex</sub>	*CC#	DEP-V
	→ most		*	
	moset	*W	L	*W

4. /mgw/ historically contained a yer vowel between the first two consonants, such that a genitive plural would have been cluster-final [mɛgl]. Modern-day Polish has thus changed the word /mgw-a/ to undergo the present vowel alternation in a different locus in the word’s stem from its historical source vowel.
5. An anonymous reviewer asks why DEP-V<sub>Ex</sub> is not preferred over CONTIGUITY<sub>Ex</sub> here. This is because of the nature of lexical indexation; an indexed constraint can only apply to the segments that are underlyingly part of the stem to which it is indexed. An inserted vowel in the output is not part of that stem in the input, thus, it would not violate a prohibition against insertion that were only applied to the stem segments.

But CONTIGUITY<sub>Ex</sub> must be dominated, since there is obligatory epenthesis for sonorant-containing cluster-final stems in the context of diminutive suffixes. This requires the action of two constraints, \*INTERNALAPPENDIX and SONORITYSEQUENCING, defined in (16) and (17), respectively, which cannot be ranked with respect to each other. Together, \*INTERNALAPPENDIX and SONORITYSEQUENCING will be referred to as \*CRC (18). The word-final [r] in (15a) is assumed to be a prosodic word appendix, and so it does not violate \*CRC.

- (16) \*INTERNALAPPENDIX - ‘assign one violation for every instance of an unsyllabified word-internal consonant’
- (17) SONORITYSEQUENCING - ‘assign one violation for ever pair of tautosyllabic consonants the sonority of which does not rise in the direction of the syllable nucleus’
- (18) \*CRC - a cover constraint for the combined action of (16) and (17)

Following Jarosz (2008), I argue that the diminutive suffix /-k/ introduces a pressure to optimize the paradigm in which it occurs by consistently placing stress on the same vowel throughout. Because Polish has regular penultimate stress in all but a small set of Latinate words, this amounts to a pressure to keep the same vowel in the penultimate syllable throughout a word’s declension. This is achieved by indexing the paradigmatic stress faithfulness constraint in (19) to the diminutive suffix /-k/.

- (19) OPSTRESS<sub>k</sub> (OPSTR<sub>k</sub>)- ‘assign one violation for every difference between the main stress placements of any two output forms in the same inflectional paradigm’

Because OPSTRESS<sub>k</sub> selects among paradigms, outputs from multiple underlying representations are considered at once in tableaux including it. Since OPSTRESS<sub>k</sub> and \*CRC do not conflict, they cannot be ranked with respect to each other.

Comparing (15a) and (20a), we find evidence that \*CRC dominates CONTIGUITY<sub>Ex</sub>: insertion is blocked when it would break up the word-final obstruent-sonorant cluster of the lexically indexed stem of [v<sup>i</sup>atr] in (15a), but it occurs when an unbroken obstruent-sonorant-obstruent cluster would otherwise result in \*[v<sup>i</sup>atrka] in (20a<sup>iii</sup>)<sup>6</sup>. OPSTRESS<sub>k</sub> rules out the candidate paradigm that shifts stress

- 6. A handful of words such as [p<sup>i</sup>otr<sub>Ex2</sub>]-[p<sup>i</sup>otrka] ‘Peter,’ [krɛf]-[krvi] ‘blood,’ and [tʃosnek]-[tʃosnku] ‘garlic,’ which host trapped sonorants, are all indexed to another, higher-ranked CONTIGUITY<sub>Ex2</sub> constraint, as shown in (i). In the case of [krɛf], HEADEDNESS compels insertion, as discussed for [mgl̩a] in (13) and (21).

(i) Exceptional nominal stems with diminutive affixes

/p <sup>i</sup> otr <sub>Ex2</sub> -k/, /p <sup>i</sup> otr <sub>Ex2</sub> -k-a/ ‘Peter’ (dim.)	CONTIG <sub>Ex2</sub>	OPSTR	*CRC	CONTIG <sub>Ex1</sub>	*CC#	DEP-V
→ p <sup>i</sup> ótrek, p <sup>i</sup> ótrka			*			*
p <sup>i</sup> ótrek, p <sup>i</sup> otréka		*W	L			**W
p <sup>i</sup> otérek, p <sup>i</sup> otérka	**W		L			***W



between the stem vowel and the diminutive vowel in (20aii), and so the optimal paradigm in (20ai) merely incurs violations of  $\text{CONTIGUITY}_{Ex}$  and  $\text{DEP-V}$ . In (20b), stress can be maintained on the stem vowel without violating the sonority sequencing principle, so no vowel is ever inserted into the stem-final cluster.

(20) Selection of nominal stems with diminutive affixes

a.	$/v\acute{a}tr_{Ex}-k_k/$ , $/v\acute{a}tr_{Ex}-k_k-a/$ 'wind' (dim.)		$\text{OPSTR}_k$	*CRC	$\text{CONTIG}_{Ex}$	*CC#	$\text{DEP-V}$
	→	i. $v\acute{a}t\acute{e}r\acute{e}k$ , $v\acute{a}t\acute{e}r\acute{k}a$			**		***
		ii. $v\acute{a}t\acute{r}e\acute{k}$ , $v\acute{a}t\acute{r}\acute{e}k\acute{a}$	*W		L		**L
		iii. $v\acute{a}t\acute{r}e\acute{k}$ , $v\acute{a}t\acute{r}k\acute{a}$		*W	L		*L
b.	$/m\acute{o}st_{Ex}-k_k/$ , $/m\acute{o}st_{Ex}-k_k-u/$ 'bridge' (dim.)		$\text{OPSTR}_k$	*CRC	$\text{CONTIG}_{Ex}$	*CC#	$\text{DEP-V}$
	→	i. $m\acute{o}st\acute{e}k$ , $m\acute{o}st\acute{k}u$					*
		ii. $m\acute{o}s\acute{e}t\acute{e}k$ , $m\acute{o}s\acute{e}t\acute{k}u$					***W

The proposed ranking of  $\text{HEADEDNESS} \gg \text{OPSTRESS}_{k^2}$ , \*CRC  $\gg \text{CONTIGUITY}_{Ex} \gg *CC\# \gg \text{DEP-V}$  accounts for the above generalizations about alternating and non-alternating environments in Polish. Words that contain vowels that do not alternate are faithful mappings from the UR of a stem to its output. Polysyllabic words that alternate with regular case morphology are the general pattern in the language, subject to the ranking of constraints against word-final consonant clusters above the constraint against epenthesis, \*CC#  $\gg \text{DEP-V}$ . In monosyllabic words that alternate, however, it is an undominated pressure that requires each word to have at least one well-formed syllable that accounts for vowel epenthesis, as captured by  $\text{HEADEDNESS} \gg *CC\# \gg \text{DEP-V}$ ; avoidance of final consonant clusters merely determines the location of insertion. Indexed  $\text{CONTIGUITY}_{Ex}$  prevents epenthesis into the unaffixed case forms of some morphemes by dominating \*CC#, as in  $\text{HEADEDNESS} \gg \text{CONTIGUITY}_{Ex} \gg *CC\# \gg \text{DEP-V}$ , but it could never do so for the monosyllables in the language. Even if a learner were to mistakenly index the stem of monosyllabic [mgwa] 'mist' to  $\text{CONTIGUITY}_{Ex}$ ,  $\text{HEADEDNESS}$  would still compel insertion, and \*CC# would determine the position, because indexed constraints participate in a language's general ranking, as in (21).

(21)  $\text{HEADEDNESS}$  compels insertion where necessary

$/mgw_{Ex}/$ 'mist'	$\text{HEADEDNESS}$	$\text{CONTIGUITY}_{Ex}$	*CC#	$\text{DEP-V}$
→ $mg^i\acute{e}w$		*		*
mgw	*W		*W	L
megw		*	*W	L

For the diminutive forms in the language that could result in an unsyllabified sonorant, \*CRC dominates normal CONTIGUITY<sub>Exp</sub> and paradigm correspondence pressures determine the site of epenthesis throughout the diminutive declension.

The analysis I advance here captures both what happens in the language and what does not. Vowel alternation occurs as a result of insertion in order to prevent stem-final consonant clusters, whether as a branching coda or as a singleton coda followed by a prosodic word appendix. This accounts for the positional generalizations of epenthesis: it always occurs in the stem-final syllable and before the stem-final consonant, i.e. \*[CeCC#]~[CCC-i#]. But regular epenthesis is blocked in exceptional cases, where final cluster faithfulness is maintained. Importantly, exceptional blocking is not undominated; it interacts with the ranking of the whole language and is prevented from over-extending. For this reason, all words obligatorily contain at least one syllabic nucleus, even if a monosyllabic stem is somehow indexed, and unsyllabified word-internal sonorants are prevented in indexed stems. This indexation analysis does not suffer from over-generation, and it does not rely on arbitrary undominated exceptions, unlike the strawman indexation analysis of Rubach (2013).

Analyses that attribute yer vowel realization to the surfacing of the rightmost of two abstract vowels in the UR cannot capture the syllable structural generalizations that my analysis does. For these sequential realization analyses, vowel alternation before a cluster \*[CeCC#]~[CCC-i#] or even in a non-final syllable of a stem \*[CeCVC#]~[CCVC-i#] should be well-formed if the underlying positions of the yer vowels happen to fall into this configuration. These sequential abstract analyses also have to posit that there are two underlyingly different overtly null suffixes. Stems that do not host a vowel in their regular case morphology, but do display a vowel in their diminutive case morphology, would be suffixed with a truly null morpheme in their overtly unaffixed regular forms, such as [v'atr] from /v'atYr-Ø/, but stems that do host alternation would be suffixed with an unrealized yer in their unaffixed forms, to yield [sfeter] from /sfetYr-Y/.

One purported advantage that these sequential abstract UR analyses have over the analysis I have presented for Polish is that the abstract account extends equally well to other Slavic languages, while my account of Polish would not be applicable to, for example, Russian. The rest of this paper argues that such a unified analysis is in fact undesirable. Below in §2.2, I present Gouskova's analysis of Russian that also uses lexical indexation, and captures the same syllable structure generalizations that my analysis does, but does so with different constraints. I then turn to the lexical statistics of Polish as evidence for my assertion about the regularity of alternation in Polish, and compare these trends with those of Russian, which do the opposite. I return to comparison with other accounts of Slavic alternations in §4.

## 2.2. Comparison with Russian

Gouskova (2012) argues that exceptionality is represented at the level of designating whole morphemes that host exceptional behavior, and proposes that Russian vowel alternations are the result of exceptional deletion, while the words that retain

a non-alternating vowel in a stem-final syllable with a single consonantal coda are the regular pattern. A lexically indexed \*MID constraint, defined in (22), triggers deletion of a mid vowel as in (23a), when it would not cause a violation of \*COMPLEXCODA or \*FINALAPPENDIX. But when such deletion would violate \*CC, the candidate with a mid vowel in the last syllable is preferred, as in (23b).

(22) \*MID - ‘assign a violation for every instance of a mid vowel’

(23) Russian words with alternations

a.	/mox <sub>Ex</sub> / ‘moss’	*CC#	*MID <sub>Ex</sub>
	→ mxa		
	moxa		*W
b.	/xʲitʲer <sub>Ex</sub> / ‘clever’	*CC#	*MID <sub>Ex</sub>
	→ xʲitʲor		*
	xʲitʲr	*W	L

For unindexed/unexceptional Russian words, normal \*MID is ranked below MAX-V, the constraint against vowel deletion defined in (24). The normal markedness of mid vowels (that Gouskova argues for based on the realization of unstressed reduced vowels in Russian) cannot compel their deletion in regular words, even when the result could be parsed into well-formed syllables. We see this in (25b), in which [bʲi.l̩.ɛ.ta] is preferred to [bʲil.ta], even though all of the syllables of [bʲi.l̩.ɛ.ta] are well-formed. Notably, although \*CC is ranked above \*MID<sub>Ex</sub>, it cannot cause vowel insertion due to high-ranking DEP-V. For this reason, the fully faithful candidate [mʲet.r] is selected in (25c), even though it ends in a consonant cluster.

(24) MAX-V - ‘assign a violation for every instance of a vowel present in the input that is absent in the output’

(25) Russian words without alternations

a.	/l̩ɛs-a/ ‘forest’	DEP-V	*CC#	*MID <sub>Ex</sub>	MAX-V	*MID
	→ l̩ɛsa					*
	lsa				*W	L
b.	/bʲil̩ɛt-a/ ‘ticket’	DEP-V	*CC#	*MID <sub>Ex</sub>	MAX-V	*MID
	→ bʲil̩ɛta					*
	bʲilta				*W	L
c.	/mʲet-r/ ‘meter’	DEP-V	*CC#	*MID <sub>Ex</sub>	MAX-V	*MID
	→ mʲet-r					*
	mʲeter	*W	L			**W

The high ranking of DEP-V in Russian may be a part of the explanation for the persistence of paradigm gaps in the unaffixed cases of words like ‘mist,’ which in Russian lacks a genitive plural, but is a cognate of the Polish [mgwa] in its nominative form [mgla]. This word that has a gap in its null affix-, and so potentially vowel-containing, case did contain a yer vowel in an earlier stage of the historical development of the language, and so after the “fall” of the yers, it could have contained an alternating mid vowel at some point. But the likely rarity of the genitive plural form of a word like ‘mist’ could have prevented successive generations of learners from receiving positive evidence for a stem-internal vowel’s existence, making it unclear whether the underlying form of the stem was vowelless /mgl/ or vowelful indexed /mgVl<sub>EX</sub>/ that always happened to appear with its vowel deleted. Faced with such uncertainty, Russian speakers might have accommodated a paradigm gap rather than risk insertion into an output for which the UR may not contain a vowel.

### 3. Lexical statistics of Polish versus Russian

In this section, I present the results of an analysis of a corpus of Polish nouns, and compare these with Gouskova and Becker’s (2013) findings for a similar study of Russian nouns. On the basis of this, I contend that the lexical statistics of Polish support the proposal that vowel alternation is the general case, while a lack of an alternating vowel within stem-final consonant clusters is the exceptional case in the language. I further argue that the lexical statistics of the two languages together support the conclusion that they should be analyzed in complementarily different ways.

The POLEX lexicon of Polish (Vetulani et al. 1998) contains 41,742 nouns. Of these, 15.8% exhibit stem-final vowel alternation, as reported in (26a). Another 6.3% of these nouns contain a non-alternating [e], as shown in (26b). Yet another 16.1% of the lexicon ends in an unbroken word-final consonant cluster in some grammatical case, as illustrated in (26c). Of these nouns that end in a consonant cluster, all of which could possibly be considered exceptions to alternation under my analysis, the majority end in the suffixes [-oɕɛ], [-izm], [-ist], [-stv], [-ovɲ] and [-itm]; these are counted in (26ci). These suffixes do not host alternating vowels in their regular case paradigms, and tend to be part of a more formal register in language use. Words that end in such consonant cluster-final suffixes represent 11.1% of the whole lexicon, leaving 5.0% of the lexicon ends in CC#, but does not contain these particular suffixes. These unsuffixed cluster-final words are reported in (26cii).

## (26) Corpus statistics for Polish

		Count	Of Lexicon	Example	
a.	Alternating [e]	6,581	15.8%	sfeter ~ sfetri	
b.	Non-alternating [e]	2,624	6.3%	seter ~ seteri	
c.	Ends CC# cluster	6,729	16.1%		
	i.	Suffixed	4,630	11.1%	markeizm ~ markeizmu
	ii.	All unsuffixed	2,099	5.0%	swufp ~ swuzba
d.	CCV# or non-[e] CVC	25,808	61.8%	azja ~ azji	
		Total	41,742	100%	

If Polish speakers know that the particular Latinate and Slavic suffixes counted in (26ci) are unacceptable contexts for vowel insertion, and so rank morpheme-specific faithfulness to them above the pressures to break up a word final consonant cluster, then the CC# words in the lexicon that must be treated as idiosyncratic exceptions to epenthesis, and would be indexed to CONTIGUITY<sub>Ex</sub> under the analysis presented here, would be 5% of the nouns of Polish. This is comparable to the percentage of alternators in Russian, to which I now turn.

Goukova and Becker (2013) performed an analysis of the 20,563 masculine second declension nouns from Zaliznjak's (1977) dictionary. They focused on masculine nouns, rather than including feminine ones, because feminine nouns are those more likely to have paradigm gaps in exactly the case expected to contain an alternating vowel. Their findings for forms comparable to those in (26) are given in (27)<sup>7</sup>, which lists the alternators that are exceptional in (27a), the unexceptional unbroken clusters in (27b), and all other words in (27c).

## (27) Corpus statistics for Russian

		Count	Of corpus	Example	
a.	Alternating [e]/[o]	1,902	9.2%	ʃatʲor ~ ʃatʲrof	
b.	Ends CC# cluster	3,177	15.5%	most ~ mastof	
c.	Other VC# or CCV#	15,484	75.3%	krot ~ kratof	
		Total	20,563	100%	

Under an account of Polish and Russian yers that combines the present analysis with Goukova's (2012), the percentage of exceptional non-alternating words (e.g. [most]~[most-i]) in Polish is smaller (5%) than the percentage of exceptional alternating words in Russian (e.g. [ʃatʲor]~[ʃatʲrof], 9%), while the percentages of words that follow the majority pattern are comparable across the two languages

7. The apparent [a]~[o] alternation in the example Russian words in (27) is the result of stress shift, with [o] under primary stress and [a] when pretonic.

(Polish 15.8% alternating, e.g. [sfeter]~[sfetri], to Russian 15.5% not hosting a vowel, e.g. [most]~[mastof]).

On the basis of these data, I argue that while Polish and Russian arose from the same historical source, they have taken divergent paths in their evolution. The languages today differ in multiple ways that likely impact the appropriate analysis of their vowel alternations. In Russian, both [e] and [o] alternate, and so the backness distinction of the original yers is preserved, but the percentage of alternators in the lexicon is almost half of the percentage of non-alternators. This contrasts with Polish, in which only the [e] vowel alternates, but the percentage of alternators in the lexicon is three times the percentage of unpredictable non-alternators. Thus, Polish and Russian are the opposites of each other on extensibility to loans, predictability of vowels, paradigm gaps, and the relative sizes of the proportions of the lexicon that undergo alternation versus retain word-final unbroken clusters in null affix cases. These differences are summarized in the table in (28).

(28) Qualities of Polish versus Russian alternations

	Polish	Russian
Extended to loans?	Yes	No
Vowel predictable?	Yes	No
Paradigm gaps?	No	Yes
Unbroken CC#	5.0%	15.5%
Alternation	15.8%	9.2%

The vowel alternations of Polish and Russian occur in phonologically similar contexts, but with different rates and limitations. While a unified analysis of the two languages' vowel alternations would capture the phonological contextual parallels, it would ignore the particular quantitative attributes of the inputs to which learners of Polish and Russian have access. I discuss the impact of these differences in §4 as part of a greater comparison of the present account with others.

#### 4. The present account versus alternatives

In this section, I compare the account that I have advanced here with alternatives by focusing on three differences. The first difference between my and most other approaches that I discuss is that my approach to Polish vowel alternations builds the syllabic contexts of the alternations into the analysis, while, to my knowledge, all other approaches besides Jarosz (2006) treat the pre-final consonant positional restriction of the alternations as accidental. The second difference between my account and others' discussed below is that I argue that Polish and Russian should be analyzed differently, while a major argument advanced in favor of adopting an abstract-UR approach to alternating vowels has been that an abstract-UR approach can give a unified analysis to all Slavic languages. As I explain above in §3, I argue for analyzing Polish and Russian alternations differently on the basis

of their speakers' qualitatively divergent behaviors and their lexical statistics' quantitatively divergent patterns. The other difference between the present and most alternative accounts that I focus on here is that my account treats Polish alternations as epenthetic, while most other accounts of Slavic alternating vowels have treated alternations as the result of deletion. If one assumes that the segmental inventory of Polish is composed of only those segments that surface in the language, there is no phonological markedness constraint that could be used to trigger vowel deletion in a lexical indexation analysis (Rubach 2013). While the pioneering whole-morpheme analysis of Polish advanced by Jarosz (2008) makes use of vowel deletion, its central insights and triggering faithfulness constraint may be retained in an account that assumes an epenthetic alternation, as I show below. For these reasons, I argue that an epenthetic analysis of Polish is simpler to posit from the perspective of markedness constraints, and does not lose any of the surface-true generalizations that deletion-based analyses of the Polish alternation can cover.

#### *4.1. Capturing syllable structure generalizations*

Most abstract-UR accounts of Slavic vowel alternations have posited the existence of underlying 'yer chains,' and a special corresponding rule of yer realization. In this section, I will demonstrate that, because of the way that this rule is written, the yer chain approach does not capture the phonological generalizations about Polish vowel alternation laid out in §2. It would allow alternations in syllable structural and stem-internal positions in which vowel alternation is never observed.

In yer chain analyses of Slavic, the process of yer vowel realization is the repair and subsequent surfacing of all the yer vowels but the very last one in an underlying string. This requires the assumption that, for every alternating yer vowel observed in the surface forms of the language, there is another yer vowel that occurs later in the underlying representation of a word that is never observed. The output forms of some words of the language, URs assumed by abstract yer chain accounts, and the URs that I propose for those same words are given for comparison in (29). For the unaffixed case form [sfeter] in (29a), a yer chain account would require an underlying yer vowel in the position that the alternating vowel (underlined) occurs, as well as one appended to the end of the stem as a case suffix that is not overtly phonologically realized. In contrast with (29a), [v<sup>ɨ</sup>atr] in (29b) would not have an unrealized yer vowel suffix in the yer chain account. Instead, its suffix would be truly null, and this would prevent the stem-internal yer that surfaces between the stem-final consonants in [v<sup>ɨ</sup>aterek] of (29c) from being realized in the non-diminutive paradigm of the word. When a yer-containing stem is realized with an overt case suffix, the yer chain account again relies on its rule of only realizing a yer if another follows, yielding forms such as [mgwa] in (29d).

## (29) Comparison of URs

	Output	Yer Chain UR	Proposed UR
a.	sfet <u>r</u>	/sfetYr-Y/	/sfetr-Ø/
b.	v <sup>i</sup> atr	/v <sup>i</sup> atYr-Ø/	/v <sup>i</sup> atr <sub>EX</sub> /
c.	v <sup>i</sup> at <u>r</u> ek	/v <sup>i</sup> atYrYkY/	/v <sup>i</sup> atr <sub>EX</sub> -k <sub>k</sub> /
d.	mgwa	/mgYw-a/	/mgw-a/

The rule that realizes all but the last yer in a chain is phonologically arbitrary; it is not integrated into the well-formedness pressures of the rest of the language. Because of its arbitrariness relative to syllable structure, this rule would allow vowels to alternate before a word-final coda cluster. Since pre-final-cluster alternation is never observed in Polish, it is an undesirable prediction of any yer chain account. If yer chains were indeed the way that speakers represented these words, it might have been expected that historical genitive plural of ‘mist’ [mьgł] could have been maintained as [megw] from /mYgw-Y/, instead of being regularized to [mq<sup>i</sup>ew]~[mgwa] from /mgw/~mgw-a/.

It is possible to test whether speakers of Polish are aware of the inappropriateness of alternation in a non-final syllable or before a word-final coda cluster. Gouskova and Becker (2013) did this in a nonsense word experiment for Russian, and found that speakers dispreferred forms with alternations in these unattested conditions relative to forms that alternated in the appropriate conditions. Given that the Russian alternation is not as common in that language as the Polish alternation, it is reasonable to expect that Polish speakers would similarly downgrade the well-formedness of pre-cluster alternating nonsense words.

Yer vowels in chains are assumed to be somehow defective relative to the segmental inventories of the languages in which they occur, and so the process of yer vowel realization in these accounts is the repair and surfacing of all but the very last yer in an underlying string. Thus, an abstract yer chain analysis requires speakers to hypothesize the existence of vowels that are never seen overtly, and to endow them with defectiveness of some kind (this varies by account). In order for speakers to arrive at a phonologically arbitrary grammatical analysis that requires specific representational assumptions about vowels that are never overtly observed, their innate knowledge would have to encompass a preference for such an analysis.

Scheer’s (2004) CVCV account of alternating vowels is similar to yer chain accounts in that it posits underlying vowels never seen on the surface that occur in a licensing relationship with alternating vowels. It also assumes that syllables are underlyingly all consonant-vowel, that is, for every apparent coda consonant, there is in fact an unrealized underlying vocalic nucleus for which it provides an onset. The difference between loci of alternation and unbroken clusters is then one of different underlying specifications of alternating vowels versus never-seen ones. This difference is taken to be identical across Polish, Russian, and all other languages (e.g., French) in which some form of vowel alternation is seen. It is not the aim of this paper to argue against the CVCV approach to syllable structure, under which



Scheer’s statement of the conditions of vowel alternation is indeed motivated by that framework’s syllable structural well-formedness criteria. But insofar as my analysis does not require that alternating and non-alternating vowels be underlyingly specified as different, does not require positing vowels that are never seen on the surface, and begins from the assumption that analyzing related Polish and Russian differently is desirable on the basis of those languages’ lexica, all the arguments presented here to favor my analysis over other approaches apply to Scheer’s as well.

One earlier analysis of Polish captures the syllable positional generalization of vowel alternation under structural assumptions like those I follow here, and employs URs with vowels that are not attested in the language. Jarosz’s (2006) account posits that alternating vowels are underlyingly /ɪ/ vowels, which do not surface in the language due to the markedness of simultaneous [+high] and [-tense] features. Due to their markedness, these vowels only surface when the alternative would be the creation of a complex coda, but even then they are not realized faithfully. Instead, the [+high] specification is changed to a [-high] one to yield a mid vowel. This is shown in (30a), in which [sfeter] is chosen over possible [sfetr] or [sfetr̩]. When a complex coda would not otherwise result, the underlying yer vowel is deleted as in (30b), while non-alternating vowels are present as mid vowels underlyingly.

(30) Unattested surface vowel in appropriate position of the UR

a.	/sfetr̩-Ø/	*ɪ	*COMPLEXCODA	ID[HI]	MAX-V
	→ sfeter			*	
	sfetr̩		*W	L	*W
	sfetr̩	*W		L	
b.	/sfetr̩-i/	*ɪ	*COMPLEXCODA	ID[HI]	MAX-V
	→ sfetri				*
	sfetr̩i	*W			L
	sfeteri			*W	L

Jarosz thus posits that alternation stems from the underlying defectiveness of the vowels, which are dispreferred by universal markedness constraints. The major differences between Jarosz’s (2006) analysis and the one I present here are its reliance on vowels that are not attested in the surface forms of the language and its characterization of the alternation as deletion-based.

#### 4.2. Related languages with different grammars

In this section, I argue that a unified account of Polish and Russian, in which one exceptional rule were posited to account for the alternations of both languages, would require assumptions about learning and the use of extra-grammatical generalization mechanisms that an account with separate analyses does not require.

As I have shown above in §3, Polish and Russian are qualitatively and quantitatively different. Qualitatively, Polish extends vowel alternation to loan words, does not have paradigm gaps, and only alternates the front mid vowel, while Russian does not extend alternation to loans, retains paradigm gaps, and alternates both of the front and back mid vowels. Quantitatively, the percentage of the Polish lexicon that undergoes alternation (15.8%) is comparable to the percentage of the Russian lexicon that does not undergo alternation (15.5%), while the percentage of non-alternators that are exceptional under my analysis of Polish (5.0%) is comparable to the percentage of exceptional alternators under Gouskova's (2012) account of Russian (9.2%). If Polish and Russian are subject to complementary grammatical analyses like those I advance here, then Polish speakers are extending a regular rule of their language to apply to loans and select output forms for even low-frequency grammatical cases, while Russian speakers are not extending an exceptional rule of their language to loan words or gaps in existing paradigms.

A unified analysis of the two languages would require speakers of Polish and Russian to be sensitive enough to the lexical frequencies of alternation in order to reach divergent decisions about whether to extend the pattern, but not so sensitive that they would adopt divergent grammatical analyses for their languages as wholes. Presumably, extension would have to be determined by a post-grammatical mechanism. Any unified grammatical analysis necessarily makes representational assumptions that, as discussed above, require it to rely on innate knowledge about the appropriate grammatical analysis for Slavic in order to ensure that learners reach the desired outcome in both languages. This is because a single-rule analysis must be neutral to the differences between the two languages such that it does not build those generalizations into an account by, for example, treating alternations as regular in one language and exceptional in another. The motivation for alternation does not come from any phonological pressure that the learner observes at work in her target language; instead, somehow, learners must be constrained to prefer phonological arbitrariness over all other phonologically-grounded possible explanations. Unified analyses thus require substantial assumptions about both the innate knowledge with which speakers begin learning and the relationship of extra-grammatical mechanisms of rule extension to grammatical analyses.

An account in which Polish and Russian differ in the way I have argued here would require speakers to observe the prevalence of vowel alternations in their native languages, and use this for both grammatical learning and later possible pattern extension. No special preference for phonological arbitrariness would have to be encoded in learners' innate knowledge, and no analytical insensitivity combined with behavioral sensitivity would have to be posited for speakers' awareness of their native languages.

#### *4.3. Insertion rather than deletion*

Under the account that I advance here, [v<sup>i</sup>atr] and [most] are exceptions to epenthesis in Polish. The alternative analysis that uses lexical indexation is that [seter]

resists deletion. In this section, I discuss the reasons for which an epenthetic analysis is to be preferred.

4.3.1. *Epenthetic analyses are simpler*

The only whole-morpheme account of Polish yers in the literature to date is Jarosz’s (2008). Jarosz argues that underlying full vowels delete in some words of Polish and not others, because some words of Polish are subject to a constraint ranking in which the constraint requiring all of the forms of a noun’s paradigm to have stress on the same segment, OPSTRESS, outranks the constraint against vowel deletion, MAX-e. Importantly for our discussion of epenthesis versus deletion, Jarosz (2008) does not motivate her choice of process or underlying representation. She assumes underlyingly present vowels, and determines that deletion is necessary to make an underlying vowel not surface when it would either interrupt completely regular penultimate stress placement or force a case form to be stressed on a different syllable from the rest of its paradigm. In Jarosz’s analysis, the paradigm in (31a), in which underlying final-syllable [e] is deleted with vocalic suffixes, is preferred over the paradigm in which stress shifts one syllable over to remain penultimate in (31b) and the paradigm in which a word-final [e] is epenthésized so as to keep the [ter] sequence both intact and stressed in (31c).

(31) OT with co-phonologies for deletion

	/sfeter-Ø/, /sfeter-a/	DEP-e	OPSTRESS	MAX-e
	/sfeter/: OPSTRESS >> MAX-e			
→	a. sféter, sfétra			*
	b. sféter, sfetéra		*W	L
	c. sfetére, sfetéra	*W		L

But it is possible to formulate an account that uses the same triggering constraint and theoretical approach as Jarosz’s if one assumes that underlying consonant clusters are broken only when it would result in stress placement on the appropriate vowel in the word’s stem. This is seen in comparison of the tableaux in (31) and (32), which respectively show Jarosz’s use of OT with co-phonologies to choose among possible paradigms for an underlying stem that contains an alternating vowel and a hypothetical use of OT with co-phonologies to choose among possible paradigms for an underlying stem that contains a consonant cluster that hosts an alternating vowel. In the alternative co-phonology analysis using OPSTRESS and epenthesis shown in (32), epenthesis of one [e] vowel as in (32a) is preferred over allowing stress to shift as in (32b) or epenthésizing both into- and after the stem as in (32c).

## (32) OT with co-phonologies for epenthesis

		/sfétr-Ø/, /sfétr-a/	MAX-e	OPSTRESS	*CC#	DEP-e
		/sfétr/: OPSTRESS >> DEP-e				
→	a. sféter, sfétra					*
	b. sféter, sfetéra			*W		**W
	c. sfetére, sfetéra					**W
	d. sfétr, sfétra				*W	

OPSTRESS can thus be used to motivate epenthesis if assumptions about underlying representations are changed. As Rubach (2013) notes, it is not possible to identify a markedness constraint that would require deletion of underlying full [e] vowels that could be used to motivate alternation in Polish. Unlike in Russian, a Polish learner would not encounter good evidence for the action of \*MID in the language, because unstressed vowels are not reduced such that their qualities change, and only [e] alternates. Furthermore, a Russian-style account à la Gouskova would wrongly predict that [o] can alternate in the last syllable of nouns' stems in the language, and such a deletion account would still have to posit epenthesis in Polish diminutives (which are the same shape as the Russian). Jarosz's (2008) account captures diminutive-conditioned alternations by allowing the demands of the [-ek] suffix to override the independent phonology of the stems of nouns like [v'jatr], and thereby compel epenthesis into the cluster only when the diminutive suffix is present. This is the co-phonology-based analysis off of which the proposal for diminutives in §2.1 is modeled.

Because Jarosz's (2008) account can so easily be re-cast using epenthesis, its success does not provide an argument in favor of using deletion. This epenthetic alternative using paradigm uniformity, however, must include the same kind of constraints against word-final clusters that my analysis does in order capture two key generalizations about syllable structure. Firstly, if it did not include syllable or prosodic word well-formedness constraints such as a prohibition against clusters or final prosodic appendices, and only mandated that stress remain on the penultimate syllable of all output forms, it would permit vowel alternation before a stem final cluster to preserve the uniform location of stress across a paradigm. Secondly, it would select a candidate like [sfétr]~[sfétra] in (32d) as the optimal paradigm, because this paradigm does not include epenthesis, but also maintains stress on the same vowel throughout. This inclusion of cluster-prohibiting constraints in an epenthetic co-phonology account renders it extensionally equivalent to the present proposal.

#### 4.3.2. Epenthetic analyses are not new

Epenthetic analyses of Polish have been advanced before. Czaykowska-Higgins (1988) proposed an epenthetic account of the Polish alternation in a rule-based framework, and noted that the existence of near-minimal pairs made it impossible

to determine by potential consonantal environment alone whether a rule should apply to a stem. Bethin (1992) proposed to analyze alternations in loanwords as the product of epenthesis, but alternations in all other words as the product of filling in a lacking representational component as in a traditional underspecification account.

My account of Polish most closely resembles the epenthetic analysis sketched as a pedagogical exercise by Hayes (2009). Under this analysis, vowel insertion is productive only in clusters that would otherwise be sonority rises, e.g. [t\_r], but not in plateaux, e.g. [t\_s] or [l\_r]. The limited number of words that contain an obstruent-obstruent cluster that hosts alternation are exceptional cases of the application of insertion, while the words that contain an obstruent-sonorant cluster that does not host alternation are exceptional cases of blocking. The major difference between my account and the one that Hayes suggests is thus in the statement of the process and the extent of its application. I treat alternation as regularly applying in clusters of all sonority profiles, and treat all the cases of unbroken stem-final clusters that are not within protected suffixes as exceptional, in contrast to motivating epenthesis by avoiding sonority rises, and requiring two sub-classes of exceptions. It would be very difficult, if not impossible, to derive different predictions from Hayes' account as could be derived from mine<sup>8</sup>; whichever account is preferred, vowel alternation is unexceptional in sonority rises, and Polish and Russian are still analyzed differently.

## 5. Conclusion

I have argued that while Russian and Polish vowel alternations are historically related, they diverged. In Russian, alternations result from exceptionally triggered deletion. But in Polish, they are the result of a productive epenthesis process that is subject to exceptions. In Russian, general faithfulness to underlying vowels, exceptional deletion of fully specified underlying vowels, and a prohibition against vowel insertion contribute to explaining a lack of extension of alternation to loan words, the semi-predictable quality of alternating vowels, and paradigm gaps. In Polish, general epenthesis of a default vowel, exceptional blocking of epenthesis, and a prohibition against deletion contribute to explaining ready extension to loan words, entirely predictable alternating vowel quality, and a lack of paradigm gaps. The analysis of Polish that I advance is capable of capturing syllable structural and stem positional generalizations that other accounts miss, while not relying on vowels that are unattested in the language, and lending itself to future experimental investigation.

8. As Zuraw (p.c.) points out, a difference in the productivity of vowel alternation across clusters with different sonority profiles does not have to be the result of exceptionally fixed occurrence of alternation in some plateaux versus general application in rises. Rather, minimally different CONTIGUITY constraints that penalize the break-up of different types of sequences may be ranked with respect to each other and the rest of the ranking of the language to yield more apparent extensibility in rises than plateaux. All of these analyses would capture the syllable and stem positional generalizations of Polish, and treat alternation as the regular rule, not the exception.

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